A clinical profile of geriatric patients at a chiropractic teaching clinic in KwaZulu-Natal

By

Carissa Anja Schirmer

This dissertation was submitted to the Faculty of Health Sciences in compliance with the requirements for the Master's Degree in Technology: Chiropractic at Durban University of Technology

I, Carissa Anja Schirmer, do declare that this dissertation is a representation of my own work both in concept and execution (except where acknowledgements indicate otherwise)

_____ _____

Carissa Anja Schirmer Date

APPROVED FOR FINAL SUBMISSION

_____ _____

Supervisor Date

Dr D. Varatharajullu (M.Tech: Chiropractic)

DEDICATION

I dedicate this research to the following:

My parents, Klaus and Liesel, thank you for being such great parents, for allowing me to always pursue my dreams, and for your unconditional love and support over the years.

To all older adults, may this dissertation make you a little less invisible in the research world.

ACKNOWLEDGEMENTS

- To my Mom, Dad, Bianca and my extended family, thank you for being the greatest and always having my back.

- To my friends, both in and out of DUT, thank you for making this thing we call life more bearable. This would not have been the same without you all!

- To Dr Desiree Varatharajullu, my supervisor, thank you for taking me on as a research student and guiding me through the process.

- To the reception staff at the clinic Jo, Linda, Mishka and Mrs Brecher and even TK, thank you for all the help and chuckles both during my time in clinic and while I was doing my data collection.

- To my statistician, Mr Deepak Singh, thank you for all your help with the statistical analysis for my study.

- To my proof reader, Dr Richard Steele, thank you for your brilliant job in proof reading my work.

- To the Chiro Class of 2016, thanks for being an awesome class!

- To anyone not mentioned, who did help me through my studies, thank you.

- Lastly but most importantly, Dr Duncan Jack, one of my first chiro friends turned brother-in-law. Thank you for the years of help and support. You always offered up your time to help me with anything and everything and without that help I would not be where I am today.

ABSTRACT

Aim: The aim of this study was to determine the clinical characteristics of geriatric patients that presented to the Durban University of Technology (DUT) Chiropractic Day Clinic (CDC) between the clinic operational dates from the 18th of January 2010 to the 4th of December 2015.

Methods: A clinical profile of the clinical records pertaining to individuals who were 65 years of age and older, that frequented the Durban University of Technology (DUT) Chiropractic Day Clinic (CDC) between the 18th of January 2010 and the 4th of December 2015. Data recorded included patient demographics, lifestyle habits and blood pressure, presenting complaint and the nature thereof, medication use, presenting co-morbidities, further tests and patient management.

Results: Data from 397 clinical records was utilized. The majority of the patients were aged between 65 to 69 years with a mean age of 71.31 years (±5.43). More females (56.9%) presented to the DUT CDC in the sampling years, marriage (49.9%) was the most common form of union, and over two thirds of the patients stated that they were retired (63.0%). No history of smoking (73.8%) was the most reported smoking habit, and no history of alcohol consumption (64.5%). In terms of exercise habits, 38.8% did not participate in any form of exercise, over half of the patients reported normal sleeping patterns (56.6%), just over a quarter of the patients were reported as overweight (27.5%), and pre-hypertension (34.0%) was the most commonly documented blood pressure reading. The most common area of complaint reported was the low back (36.5%), with the majority stating that they were suffering with pain only, with an initial onset of pain over one year ago and having previously had x-ray examinations done. Patients consumed on average 3.35 medications, with most taking between three to five medications (43.1%). Anti-hypertensive, non-steroidal anti-inflammatories and cholesterol lowering drugs were the most commonly consumed. The mean co-morbidities presented were hypertension, diabetes and headaches. Generally, the patients had three treatments (mean = 2.94). Soft tissue therapy, electro-modalities and mobilisation were the preferred treatment methods. X-rays were the preferred form of referral and stretching was the most prescribed continuation of care at home.

Conclusion: This is a clinical profile of the patients which presented at a chiropractic teaching clinic in KwaZulu-Natal, South Africa. Similarities to other local and international studies were noted, namely: females were the most documented gender, the most commonly presented areas of complaint were the low back and the cervical spine, the

patients generally suffered with chronic pain and multiple co-morbidities and consumed on average of three to five medications. To validate the findings of this study, follow-up studies should be conducted every five years.

Key Indexing Terms: Geriatrics, Chiropractic, clinical profile, musculoskeletal pain, patient management

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDIXES

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Over the years, it has been difficult to give an exact chronological age of when one is defined as being old. According to the World Health Organisation (WHO), the default age of being classified as an older adult may be either 60 or 65 years (World Health Organization, 2002). Although ageing is an important biological phase in an individual's lifetime, it is a phenomenon which was previously only perceived to occur in industrialised countries. However, now it has become a global issue, particularly in the developing countries (Lehohla, 2014; United Nations, 2013).

A census conducted in South Africa in 2011, estimates that the 60+ population in the country will increase from 4.1 million in 2011 to approximately seven million older adults in 2030, with KwaZulu-Natal (KZN) ranked as the province with the second highest number of geriatrics residents. The increase in numbers is now becoming a concern for the country (Lehohla, 2014; Statistics South Africa, 2016). Unlike in developed countries such as Japan, Germany and Sweden where ageing has occurred in an already well established socioeconomic and political environment, this is not the case in developing countries much like South Africa. Ageing occurs at a much faster rate with poorer socioeconomic conditions and lower socioeconomic levels result in higher cases of death and illness (Lehohla, 2014; Bradshaw and Steyn, 2001). In addition to this, South Africa also remains as having one of the largest gaps in socioeconomic status amongst its population in the world (Lehohla, 2014).

Many older adults ingest numerous drugs to relieve their chronic pain and managing disease symptoms (Batulla *et al*., 2015). Medication adherence is a major issue among the older individuals, as non-adherence often leads to increased side effects in the person often ultimately requiring hospitalisation. Health illiteracy is a major contributor to medication non-compliance as the person is unable to make informed choices about their health (Jin *et al*., 2016; Ntulu, 2016). To assist with medication adherence and reduce polypharmacy Batulla *et al*. (2015) write about how fewer doctors should be prescribing medication to one patient, and greater focus should be placed on what the effects of the medication are in order to prevent adverse reactions.

Twenty-six percent of the older adults in SA consult a health care provider in any one month, and Chiropractic being one of the most utilised Complementary and/or Alternative Medicines (CAM) practitioners by older adults, it is imperative for all Chiropractors and Chiropractic students to better acquaint themselves with this population group (Astin *et al*., 2000; Lehohla, 2004).

The purpose of a Chiropractor is to restore joints using non-invasive methods for optimal biomechanical function, which involves reducing pain, increasing range of motion and allowing for adequate functioning of the muscles and nerves (Chiropractic Clinic, 2015). Hunnisett and Cunliffe (2012) added that for those who are older, Chiropractors restore function where possible and also attempt to delay age related degenerative processes. In some instances geriatric patients may seek out Chiropractic care as they may be opposed to treatment from a medical doctor for certain conditions (Molina, 2008).

Old age is often characterised by poor health due to fragility, disabilities and morbidities (Lehohla, 2014). Moreover, formulating a treatment plan for geriatrics can be complicated and limiting as geriatrics are unique in that their clinical manifestations of disease present differently compared to younger people and they frequently present with co-morbidities (Kaye, Baluch and Scott, 2010; Dougherty *et al*., 2012). Co-morbidities are "the concurrent presence of two or more medically diagnosed diseases in the same individual, with the diagnosis of each contributing disease based on established, widely recognised criteria" (Fried *et al*., 2004: 258). The more frequent co-morbidities seen in geriatric patients include cancer, arthritis, cardiovascular disease, diabetes mellitus, respiratory disease and hip fractures (Weigel *et al*., 2010). The most common reason for an older individual to seek a Chiropractor is the decline in musculoskeletal function which is one of the most prevalent disease conditions associated with aging (Dougherty *et al*., 2012; Hunnisett and Cunliffe, 2012). According to Woolf and Pfleger (2003), the four major disabling musculoskeletal conditions affecting the older adult are osteoarthritis (OA), rheumatoid arthritis (RA), osteoporosis (OP), and back pain, with back pain being one of the main reasons for an older individual to initially seek Chiropractic care (Killinger, 2012). With all these factors to take cognisance of, defining a chief complaint in a geriatric patient is often a difficult task, emphasising the need for a thorough assessment to be carried out (Molina, 2008; Killinger, 2012).

Chiropractors are not limited to treating musculoskeletal conditions only but manage the patient in a holistic manner, thus playing a vital role in managing the health of the older population (Dougherty *et al*., 2012). With many factors contributing to the health status of the older adult, the management of them should not follow the traditional condition

focused approach. Their management should be shifted towards a patient centred approach, meaning the goals and preferences of each patient are central to management. The health status and prognosis also allows the practitioner to determine which goals are realistic (Gestuvo, 2012). Preserving function and independence are very important factors for geriatrics and setting patient specific goals for each individual patient places them in the driving seat of their management outcomes. However, reaching a shared health maintenance plan is not an easy task. The geriatric population are often excluded in clinical trials which contribute to a limited amount of evidence-based research involving this population group especially those with co-morbidities (Gestuvo, 2012).

Chiropractors are able to use a variety of treatment methods and are not limited to using joint manipulation and mobilization only, which allows for a patient centred management approach. The other management options most commonly used include exercise, massage, ultrasound, electrical therapy, acupressure and cold and heat therapy (Hawk *et al*., 2010; Gleberzon, 2001).

Treating a geriatric individual can be quite a challenge to even an experienced Chiropractor, so it is important that students learn as much about this population group as possible. One method for Chiropractic students to better acquaint themselves with the geriatric subset is through Chiropractic teaching clinics (Lishchyna and Mior, 2012). Lishchyna and Mior (2012) state that Chiropractic teaching clinics, much like the Durban University of Technology Chiropractic Department Clinic (DUT CDC) are designed to simulate private practise and ensure that the students graduating are proficient in diagnosing conditions, as well as being experts in the management of patients with neuromuscular conditions. Patient detailing aids the student in understanding the various patient characteristics they may encounter, thereby, preparing them for private practise (Lishchyna and Mior, 2012). The few studies that have been conducted on patient detailing have been conducted mainly on patients attending Chiropractic academic teaching clinics (Lishchyna and Mior, 2012).

The majority of research done in South Africa focuses mainly on areas of major concern in the country such as the human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (Aids) pandemic (Lehohla, 2014). Minimal research on the geriatric population in South Africa exists, particularly Chiropractic studies, even more so in the Chiropractic teaching clinics. This has resulted in them being a vulnerable group (Lehohla, 2014). Chiropractors in South Africa should, therefore, strive to increase their knowledge of this subgroup of people which is best achieved at a student level. By targeting the older population, it will help the South African Chiropractic profession, and

potentially other developing countries, improve their understanding of geriatrics, thus aiding their choice of management programme for their patients, both in the teaching clinic and in private practise. Not only will this benefit the students and clinicians but also the teaching institute, in this case DUT (Lishchyna and Mior, 2012).

1.2 RESEARCH PROBLEM, AIMS AND OBJECTIVES

1.2.1 Research Problem

There is limited literature, profiling the South African geriatric population that seek Chiropractic management. Therefore, this study will add to the literature in terms of better understanding the geriatric population with respect to the types of conditions, in particular which types of musculoskeletal conditions they present with, as well as the management of thereof.

1.2.2 Aim

The aim of this study was to determine the clinical characteristics of geriatric patients that presented to the Durban University of Technology (DUT) Chiropractic Day Clinic (CDC) between the clinic operational dates 18th January 2010 to 4th December 2015.

1.2.3 Objectives

Objective One:

To establish the number of geriatric patients presenting at the DUT CDC between January 2010 and December 2015.

Objective Two:

To describe the demographics (age, gender, marital status and occupation) of geriatric patients seen at the DUT CDC.

Objective Three:

To determine the chief musculoskeletal complaint and management protocol for geriatric patients treated at the DUT CDC.

Objective Four:

To document co-morbidities that geriatric patients may present with at the initial consultation

Objective Five:

To determine associations between the demographics, chief complaint and co-morbidities

1.3 RATIONALE

Weigel *et al*. (2010) reported that the Institute of Medicine (IOM) requires additional studies on all CAM utilised by the public, including who uses CAM and what is known about their services. Over the years, there have been a few prevalence studies done on Chiropractic as a CAM in the United States; however, these studies have provided little insight into the health of the patients, their demographics, and socioeconomic factors, particularly regarding the geriatric population (Weigel *et al*., 2010).

Chiropractic Therapy is becoming an increasingly prominent component in the multidisciplinary health care management system of older adults (Dougherty *et al*., 2012). More recently, it has been observed that there has been a steady increase in the verified benefits of Chiropractic Therapy, particularly in the area of chronic musculoskeletal conditions (Enyinnaya *et al*., 2012; Evans, Ndetan and Hawk, 2011). While Chiropractic Therapy has been utilised more as time goes by, there is very little descriptive data on Chiropractors and Chiropractic patients (Coulter and Shekelle, 2005). Therefore, it is imperative that there be more studies conducted in relation to patient characteristics, Chiropractic treatment and care of geriatrics. Such studies will allow Chiropractors and Chiropractic students to become more familiar with this vulnerable population group, be aware of their different presentations, and be able to determine the correct management plan (Dougherty *et al*., 2012; Buckingham *et al.,* 2012). This is of importance as treating the geriatric population can prove to be a challenge for Chiropractors as they present with many co-morbidities and their perception of pain often differs in comparison to younger people, thereby limiting their treatment options (Dougherty *et al.*, 2012; Kaye, Baluch and Scott, 2010).

Lishchyna and Mior (2012) state that Chiropractic academic teaching clinics are designed to simulate private practise, making sure that once students move to private practise they are competent in treating the general public. Targeting and looking at the patient characteristics of a particular subgroup presenting to a Chiropractic teaching clinic, in this instance geriatrics, will allow students to become familiar with that particular subgroup. This will also ensure proficient treatment and management regimes as well as enhancement of the clinic's teaching base (Lishchyna and Mior, 2012).

The DUT CDC is one of two academic Chiropractic teaching clinics in South Africa which benefit the public with its services but also develop future Chiropractors (Chiropractic Association of South Africa, 2018; McDonald, 2012). Mahomed (2007) noted that older adults utilise health services more than younger population groups do. KwaZulu-Natal currently has the second highest older adult growth rates compared to the other provinces in South Africa (Lehohla, 2014). With a paucity of studies conducted on the geriatric population in South Africa it would be beneficial to conduct such a study on this group. Profiling geriatrics at a teaching clinic allows the students and the clinicians to evaluate the common age related health issues, thus understanding the population group better (Lehohla, 2014; Lishchyna and Mior, 2012; Tiwari *et al*., 2010). Noting the differences in socioeconomic status in a population from a developed country and that of a developing country can result in substantial differences in the clinical characteristics of their population (Lehohla, 2014).

1.4 CONCLUSION

Chapter 1 describes the older adult in a more condensed manner, as well as highlighting the desired outcomes of the study. Chapter 2 looks at the older adult from a descriptive point of view.

CHAPTER 2: LITERATURE REVIEW

2.1 DEFINITION OF GERIATRIC AND THE OLDER ADULT

When looking at the literature, there are no standardised criteria defining when a person is old or elderly. There have been many debates over the years, even as far back as 1875, with regards to the defining moment a person is to be called 'old'. The UN has agreed to a cut-off of 60 years of age and older, nevertheless most developed countries and some developing countries have accepted 65 years as being the chronological age for elderly or otherwise older persons (World Health Organization [WHO], 2002; Orimo *et al.*, 2006). The WHO (2002) has even suggested that for many African countries, the definition should be either 50 or 55 years of age and older, depending not only on the country but also the region as well as the setting. However, instituting this type of age variance would result in difficulties regarding data comparisons across nations (WHO, 2002). Due to the lack of standardised criteria, the pensionable age limit has grown to be the default definition of elderly, namely, 60 or 65 years of age.

As seen from the previous paragraph, it is difficult to describe at what point a person is to be called old. The WHO (2002) states that developed and developing countries should have different ages for defining an older adult due to the variances in demographics and socio-economic status. Rather than defining age as a chronological number, Tiwari *et al*. (2010) suggest people in developing countries be deemed old once they are unable to contribute to society, compared to developed countries where the age of a person can be marked in sequential milestones.

Further, there are sub-classifications proposed within the broad classification of 'old'. Orimo *et al.* (2006) classify those of 65 to 74 years of age as the early elderly, and those over 75 years as late elderly. The WHO classifies those over 80 years of age as the oldest old, between 100 years and 110 years as centenarian and those over 110 years as super centenarian (WHO Regional Office for South-East Asia, 2017). May (2003) classifies 64 to 73 year olds as old age, the 74 to 83 year olds as late old age and those over 84 years of age as frail old age.

Appropriate terminology regarding the discussion of those in their latter years has also come to the forefront in recent times. Avers *et al.* (2011) are of the opinion that the term elderly is ageist. Ageist terms are "terms in which a stereotype is promulgated and treatment is delivered differently on the basis of age." Ageist terms such as 'elderly' are

widely used in the healthcare system which diminishes such people and results in them being stereotyped as physically dependent, sick and frail. This can result in the older adult receiving less than satisfactory care, and can negatively affect outcomes. Avers *et al.* (2011) also state that the term 'elderly' is misleading, because one cannot use one word to define two people of the same age where one is independent and robust, whereas the other is dependent and frail. The editor of the *Journal of Gerontological Social Work,* Dr Michelle Putnam (2015) declared in her editorial in April 2015 that although the term 'elderly' is still used regularly in medical journals, the journal will no longer accept manuscripts where this term is utilised, preferring the term 'older adults'. There are several articles found on the internet regarding the correct terminology for older adults. One in particular is an online newspaper article in *The Telegraph* by Wardrop (2009). Wardrop (2009) explains that a new guide for journalists has been created assisting journalists in the ways of reporting information that is fair and non-discriminatory towards older adults. Unless relevant to the story, it would even be preferred that any descriptive words other than the gender and age of the person involved in any articles be omitted to further insure no bias. Wardorp (2009) reported the late president of the International Longevity Centre Dr Robert Butler as saying that the guide is "an important step in overcoming ageist language and beliefs". A common thread amongst these articles is that older adults do not like to be referred to as 'elderly', with terms such as 'older adult' or 'older person' being regarded as more respectful (Avers *et al*., 2011).

Unlike 'elderly', the term 'geriatric' has an equal and opposite term, namely paediatric and describes an area of medicine (Avers *et al.*, 2011). According to the English Oxford Living Dictionaries (2017), the term geriatric originates from the Greek words "gēras" and "iatros" meaning old age and doctor respectively. Geriatric, therefore, relates to the older adult, particularly their care and health status.

2.2 AGEING AND AGE RELATED CONSEQUENCES

To age and still continue to thrive is described as successful ageing. Successful aging has been a topic of discussion among people for several decades. When a person successfully ages, they add more life to their years which means they are able to remain active and experience liveliness in their latter years, a privilege few experience (Anton *et al*., 2015).

The aged become a vulnerable group and influence the socio-economic, demographic and social welfare of a country (Lehohla, 2014). Watson (2008) writes that while the average lifespan of individuals is not shifting much, it has been observed that more individuals are living longer. The UN has estimated that the population of adults over 60

years of age will triple by 2050 and make up over 20% of the world's population. At the same time, it is calculated that of every five older adults, one of them will be over 80 years of age (Fejer and Ruhe, 2012).

Ageing is an unavoidable and important part of life and as one goes up in age so does the prevalence of disease and disorders, with almost every four in five older adults suffering from one chronic or persistent disease (Lehohla, 2014; Battula *et al*., 2015). Most conditions are not due to ageing but are rather said to be age related. Larsson *et al*. (2016) described chronic pain as being a significant risk factor in decreasing an individual's functional capacity. An increase in falls, symptoms of depression and poorer physical performance are further risk factors associated with chronic pain (Larsson *et al*., 2016).

The WHO has stated that musculoskeletal disorders are one of the leading conditions contributing to disability among the older population. Osteoarthritis, RA, OP and back pain are identified as being the four major contributing musculoskeletal diseases (Fejer and Ruhe, 2012). However, in most cases an older individual does not suffer from one morbidity, but rather co-morbidities or multi-morbidities, meaning a single person suffering from numerous (two or more) long-standing diseases simultaneously. The most common co-morbidities seen in geriatric patients include cancer, arthritis, cardiovascular diseases, diabetes mellitus, respiratory disease and hip fractures (Melis *et al*., 2014; Weigel *et al*., 2010). Depending on the factors researched, multi-morbidities have been found to be present in 55% to 98% of the older population; with a high incidence of multi-morbidities in the older population, determining a concrete diagnosis in an individual becomes complicated (Melis *et al*., 2014; Killinger, 2012). Melis *et al.* (2014) suggest that mental disorders are highly influential on older adults' health, because low moods and worsening cognition are possible predictors for developing co-morbidities.

Salive (2013) evaluated the multi-morbidities of Medicare beneficiaries in the year 2008. Medicare is an American federal health insurance program for those over 65 years of age, those who are younger in age with certain disabilities, and those with end-stage renal disease. There were 30 923 846 individuals enrolled in this medical scheme in 2008 with 16.5% of this total being under the age of 65 years. Salive (2013) documented that the top 15 chronic conditions in those over 65 years of age which were: hypertension (59.6%), hyperlipidaemia (45.4%), ischaemic heart disease (34.5%), diabetes (26.9%), arthritis (22.2%), heart failure (18.0%), depression (10.7%), chronic kidney disease (13.1%), osteoporosis (13.9%), Alzheimer's disease (12.6%), chronic obstructive pulmonary disease (11.1%), atrial fibrillation (8.9%), cancer (7.4%), asthma (4.0%) and

stroke (4.6%). In terms of the prevalence of chronic disease, only 33% of the Medicare patients in 2008 had zero to one chronic condition, whereas 67% had two or more chronic conditions. Salive (2013) found that the prevalence of four or more chronic conditions increased with age, and that women were had more multi-morbidities than men within each age group.

2.2.1 Physiological Changes Associated with Ageing

Age related physiological changes occur at different periods in the majority of the organ systems, meaning the rate of regeneration and the function of the organ systems decrease as one ages (Navaratnarajah and Jackson, 2017). These changes occur not only at structural and functional levels, but also on molecular levels (Alvis and Hughes, 2015). Without an underlying cause, the rate at which age related changes occur do not increase but rather there is an accumulation of these changes over time, whereas a concomitant disease or diseases present in an individual's body may further reduce organ function (Navaratnarajah and Jackson, 2017; Boss and Seegmiller, 1981).

The physiological changes within the major organ systems are discussed below.

2.2.1.1 The Cardiovascular System including Blood Pressure Changes and Cholesterol

The changes that occur within the cardiovascular system (CVS) include decreased function of the heart due to thickening of the arterial walls, changes within the vascular matrix from increased collagenolytic and elastolytic activity, and an increase in the tone of the smooth muscle (Navaratnarajah and Jackson, 2017). All of this ultimately leads to hypertension, from the stiffened vessels and an increase in systemic resistance and cardiac afterload. Lionakis *et al*. (2012) state that cardiovascular disease has become a major contributor to morbidity and mortality in older adults, with hypertension being one of the largest contributing factors. In younger adults, the main cause for an increase in blood pressure is usually that of peripheral resistance, while in those who are older, an increase in the individual's central arterial stiffness (arteriosclerosis) is often the determining factor. Central arterial stiffness typically leads to an increase in systolic pressure and a decrease in the diastolic pressure, whereas in peripheral vascular resistance an increase in both systolic and diastolic pressure is noted (Aalami *et al.*, 2003). This difference in systolic and diastolic pressure is evident in a widened pulse pressure, which is a far more superior method of predicting coronary disease than using the increase in systolic pressure as a screening method (Aalami *et al*., 2003). Hypertension is highly prevalent in the aged community with Lionakis *et al*. (2012) reporting that more than two thirds of those aged 65

years and older having hypertension. Lionakis *et al.* (2012) discuss the Framingham Heart Study which shows that 90% of those who do not have hypertension by the age of 55 years will develop it in their remaining lifespan. Before the age of 45 years, hypertension is more prevalent among the male population, between the ages of 45 and 64 years men and women appear to be equal in terms of prevalence and from 65 years and above more women have hypertension. This shows that the rate of hypertension increases substantially with age in women (Lionakis *et al*., 2012). Hawk *et al*. (2000) found that in the 55 to 65 years old group, only 9.7% of the patients sampled had hypertension. The age group with the most hypertension diagnosed was the 75 to 85 years old group, at 21.2%. The 65 to 74 years old group had a prevalence of 7.7% (Hawk *et al.,* 2000).

Plasma cholesterol is found naturally in the human body and may arise from three sources: the absorption of food, bile salts reabsorbed by the intestine and from cellular synthesis. As one ages, the concentration of cholesterol increases in the plasma. This is a steady process from puberty until 45 to 55 years of age in men, however, it continues for approximately 10 more years in women. Thereafter, it decreases for both men and women (Félix-Redondo, Grau, and Fernández-Bergés, 2013). One explanation for this decrease is the impaired or decreased liver function that also takes place with age. Further determinants of the concentration of cholesterol in the plasma vary for each individual and depend on exercise habits, diet and the presence of metabolic disorders (Félix-Redondo, Grau, and Fernández-Bergés, 2013). Félix-Redondo, Grau, and Fernández-Bergés (2013) describe the lipid changes that take place in older adults. While other mechanisms may intervene, the formation of an atherosclerotic plaque is due to the increase in the concentration of cholesterol within the plasma. Atherosclerosis is a type of arteriosclerosis where atherosclerosis is the thickening and stiffening of one's arteries due to the infiltration of atherosclerotic plaques (Mayo Clinic, 2018). Other factors which may contribute to the formation of atherosclerotic plaques and atherosclerosis are smoking, diabetes and hypertension. This is because these factors increase tissue permeability, oxidation, coagulation and inflammation within the vessels (Félix-Redondo, Grau, and Fernández-Bergés, 2013). The process of the plaque formation begins at an early age but most cardiovascular disease cases and deaths occur in those over 65 years of age. This is presumed to be due to the long-term exposure to harmful agents associated with factors listed above (Félix-Redondo, Grau, and Fernández-Bergés, 2013).

Xue, Head and McMunn (2017) looked for associations between retirement and cardiovascular disease in a 20 year (1991 to 2011) prospective study in China, with a sample size of 1 084 people. It was observed from the results of a linear regression

analysis that systolic blood pressure increased both pre-retirement and post-retirement, however, the rate at which it increased post-retirement was significantly less than pre-retirement, while diastolic blood pressure increased pre-retirement and decreased post-retirement. A further observation made, was that retirement related blood pressure changes were not as significant in women as they were for men (systolic blood pressure $p < 0.01$ and diastolic blood pressure $p < 0.03$). This is thought to be due to the increase in family- related labour post-retirement (Xue, Head and McMunn (2017).

2.2.1.2 The Nervous System

It is estimated that by the age of 80 years, 30% of an individual's brain mass is lost, as a decrease in neural density due to neuronal cell death primarily involving the grey matter occurs as one ages (Navaratnarajah and Jackson, 2017; Alvis and Hughes, 2015). Alvis and Hughes (2015) state that the rate at which the brain decreases in body mass and volume is believed to increase once the brain is 70 years of age, with brain atrophy beginning earlier in men than in women. Cognitive changes such as memory loss are also seen to occur with the decrease in brain mass (Alvis and Hughes, 2015).

A change in the production of the central neurotransmitters takes place which include the levels of dopamine and serotonin. These have an effect on a person's speed as well as their memory and a reduction in synaptic plasticity regulation and neurogenesis (Navaratnarajah and Jackson, 2017; Alvis and Hughes, 2015). Regarding circulation, the permeability of the blood brain barrier increases, allowing for more inflammatory responses in the brain, as well as structural brain damage. With age, capillaries in the brain develop more micro-vessel deformities, and the intima of the cerebroarteries may be thickened by up to 80% by the 8^{th} decade. Both are seen to be precursors to arteriosclerosis which ultimately compromises neurocognitive function due to the increased vascular resistance and decreased perfusion (Alvis and Hughes, 2015).

In terms of vision, the receptor cells in the retina, cones, and rods also undergo changes with age, thus resulting in vision changes. Within the auditory system there is a stiffening of the tympanic membrane as well as sensory loss within the cochlea. The vestibulo-ocular reflex is also affected due to the loss of labyrinth hair cells, vestibular ganglion cells, and the nerve fibres (Aalami *et al.*, 2003). Within the peripheral nervous system the motor, sensory and autonomic fibres are lost, resulting in denervation and muscle atrophy as there is a loss in muscle cell innervation (Navaratnarajah and Jackson, 2017). Decreased tactile and proprioceptive sensation is also observed (Aalami *et al*., 2003).

2.2.1.3 The Respiratory System

Changes occur in the lung parenchyma and its anatomical structures with age. Increased rigidity in the thoracic cage and a loss in respiratory muscle strength occur, thus resulting in an increase in the closing capacity of the lungs and a decrease in the forced expiratory volume in one second (FEV1). In addition to this, there is a progressive reduction in the partial pressure of oxygen (Aalami *et al*., 2003). As one ages, stiffness of the thoracic cage occurs with progressive calcification of the intercostal cartilages, ongoing weakening and atrophy of the intercostal muscles, and arthritis of the costovertebral joints. Further rigidity in the thoracic cage is seen in those with a significant thoracic kyphosis or osteoporosis. With the continuous stiffness of the thoracic cage as well as the atrophy and weakness of the intercostal muscles, the abdominal muscles and diaphragm are required to do more work in relation to breathing. However, the diaphragm also decreases in strength with age (Aalami *et al*., 2003).

With respect to the lungs, there is an insignificant growth occurring in the large airways with age. The bronchioles and alveolar ducts grow significantly in size after 60 years of age. The alveoli also grow in size resulting in a 15% decrease in the surface area available for gas exchange around 70 years of age. A further change which occurs in the lungs as one ages is a reduction in elastic recoil pressure due to the adjacent alveoli fusing and the decreased surface tension forces (Aalami *et al*., 2003; Navaratnarajah and Jackson, 2017).

A decline in FEV1 occurs with ageing. In non-smoking men, it is often seen to decrease by 30mL/y while in non-smoking women it decreases by 23mL/y and even more so after 60 years of age, with an 8% to 10% decline in FEV1 per year. While the forced vital capacity decreases and the residual volume slowly increases, there is no real change in the total lung capacity (Aalami *et al.,* 2003; Boss and Seegmiller, 1981). Gas defusing capabilities decrease due to an increase in alveolar basement membrane thickness, resulting in alveolar-arterial oxygen gradients from the ventilation perfusion mismatch. These changes are most often seen when an older person exercises (Aalami *et al*., 2003). When these changes happen, the risk of pulmonary complications arise. A loss of the individual's respiratory reserves occurs, thus it is important to maintain an older individual's respiratory function (Aalami *et al*., 2003).

2.2.1.4 The Renal and Genitourinary System

Renal mass decreases from an approximate 400g to 300g by approximately 80 years of age. The change in mass is largely due to the loss of the renal cortex, resulting in a

decrease in the glomerular filtration rate due to the loss of glomerular lobulation and sclerosis. From 30 years of age the blood flow to the kidneys, in particular the renal cortex, is diminished by 10% each year (Navaratnarajah and Jackson, 2017; Aalami *et al*., 2003). Glomerulonephrosis is accelerated further in the presence of diabetes mellitus, hypertension and atherosclerosis (Aalami *et al*., 2003). Men are more affected by age related renal decline than females (Alvis and Hughes, 2015). Due to the reduction in glomerular filtration rates and the reduced clearance of creatinine when one ages, acute insults happen more frequently and the rate of chronic renal impairment, as well as end stage renal failure, is more likely (Navaratnarajah and Jackson, 2017; Alvis and Hughes, 2015).

With age, the rate at which the body is able to reach electrolyte homeostasis is lowered, and therefore its response to changes in sodium levels within the body is altered. This is also true for movement of other electrolytes and ions across the tubular epithelium (Alvis and Hughes, 2015). A decrease in the levels of plasma rennin and aldosterone when compared to angiotensin II is also noted, due to the effect that age has on the rennin-angiotensin-aldosterone system (Alvis and Hughes, 2015).

Looking at the female genitourinary system, one of the most frequently performed major surgeries in terms of gynaecology is a hysterectomy. Hysterectomies are commonly performed for benign disorders such as endometriosis, leiomyoma's and genital prolapse (Stang, 2012; Stang *et al.*, 2014). Stang *et al.* (2012) conducted a study on 9 536 women in Germany and found that at least one third of women 65 years of age and older had had a hysterectomy. The incidence of cervical and uterine cancer had also increased by 67% in those who were 65 years of age and older. Stang *et al.* (2014) found that there were regional variances in the rate of hysterectomies performed. Social factors contribute to these variances in terms of the level of education, household income, occupational status, and the child and adult socioeconomic position. There are concerns that women of lower educational levels are at a higher risk of having unnecessary hysterectomies.

In terms of the male genitourinary system, Zaichick and Zaichick (2016) describe how the prostate gland is the only internal organ which continues to grow throughout one's adulthood. More than 70% of the male population over sixty years of age has histological or clinical evidence of benign prostatic hyperplasia (BPH). The most common male non-cutaneous malignancy described in the western world is prostate cancer. The prevalence of both BPH and prostate cancer rises exponentially with age, making increased age the greatest risk factor for both diseases (Zaichick and Zaichick, 2016).

2.2.1.5 The Gastrointestinal System

Changes along the majority of the gastrointestinal tract occur with age. While the initial swallowing response is voluntary the second part of the swallowing response occurs due to the transport reflex and smooth muscle peristalsis. However, as the peristaltic response is altered with age and becomes less efficient and desynchronized, swallowing becomes more difficult (Navaratnarajah and Jackson, 2017; Alvis and Hughes, 2015).

Atrophic gastritis is common in older individuals as the secretion of gastric acid is diminished with age (Alvis and Hughes, 2015). While a reduction in the absorption of some substances such as vitamin B12 may occur due to the changes within the stomach and its abilities to secrete important gastric fluids, this is not sufficient to create vitamin B12 malabsorption diseases such as pernicious anaemia (Alvis and Hughes, 2015; Navaratnarajah and Jackson, 2017). However, a decrease in the height of the villi in the small intestine and thus a reduction of the surface area thereof, may contribute to disorders of absorption (Aalami *et al*., 2003). Also, the bioavailability of calcium may be compromised in atrophic gastritis due to the inadequate capability of dissociating calcium from food complexes (Alvis and Hughes, 2015).

Together with decreased motility, chronic constipation ensues from the lengthened stool transit, which results in the stool becoming dryer due to the water uptake and increased storage capacity as a result of hypotonicity (Navaratnarajah and Jackson, 2017). Diverticula are uncommon in those aged below 40 years, whereas almost 50% of adults older than 80 years of age are found to have diverticulosis. However, only 20% to 25% of those with diverticulosis present with symptoms and an even smaller amount have diverticulitis, which is the inflammatory phase of diverticulosis which presents with pain and often bleeding (Aalami *et al*., 2003; Boss and Seegmiller, 1981).

The liver mass decreases by approximately 20% from the age of 50 years. It has been found that numerous medications are metabolised slower in older adults from the possible decrease in the number of smooth endoplasmic reticulum and hepatocytes. Although a decrease in cells is noted, the liver function remains relatively normal even in older adults (Alvis and Hughes, 2015; Aalami *et al*., 2003). Aalami *et al*. (2003) also stated that the possible increase of the lipid-cholesterol ratio in the bile may be a contributing factor to the incidence of gallstones in older adults.

2.2.1.6 The Endocrine System

The endocrine system begins declining in function due to a decline in hormone production as well as a decline in tissue responsiveness (Alvis and Hughes, 2015). The thyroid decreases in size with age, along with an increase in fibrosis and a decrease in follicle sizes. In terms of its function, there is a lessened uptake of iodine, the peripheral conversion of thyroxine and triiodothyronine is lower, and the levels of thyroxine and free thyroxine are lower (Aalami *et al*., 2003). Adrenal gland function in older individuals changes the secretion of cortisol, shifting it to produce higher levels of cortisol in the evening and this may be a contributor to the insomnia often experienced in older persons (Aalami *et al*., 2003).

Glucose intolerance develops in more than 50% of those over 80 years of age due to decreased insulin production from the beta cells within the pancreas and increased tissue resistance to insulin. These changes may be attributed to poor diet, a decrease in lean body mass and also an increase in abdominal adipose tissue (Alvis and Hughes, 2015).

2.2.1.7 The Musculoskeletal System

Approximately 30% of an individual's muscle mass is lost from the third to the eighth decade (Navaratnarajah and Jackson, 2017). The total cross-sectional area of the muscle fibre is also reduced. This loss of muscle mass and strength is known as sarcopenia. Together, this results in the person slowly losing muscle strength with age. Whilst poor proprioception is the major cause, these physiological changes also contribute to the high rates of falling in older adults (Navaratnarajah and Jackson, 2017; Knight, Nigam and Hore, 2017).

Osteoporosis is another musculoskeletal disorder affecting mainly older adults. Knight, Nigam and Hore (2017) state that those who are 80 years of age have approximately half the bone mass they had at their peak in their young adulthood. Men lose roughly 1% of bone mass per year post 50 years of age, whereas women lose between 2% and 3% of their bone mass each year after menopause (Navaratnarajah and Jackson, 2017). Pre- and post-menopausal women are particularly at risk of osteoporosis and bone demineralisation, due to the loss of the protective effects from oestrogen (Knight, Nigam and Hore, 2017). Bone demineralisation predisposes an individual to fractures. Other factors contributing to the loss of bone mass are the withdrawal of dietary calcium and oestrogen, as well as decreased physical activity (Navaratnarajah and Jackson, 2017). The vertebrae are at particular risk from osteoporosis where micro-fractures may form which results in them collapsing and becoming compressed and thus deformed due to the

weight of the body. This produces the typical hunched over or stooped appearance one may observe in an older individual (Knight, Nigam and Hore, 2017).

Osteoarthritis is present in approximately 10% of men and 13% of women, and is the most commonly occurring arthropathy in the world (Knight, Nigam and Hore, 2017). Age is described as being the greatest risk factor associated with OA, while gender, obesity, genetic predisposition and prior joint injury are risk factors with a less significant contribution (Knight, Nigam and Hore, 2017). As one ages the collagen and elastin components of the joint capsule's outer elastic ligaments lose their elastic properties and therefore stiffness and reduced mobility ensue (Knight, Nigam and Hore, 2017).

2.2.2 Headaches and the Older Adult

Headaches are not uncommon in the older adult; however, the prevalence of primary headaches tends to decrease after the age of 40 years, while secondary headaches are seen to increase with age (Hershey and Bednarczyk, 2013). In an older individual it is important to exclude any secondary headaches when this is presented to a health practitioner, therefore a full diagnostic work-up is vital (Semenov, 2015). Common primary headaches found in the older adult include migraines, tension, cluster, late-life migraine accompaniments (e.g. transient visual, sensory, motor, or behavioural neurologic manifestations), and hypnic headaches.

According to a study done on 833 older adults in Italy, tension type headaches were more common in this population (44.5%) than migraine headaches (11%) (Hershey and Bednarczyk, 2013). Semenov's (2015) agreed and stated that of the primary headaches, tension type headaches occurred more frequently in older adults, with women being affected more frequently. Semenov (2015) also found that migraine headaches have a prevalence of 3% to 10% in this population group, with cluster headaches reported in up to 10% of patients older than 60 years of age. Hershey and Bednarczyk (2013) discuss the American Migraine Study which found that the occurrence of migraine headaches decreased by 15% in women who were 70 years of age compared to women in their fifties. While in men of the same ages there was only a 3% decrease (Hershey and Bednarczyk, 2013).

Secondary headaches which are common and must be included in the differential diagnoses of those adults with headaches are: central nervous system infections, vasculitis, space occupying lesions, diseases contributing to a raise in the intracranial pressure, giant cell arteritis, obstructive sleep apnoea and cerebrovascular disease (Semenov, 2015). Brain tumours both primary and metastatic in nature are more frequent

in the older population and need to be ruled out. Other causes for secondary headaches which need to be ruled out are haemorrhages such as subarachnoid and intracranial haemorrhages. Hospital admissions due to brain bleeds are often found in those with uncontrolled hypertension (Hershey and Bednarczyk, 2013).

2.2.3 Smoking and Older Adults

One of the more serious preventable causes of premature death and disease worldwide is smoking (Reddy *et al*., 2015). Lugo *et al*. (2013) state that smoking not only increases the risk of a shorter life expectancy but also, when compared to their non-smoking counter parts, older adults who smoke have a higher mortality rate from many chronic conditions in particular respiratory and cardiovascular diseases and more so cancers. A meta-analysis on 17 cohort studies found that there is an 83% increase in mortality in older adults who smoked compared to those who did not smoke. Older adults who were former smokers had a far lower excess risk at 34% which continues to decrease as time goes on since smoking cessation (Lugo *et al*., 2013). Reddy *et al*. (2015) highlighted that there has been a slight increase in the consumption of tobacco in the low and middle income countries. It is estimated that by 2030 the use of tobacco will kill more than eight million people annually, with 80% of these deaths occurring in low and middle income countries because adverse health consequences from tobacco use are not as likely to be made known in low income countries (including South Africa) as it is as they are in high income countries (Reddy *et al*., 2015).

Smoking is far more difficult to quit for an older adult and the reasons to quit smoking are often far different in older adults than what they are in younger adults. The number of cigarettes smoked daily often being higher, these individuals having been smoking for longer and so it is more of a habit, and these individuals having less intention of quitting as well as make fewer attempts of quitting. The more serious ‘hardcore’ smokers are those who are older (Lugo *et al*., 2013).

Lugo *et al*. (2013) determined the prevalence of smoking among older adults in Europe and concluded that smoking was found to be more prevalent among men, particularly the 65 to 74 year old age group, and those who had a lower level of education. Among women, a greater number of smokers was found in those who had an intermediate level of education. The smallest number of ex-smokers was found in those whose education was lowest which was true for both gender groups. The overall smoking prevalence in 17 European countries was 12% for those aged 65 years and older (Lugo *et al*., 2013).

When compared to middle-aged adults, older adults had far lower nicotine dependence. Lugo *et al.* (2013), reported that 23% older adults were nicotine dependent. It is thought that many older adults who smoke not only have a physical addiction but also a psychological addiction. Many of those older adults who do quit smoking do so for health reasons particularly after being diagnosed with a smoking-related disorder. Unfortunately, the morbidity and mortality rate in these individuals is still high as they quit smoking too late and have already been diagnosed with a severe smoking-related disease (Lugo *et al*., 2013).

A study by Reddy *et al*. (2015) conducted on a sample of 13 897 people in South Africa which documented the prevalence of tobacco use amongst adults, reported that 10.8% South African older adults were smokers, of which 10.2% smoked daily. Older male adults (16.9%) smoked more frequently than females (7.5%).

A study by Hawk *et al*. (2000) on the Chiropractic care of older adults aged 55 years and above in America and two Canadian provinces observed that 52.2% of their sample never smoked, 32.4% were former smokers and 12.7% were smokers.

Noh *et al.* (2016) conducted a study using data from 7 228 participants who were 45 years of age and older which was extrapolated from the Korean Longitudinal Study of Ageing where the smoking habits of the population sample were recorded. Non-smokers made up 68.5% (n = 4950), 15.3% (n = 1105) were former smokers and 16.2% (n = 1173) were current smokers.

2.2.4 Ageing and Sleep

As one ages one's sleep becomes lighter and more fragmented as a result of an increase in arousals and awakenings. This poor sleep pattern contributes to day time sleepiness; hence older adults are far sleepier than younger adults (Cooke and Ancoli-Israel, 2011). Older adults will frequently complain of difficulty in falling asleep and difficulty in maintaining sleep with recurrent awakenings both at night and in the early morning (Cooke and Ancoli-Israel, 2011).

A decreased ability to sleep is often reported as insomnia in older adults, which is "defined as the inability to initiate or maintain sleep resulting in daytime consequences". Of the adults aged 60 years and older, it was found that 40% to 50% of these adults experience insomnia, with women tending to complain more than men (Cooke and Ancoli-Israel, 2011).

The most common causes of insomnia include depression and psychological stress, medical illness and medications. Daytime anxiety and stress may cause transient insomnia, while depression from serious life events can cause long-lasting insomnia (Cooke and Ancoli-Israel, 2011). Various medical illnesses or even multiple disorders may contribute to insomnia. Pain is often associated with insomnia (most commonly due to OA), breathing difficulties from cardiovascular and pulmonary disorders, and nocturia from an enlarged prostate or neurological deficits such as Parkinson's (Cooke and Ancoli-Israel, 2011). Some medications prescribed for co-morbidities may also create sleep disturbances. Many neurological, gastrointestinal, psychiatric, cardiovascular and pulmonary medications may contribute to insomnia. Polypharmacy may also be a further contributing factor (Cooke and Ancoli-Israel, 2011).

Nocturia, the need to urinate at night time, is a major contributor to poor sleep quality and is common in the older populace with approximately 10% to 24% being affected (Yoo *et al.,* 2010). A Korean study conducted by Yoo *et al.* (2010) on 102 adults aged between 23 and 84 years of age found that 66.7% (n = 68) of the patients complained of true nocturia i.e. they woke up at night to void their bladders. All the patients were given questionnaires to complete. The Overactive Bladder questionnaire determined a significance in those who had to urinate at night time ($p < 0.004$), meaning there is a significant relationship between disturbance of sleep and nocturia (Yoo *et al.*, 2010).

2.2.5 Ageing and Physical Activity

Not only does ageing decrease the ability to perform daily tasks, it is also associated with an in increase in degenerative processes and in the occurrence of varying diseases. Living longer, as many older people are doing today, does not necessarily equate to an increase in the quality of life (Pienaar *et al*., 2004). The dependency period before death in those who are healthier and exercise is delayed and the onset of disability is also delayed (Pienaar *et al*., 2004). Musculoskeletal decline and disorder (including a decrease in muscle function and muscle mass) is one of the most common conditions associated with ageing (Hunnisett and Cunliffe, 2012). To maintain an independent lifestyle as one grows older, both physically and psychologically, it is crucial for general function to be retained. Exercise and basic physical activity are not only ways in which one is able maintain general function; they also play a vital role in moderating both the psychological and physical aspects of chronic pain (Larsson *et al*., 2016; Pienaar *et al*., 2004). Both Stubbs *et al.* (2013) and Larsson *et al*. (2016) write that levels of physical activity are lower in those with chronic pain. However, exercise is a key non-pharmacological method which can assist with pain reduction (Stubbs *et al*., 2013).

Queiroz Ribeiro *et al*. (2016) state that a low socioeconomic status may contribute to increased physical inactivity.

Pienaar *et al.* (2004) reported that South African common reason for adopting a sedentary lifestyle are back pain (34.7%), arthritis (26.4%), dizziness (18.1%), dyspnoea (18.1%), hypertension (8.3%), diabetes mellitus (6.9%), advanced age (6.8%) and the perception exercise will induce a heart attack (2.8%), which ironic because structured regular physical activity lowers the symptoms and dissipates the aforementioned exercises. Larsson *et al.* (2016) found that common co-morbidities such as cardiovascular disorders, obesity, type II diabetes, osteoporosis, cancer, and factors which lead to a decline in an individual's ability to perform activities of daily living such as depression and anxiety, can be lowered in those who exercise (Larsson *et al*., 2016).

Pienaar *et al*. (2004) found in their study that the percentage of older adults over 65 years of age participating in some form of activity was 80%, while those who exercised daily was 67.9%. The most common form of exercise documented was walking at 91.8%, followed by housework at 34.0%, and gardening at 32.1%. None of the participants utilised a gymnasium (gym). Pienaar *et al*. (2004) interpreted this finding as being due to that generation not having a culture of attending a gym.

Hawk *et al*. (2000) found that only 50.2% of adults aged 55 years and older were regular exercisers. The group who exercised the most were adults aged between 65 and 74 at 53.6%.

Watson *et al.* (2016) reported that a higher percentage of females (29.4%) were inactive than males (25.5%). It is also described that inactivity in this population was increasing with age where 25.4% of those aged between 50 to 64 years of age were inactive, 26.9% of those between 65 to 74 years and 35.3% of those 75 years of age and older were inactive ($p < 0.05$) (Watson *et al.,* 2016).

Exercise is an effective tool to reduce fat mass. Hawk *et al.* (2000) found that 38.6% and 20.6% of Americans over 55 years were overweight and obese respectively. Watson *et al*. (2016) reported an association between physical inactivity and the incidence of overweight and obesity ($p < 0.05$).

There are few healthcare practitioners who recommend or prescribe exercise to older patients. The resultant effect is that many older adults have negative or false perceptions with regards to exercise (Pienaar *et al*., 2004). How the older adult goes about exercising with regards to type of exercise, amount of time and where, is up to each individual

person. The onus is on their healthcare practitioner to encourage them to exercise, with some motivation by friends and family, and the media (Pienaar *et al*., 2004).

Noh *et al.* (2016) studied unemployment as a contributing factor to body mass gain and inactivity. Unemployment leads to a general decrease in activity due to the individual no longer being in an active workforce as well as behavioural changes which influence the individual's diet. Body mass gain, overweight and obesity are frequently observed in older adults due to their loss of energy, with body mass gain with unemployment/retirement being more prevalent in women (Noh *et al.*, 2016).

2.3 AGEING AND THE FINANCIAL BURDEN ON A HEALTHCARE SYSTEM

Countries all over the world have been faced with an ever increasing older population; this has also lead to a financial struggle that most healthcare systems in various countries have not been able to keep up (Watson, 2008; Brown, 2012). The sum of money that is often put towards the care of the older adult population in most cases equals the amount that could go towards care for the younger population, the chronically ill and those with now treatable acute and chronic disorders which were previously untreatable (Hunnisett and Cunliffe, 2012; Watson, 2008) The older population is a major burden for healthcare costs due to the often long-term care they require. This is true for developed countries and developing countries alike. While South Africa is seen as a wealthier country in comparison to its neighbouring countries, the healthcare system within it is disjointed resulting in a large proportion of the country's population receiving very little care in terms of modern medicine (Brown, 2012). The transformation of healthcare in each country is pivotal to prevent an economic disaster; however, growth within the current structure is not viable meaning a new approach is to take place while still satisfying the current needs (Brown, 2012).

Medication consumption and its complications are also large contributors to high healthcare expenditures. While a Chiropractor will treat spinal pain in a holistic manner for patients of all ages, physicians will primarily prescribe medication such as a non-steroidal anti-inflammatory to patients (Gleberzon, 2001). Medication prescription in older adults has many risks associated with it, with the incidence of adverse drug reactions being relatively high. The factors involved with this are discussed later in this chapter; however, these adverse reactions often result in the patient being admitted to hospital due to complications that ensue resulting in more expenses (Gleberzon, 2001).

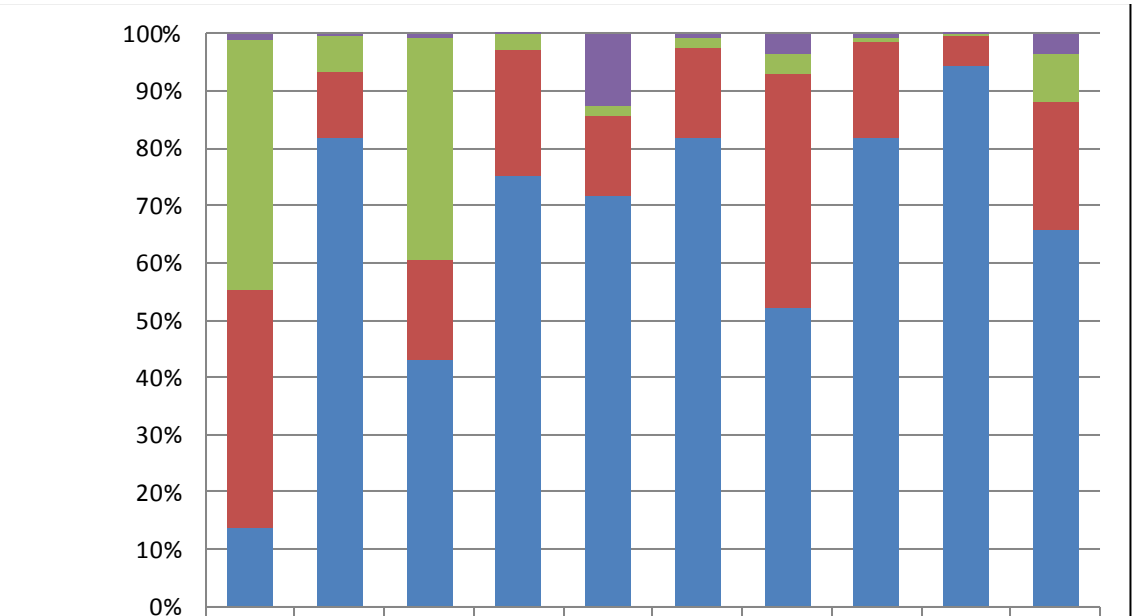
2.4 OLDER ADULTS IN SOUTH AFRICA

Two circumstances which go hand in hand with one another, are health and development. It has been documented for many decades now that those with a low socio-economic level in a community have higher rates of death and illness, as well as a decline in the functional and cognitive abilities of the population, particularly in the older sector. Regardless of the socio-economic status and cause of disease, poverty and ill health have always been correlated (Bradshaw and Steyn, 2001; Naidoo *et al*., 2015). Unlike in developed countries where ageing has occurred in an already well established socioeconomic and political environment, this is not the case in developing countries like South Africa. Ageing occurs at a much faster rate when poorer socio-economic conditions and lower socio-economic levels are present resulting in higher cases of death and illness. South Africa is also a country with one of the most severe disproportions in wealth in the world (Lehohla, 2014; Bradshaw and Steyn, 2001).

Lehohla (2014) mentions that the aged population change the socio-economic, demographic and social welfare aspects of a country. Statistics are necessary for a country to tackle the needs of the population. Statistics South Africa has conducted many censuses in its history; however only three have been conducted in the post-apartheid era. These censuses took place in 1996, 2001 and 2011. The next census is scheduled for 2021 (Lehohla, 2011; Statistics South Africa, 2016). Two Community Surveys also took place i.e. in 2007 and 2016. Community Surveys are surveys which take place on a larger scale between the Censuses, providing information at a municipal level. Community Surveys are conducted to assist both the private and government sectors in any planning and decision making needed (Statistics South Africa, 2016). Censuses and surveys are also invaluable for monitoring desired outcomes and possible declines in the Millennium Developmental Goals that South Africa has embraced (Statistics South Africa, 2016).

When looking at continental Africa, not only does South Africa have the highest percentage of individuals who are older, but South Africa has also one of the fastest ageing populations, with the 64 to 73 year old age group increasing the most in size, a pattern of ageing which follows that of a developing country (Naidoo *et al*., 2015; May, 2003). The number of people over 65 years of age has increased from 2 765 922 in 2011 to 2 952 428 in 2016. Projections estimate that the number of older adults will increase to approximately seven million by the year 2030 (this estimation includes the age bracket 60 to 64 years, which has been excluded from the figures mentioned previously) (Lehohla, 2014; Statistics South Africa, 2016; Naidoo *et al*., 2015).

Both the 2011 Census and the 2016 Community Survey indicate a feminised older population in South Africa. Between the 2001 and 2011 Census there was an improvement in the health of older men as their numbers increased from 64 older men for every 100 older females to 66 older men per 100 older females. A change in these numbers was not depicted in the 2016 Community Survey (Lehohla, 2014; Statistics South Africa, 2016). As a whole this also means that more households are female-headed, in particular by the grandmother of the family rather than the mother (May, 2003). Limpopo has been shown to have the lowest amount of older men, while Gauteng, the Western Cape and the North West provinces have the highest amount of men per women. This is attributed to the high levels of out-migration of men in Limpopo and in-migration into the latter provinces due to the highly male-selective work sectors found in those provinces such as mining, manufacturing and construction (Lehohla, 2014).



	WC	EC	NC	FS	KZN	NW	GP	MP	LP	Total
Indian or Asian	1.1%	0.4%	0.6%	0.2%	12.6%	0.6%	3.7%	0.8%	0.2%	3.5%
Coloured	43.6%	6.2%	38.8%	2.5%	1.7%	1.8%	3.2%	0.8%	0.2%	8.6%
White	41.7%	11.5%	17.6%	22.1%	13.9%	15.8%	40.9%	16.6%	5.3%	22.3%
Black African	13.6%	81.9%	43.0%	75.3%	71.1%	81.7%	52.1%	81.8%	94.2%	65.6%

Key: WC - Western Cape; EC - Eastern Cape; NC - Northern Cape; FS - Free State; KZN - KwaZulu-Natal; NW - North West; GP - Gauteng; MP - Mpumalanga; LP - Limpopo

Figure 2.1: Percentage distribution of the older adults aged 60 years and above by population group and province, Census 2011
Source: Lehohla, 2014

When looking at South Africa as a whole in terms of population groups (**Figure 2.1**), the highest proportion of older adults are black Africans at 65.6%. Older whites come in next making up 22.3% of the older population, thereafter coloureds at 8.6% and lastly Indians/Asians at 3.5% (Lehohla, 2014). It can be noted that the majority of black Africans live in the rural provinces such as Limpopo, Mpumalanga and the Eastern Cape. Rural areas are becoming more populated with older adults. Younger adults tend to migrate out of their rural homes to more urban areas to work, while previous urban migrants have a tendency to move back to their rural communities when they age (Lehohla, 2014).

Table 2.1: Population distribution by province according to Census 2011 and Community Survey 2016

Age Group	Western Cape		Eastern Cape		Northern Cape	
	2011	**2016**	**2011**	**2016**	**2011**	**2016**
65-69	125 210	155 099	140 470	141 317	23 792	30 803
70-74	93 193	105 273	125 950	100 433	17 243	22 086
75-79	59 940	73 023	81 236	65 306	11 474	13 102
80-84	36 435	34 391	53 727	34 792	6 487	7 597
85+	27 448	21 373	40 211	30 715	5 774	5 171
Total	**342 226**	**389 159**	**441 594**	**372 563**	**64 770**	**78 759**
Age Group	**Free State**		**KwaZulu-Natal**		**North West**	
	2011	**2016**	**2011**	**2016**	**2011**	**2016**
65-69	54 101	64 549	175 673	220 261	71 692	74 294
70-74	40 084	45 800	137 821	144 852	51 710	55 498
75-79	27 459	24 261	86 378	84 492	34 216	29 087
80-84	15 755	14 286	62 126	41 355	21 483	17 100
85+	13 357	9 461	46 054	36 650	18 754	13 738
Total	**150 756**	**158 357**	**508 052**	**527 610**	**197 855**	**189 717**
Age Group	**Gauteng**		**Mpumalanga**		**Limpopo**	
	2011	**2016**	**2011**	**2016**	**2011**	**2016**
65-69	201 628	319 548	54 216	73 782	101 022	99 723
70-74	142 909	217 667	51 763	52 192	87 658	80 932
75-79	89 355	117 528	31 215	29 405	59 993	50 133
80-84	55 460	56 355	23 550	16 000	47 895	29 130
85+	43 255	41 113	18 970	16 388	41 848	36 456
Total	**532 607**	**752 211**	**189 654**	**187 767**	**338 416**	**296 374**

Age Group	Total	
	2011	**2016**
65-69	957 805	1 179 287
70-74	748 331	824 733
75-79	481 267	486 377
80-84	322 916	251 007
85+	255 673	211 064
Total	**2 765 992**	**2 952 428**

Source: Statistics South Africa (2016)

More than half of the older population are married thus revealing that the most common form of union was that of marriage. There has been a rise in the number of cohabiting older adults from 1996 to 2011. The proportion of those not married has also risen (Lehohla, 2014).

One's level of education is deemed to be one of the major determinants of one's socio-economic status. A higher level of education is often attained by those with a higher socio-economic status; furthermore the socio-economic status of the next generation is in turn influenced by those with a higher level of education (Lehohla, 2014). The majority of older South African adults have no formal education which directly influences their socio-economic status and thus their well-being, meaning that it is critical that older adults are educated overtime. KwaZulu-Natal had the highest number of uneducated older adults in 2001 (319 033), fortunately by 2011 this number decreased (245 334) and KZN is no longer the province with the highest number of uneducated older adults (Lehohla, 2014). Functional literacy which is described as being able to write one's name down on a form, fill out a form, the ability to read in any language and to calculate the amount of change received was surveyed and the finding was that more than half of the older adults with no schooling had good functional literacy (Lehohla, 2014). Females had poorer functional literacy compared to males and when compared to other population groups, older coloured adults were found to have the lowest functional literacy while older white adults had the highest levels of literacy (Lehohla, 2014).

The apartheid era had a big influence on much of the variance in demographics and socio-economic statuses of the older adults in the country. One of the biggest variances was the type of schooling the population received, as there is a noticeable gap in education between the population groups. It was noted that 28.4% of older whites had attained a higher level of education, while only 2.5% of black Africans, 8.2% of Indians/Asians and 3.6% of the coloured population had a higher level of education. Men had a higher level of education, almost twice as high as women (Lehohla, 2014).

The socio-economic status of older adults was evaluated in the 2011 census. What was found was that four in every ten older adults were poor in South Africa, with over a third making an average living and 27% comprising the rich. Rural provinces like Limpopo and the Eastern Cape contain a larger portion of poor older adults at 77.1% and 64.4% respectively, while the more urban provinces of the Western Cape and Gauteng had the highest proportions of wealthier older adults at 57.5% and 50.4% respectively (Lehohla, 2014). Furthermore, these findings show that households run by older women are socio-economically more deprived than those run by their male counterparts (41.8% and 36.9% respectively). Older adults that are white and Indian/Asian had a higher socio-economic status than older adults who are coloured and black Africans (Lehohla, 2014). Lehohla (2014) also stated that 80.7% of white older adults were rich compared to only 8% of black Africans. When comparing the socio-economic status of the provinces, KZN was

deemed neither “rich” nor “poor”. In 2011, 52.3% of the province was regarded as being poor, whilst 24.5% were regarded as being rich (Lehohla, 2014).

The 2011 census to a small extent also looked at the health of older adults in South Africa and compared certain functions with the males and females in the country. It was found that women experienced higher levers of severe difficulty in the functions of memory, ambulating and sight (2.0%, 1.8% and 1.9% respectively) compared to men (Lehohla, 2014). Lehohla (2004) with Statistics South Africa published a report on the “Perceived Health and other Health Indicators in South Africa” where it was found that of those people aged 66 years and older, 26.6% of this group had consulted a healthcare practitioner. This amount is more than double that of the next highest group which were those aged between 15 and 65 at 11.7%.

Pienaar *et al*. (2004) conducted a study which looked at those aged 65 years and older in several old age homes in Bloemfontein South Africa with 390 participants. Unfortunately, this study only included white participants and only those who could communicate in English; however, the findings noted that the participant’s ages ranged from 65 to 101 years with a mean of age of 78 years. The number of female participants was 81.5%. Of the sampled participants 67.2% were widowed, 26.4% were married, 4.6% single and 1.8% divorced. In terms of the most common co-morbidities noted 48.5% had hypertension, 48.2% arthritis, 32.6% were obese and 29.9% were osteoporotic (Pienaar *et al*., 2004). Of the 390 participants, 50.5% stated that they consume alcohol and 5.6% smoked.

Stevenson *et al.* (2015) conducted a study in New Zealand which compared the drinking habits of 6 642 New Zealanders aged 55 to 70 years. Men were more likely to be heavy drinkers (56.8%) compared to women in this age group (32.3%) ($p < 0.001$). Similar findings were reported in a Croatian study by Rusac (2015) where 1000 people were sampled in the capital Zagreb. In this study sample, 63.3% never drank alcohol, 33.0% occasionally drank and 3.7% drank nearly every day. Rusac (2015) further explained that men who are older in age are more likely to drink than women who are older ($p < 0.01$).

Hawk *et al.* (2000) looked at the patient characteristics of 805 patients who were 55 years of age and older in the United States of America and Canada. In the case of all age groups namely 55 to 64 (59.8%), 65 to 74 (59.3%), 75 to 84 (62.2%) and 85+ years (61.8%) females attended chiropractic clinics more frequently than males. The age group which frequented the chiropractor the most were those aged 65 to 74 years making up 39.4% of the sample. Comparing marital status in the study by Hawk *et al*. (2000), it was

found in their study on chiropractic patients over 55 years of age, 66.3% that were married, 20.0% widowed, 9.8% divorced and 2.9% single.

Noh *et al.* (2016) conducted a study utilising data from the Korean Longitudinal Study of Ageing and documented the demographics in their sampled population (n = 7 228). Within the sample, 59.7% (n = 4318) were employed and 40.3% (n = 2910) were unemployed, which included those who were retired. There were more females (56.6%) than males (43.4%) in the sample, of which 77.1% were married and 22.9% were not married. They also documented the drinking habits of the sample and determined that normal drinkers made up the majority of the sample at 65.5% (n = 4732), heavy drinkers made up approximately one third (30.5%, n = 2205) and 4% (n = 291) were alcohol dependent (Noh *et al*., 2016).

As stated previously, Pienaar *et al.* (2004) found alcohol consumption to be as high as 50.5% in a South African old age home. Hawk *et al*. (2000) looked at alcohol consumption in-depth and categorised alcohol use into never, formerly, occasionally and daily, and found that 36.6% had never consumed alcohol, 8.9% had drank alcohol previously, 42.1% were still occasional consumers of alcohol and only 7.1% were still daily drinkers. The highest number of former drinkers were those over 85 years of age at 17.7%. This group comprised the least occasional and daily drinkers at 29.4% and 2.9% respectively (Hawk *et al*., 2000).

2.4.1 Traditional Medicine in South Africa

In Southern Africa, traditional healers hold a powerful and esteemed position within their societies (Truter, 2007). Traditional healers often referred to as *sangomas*, have been present in South Africa prior the colonisation of the country by the Dutch settlers in the 17th century (Truter, 2007; Nyundu and Naidoo, 2016). In Africa it is estimated that 70% to 80% of the population frequent a traditional healer, while in South Africa approximately 60% to 80% of the population frequent a traditional healer before that of a doctor practising western medicine (Truter, 2007). Traditional medicine is holistic and intertwined with many cultural and religious beliefs relying exclusively on the practical experience and observations of the practitioner which has been handed down from generation to generation both verbally and/or in writing (Truter, 2007). It draws on items or substances utilising them following traditional philosophies. In doing so, they assist in diagnosing, treating and preventing any mental and physical as well as social ailments. Traditional medicine also assists the individuals involved in the physical and mental celebration of certain milestones such as puberty, adulthood and childbirth to name a few. The drugs

used are not dependence-producing nor are they dangerous and are commonly herbal in nature (Truter, 2007).

Truter (2007) writes that the main difference between western medicine and traditional medicine is that western medicine looks at disease at the level of the physical body only, whereas traditional healers look at not only the physical aspects but also the psychological, spiritual and social components of the individual. Many black ethnic groups in South Africa believe in the same principles that govern traditional medicine, believing that the healer will heal them as a whole. The family and community are often involved too. It is uncommon for a patient to be treated as an individual; the family is almost always included in the healing process with the community members assisting at a more expansive level (Truter, 2007).

Various Africans seek treatment from *sangomas* due to their familiarity with this option, their knowledge of cultural customs and traditions as well as their accessibility and availability. A common reason for visiting a *sangoma* over western practitioners is that many western practitioners do not understand their cultural bound syndromes and how to treat them. There are also numerous African cultures which cannot be separated from traditional medicine (Truter, 2007).

Nyundu and Naidoo (2016) found that consulting a *sangoma* is more common among the older population than the younger population. This is believed to be due to the number of younger South Africans who have often received a western orientated education than their parents as well as the forces of the modern world pushing them to use western medicine. Many younger families have also migrated out of rural areas into the urban spaces where fewer *sangomas* are found as they are commonly situated in the rural and semi-urban regions (Nyundu and Naidoo, 2016). The fact that the majority of older black Africans reside in rural areas and the prevalence of *sangomas* in these areas may be a reason why older adults tend to utilise traditional healers rather than allopathic practitioners.

2.5 OLDER ADULTS AND MEDICATION USE

With so many older people suffering from unrelieved chronic diseases and pain conditions, many older adults seek medical help which often results in them receiving several drugs (polypharmacy), most of which are used over the long-term (Battula *et al*., 2015). While prescribing medication is not included in a Chiropractor's scope of practise, Chiropractors do see patients who often take several drugs, both prescription and over-the-counter (Killinger, 2012).

A study conducted on adults over 65 years of age in the Republic of Korea found that approximately 90% of this population group suffers from one or more chronic conditions, while 69.7% have multiple chronic conditions. In the same group, 82% of the individuals take one or more prescribed medications, while 60.3% of the individuals take three or more prescribed medications (Jin *et al*., 2016). A similar situation was found in the United States of America (USA), with the average older adult taking between six and eight drugs (Killinger, 2012). In South Africa, it was found in the 2011 census that 38% of adults aged between 60 to 64 years were already consuming medication chronically. Furthermore, of the adults older than 60 years of age in South Africa, 43.9% of women were consuming chronic medication which was 6.1% more than men in the same category (Lehohla, 2014). Such a high level of medication prescription/consumption is another cause for strain on a country's healthcare system with increased costs, an increase in the risk of side effects and more importantly non-adherence which is often found in older adults. Despite all the negative effects, there have been positive outcomes with the use of modern medications such as symptom alleviation and a decrease in mortality and morbidity rates (Jin *et al*., 2016).

Jin *et al*. (2016) have highlighted the risks associated with older people and medication use, non-compliance or non-adherence being the most common issue. Medication adherence is defined as the patient being able to administer the correct drug and the correct dosage of said drug at the appropriate dosing interval to themselves (Jin *et al.,* 2016; Barat, Andreasen, and Damsgaard*,* 2001). One of the greatest complications with medication non-compliance is that the conditions the patients suffer with and are medicated for may become exacerbated due to overdosing or under dosing, therefore, requiring hospitalisation. Not only has it been observed that 10% to 20% of hospital admissions in older adults have been due to medication related causes, the older adult is also twice as likely to seek emergency medical care than any other population group due to medication side effects (Barat, Andreasen, and Damsgaard*,* 2001; Battula *et al*., 2015; Killinger, 2012). Jin *et al*. (2016) describe the main points for medication non-adherence, namely: patient factors, patient-provider relationship factors, medication factors and healthcare system factors. Patient factors include the age of the patient, gender (with men tending to be less complaint), education level, mental and physical status, and health literacy (Jin *et al.,* 2016; Barat, Andreasen, and Damsgaard*,* 2001). Patient-provider relationship factors involve the level of trust and any dissatisfaction with the healthcare provider and the amount of patient involvement. The medication factors involve the cost of medication, instructions on the label and how complex the medication regimen is. Healthcare system factors involve the level of pharmacy access, quality and quantity of

the follow-up and lastly, the treatment by untrained staff (Jin *et al*., 2016). While various factors exist which may contribute to medication non-adherence, Barat, Andreasen, and Damsgaard (2001) found that the greatest predictor for medication non-adherence was when the amount of prescribed medications was increased. They recommended a decrease in the number of drugs a patient has to take both in terms of the quantity of drugs as well as the dosage taken per day; however, to avoid this unnecessary polypharmacy, the medical physician in charge of the prescriptions needs to evaluate each drug carefully. Non-adherence is especially a concern in those people who are living by themselves and those with early onset dementia (Barat, Andreasen, and Damsgaard, 2001).

Hawk *et al*. (2000) documented the use of pain medication in 805 patients visiting Chiropractic practises in the USA and two Canadian provinces and determined that aspirin consumption of more than three times per week was seen in 20.4% patients. The patients taking non-aspirin analgesics compromised 16.9% of the sample, and 14.5% of the patients were taking prescribed medication.

2.5.1 Health Literacy

In the Republic of Korea, health literacy has come to the fore of clinical concepts. Health literacy looks at how much individuals know about basic health information, and how and where they obtain this information so that they are able to make informed choices about their health (Jin *et al.,* 2016). Those who have a lower health literacy have been found to have a poor understanding of the instructions and indications of medication prescribed, which may result in undesirable drug effects and medication errors. This can lead to increased hospitalisations, readmissions, non-compliance with medication intake, and healthcare costs which could have been otherwise avoided (Jin *et al.* 2016). Unable to make informed choices about their own health, it can therefore be said that those who are health illiterate become a vulnerable group, due to a lack of understanding of important information and little access to health services (Ntulu, 2016).

Willies Mchunu, the premier of the province KwaZulu-Natal (KZN) stated in an interview that due to the high levels of health illiteracy in KZN there are scores of preventable diseases that have undermined the quality of life and health of countless people in KZN (Ntulu, 2016). This comes as a direct result of individuals not having the capability to make adequate health decisions due to a lack of understanding of health information and their services (Ntulu, 2016). Mchunu mentions further in the interview that while the overall life expectancy has improved in KZN, health illiteracy still remains a challenge. It is the older adult and those who have little schooling who experience the greatest plight

associated with health illiteracy. Since the leading cause of mortality among South Africans is persistent poor health, it is imperative for changes to be made to create a better health literacy status thereby improving the well-being of its citizens (Ntulu, 2016).

With ageing, come many physiological changes in one's body, which makes medication prescription in older adults much more difficult, compared to those who are younger in age. These changes often affect the renal and hepatic functions, therefore, may have an effect on how medication is absorbed, digested and excreted. Drugs also accumulate in the adipose tissue in an individual's body (Battula *et al*., 2015). With total body fat increasing drastically when one is older and body mass decreasing, there is an increase in the accumulation of drugs in the body and with the physiological changes less of the drug is excreted. This requires that lower doses of the drugs are prescribed in an attempt to decrease the risk of undesired affects (Battula *et al*., 2015).

Battula *et al*. (2015) suggest that prudent prescribing in the older adult should include not treating any adverse drug reactions with more medication, and more effort should be made to look for alternate treatments which are non-pharmacological in nature. Chiropractors also need to be aware of the medications their patients are consuming, particularly their older patients, and check if they are experiencing any side effects or showing signs of side effects such as joint or muscle pain (Killinger, 2012).

2.6 DEFINING CHIROPRACTIC AND THE ROLE OF CHIROPRACTORS

The term "Chiropractic" is of Greek origin derived from the words *chiro* and *praktikos* which translates to "hand" plus "practical" respectively; when used as a whole the general context thereof means "done by hand" (Online Etymology Dictionary, 2018).

The training of a Chiropractor includes all aspects of primary care, meaning Chiropractors are trained to diagnose several disorders as well as treat those (Cambron *et al*. 2007). The profession falls under the branch of holistic medicine where treatment is drug free with a non-surgical approach and is performed utilising various adjustment techniques which are done predominately by hand (Hunnisett and Cunliffe, 2012; Enyinnaya *et al*., 2012). Over the past several years there has been much discussion about Chiropractors as primary care providers (PCP). Cambron *et al*. (2007) evaluated Chiropractors and physicians who were working in an interdisciplinary environment, most of the other disciplines being allopathic. No significant difference was found between the two groups when the scope, taxonomy and importance to achieve good health were compared. Cambron *et al*. (2007) found that 92% of the disorders patients presented with were diagnosable by Chiropractors and they were able to assist in treating over 50% thereof.

While some patients use Chiropractors as their primary care physician, the focus of Chiropractic is on the musculoskeletal and neurological systems. For this reason, it can be a cost-effective method for treating spinal as well as any other condition relating to the neuromusculoskeletal system especially chronic conditions (Brown, 2012; Enyinnaya *et al*., 2012; Cambron *et al.*, 2007).

2.7 CHIROPRACTIC AS A COMPLEMENTARY AND ALTERNATE MEDICINE

Chiropractic also falls under the category of complementary and alternative medicine (CAM). Studies conducted in both the USA and United Kingdom (UK) have noted that CAM therapies, in particular Chiropractic, have become ever more popular as more people have begun looking for alternatives to “mainstream” medicine (Hunnisett and Cunliffe, 2012; Astin *et al*., 2000). Complementary and alternative medicine therapies have become increasingly popular amongst the older population as well (Arcury *et al*., 2006; Gleberzon, 2001). Arcury *et al.* (2006) found that older adults prefer CAM practitioners.. The approach towards treating the older adult has begun changing in the medical world where the goals and desires of the patient are the focus of the treatment rather than the standard disease-specific approach (Arcury *et al*., 2006). This is known as a patient-centred care (PCC). In this approach, the patient feels more in control as their goals and preferences of treatment are taken into consideration (Gestuvo, 2012). This approach mimics that of the Chiropractic intention, which is holistic and conforms to the biopsychosocial method of being patient centred (Gleberzon, 2011).

The most common reasoning for people to seek out care from a CAM practitioner is that they suffer from back pain, with Chiropractic being the most frequently utilised CAM therapy in this case (Killinger, 2004; Evans, Ndetan and Hawk, 2010). While most new patients attend Chiropractic treatment for back pain, there are many repeat patients who continue their Chiropractic treatment as a management approach as well as for maintenance care, to manage current complaints, prevent any further issues arising, promote health and enhance the quality of life (Killinger, 2004; Gleberzon, 2001). A further common reason for patients seeking Chiropractic treatment is due to the pain and disability associated with arthritis. Enyinnaya *et al*. (2012) stated that Chiropractic treatment has benefited those with OA resulting in the patient suffering with less pain, and gaining improvement in function.

It is well known that the number of musculoskeletal complaints increase in the older adult, for this reason it is anticipated that the number of visits by older adults to Chiropractors and other CAM practitioners is likely to rise due to the current change in population demographics and the increased interest in CAM therapies (Killinger, 2004). While

Chiropractic is becoming increasingly popular in most countries, particularly in developed countries, Mahomed (2007) stated that very little about Chiropractic is known by the populations of developing countries, which is the case in South Africa as well. Lehohla (2014) reported that the largest portion of older adults in South Africa are black Africans who make up 65.5% of the older population group. The report also indicates that a large portion of these adults live in rural places where traditional healers are frequently found (Lehohla, 2014; Truter, 2007). The growth of Chiropractic visits by older adults in South Africa is slow, which could possibly be explained by the fact that older black African adults prefer treatment from traditional healers (Truter, 2007; Nyundu and Naidoo, 2016).

2.8 CHIROPRACTIC CARE AND OLDER ADULTS

As previously mentioned the four common musculoskeletal complaints in the older adult are OA, RA, OP and back pain. Low back pain is, however, the main causative factor that results in an older adult seeking out the help of a Chiropractor, with 6% of spinal pain being reported as disabling and 23% as non-disabling (Fejer and Ruhe, 2012; Dougherty *et al*., 2012). Osteoarthritis is also highly prevalent among the older population, contributing greatly to disability, and being the most commonly diagnosed form of arthritis among the older population (Enyinnaya *et al*., 2012). Low back pain is the number one complaint throughout most studies conducted on patients at Chiropractic clinics. Nyiendo *et al.* (1989), reported that the most frequently reported health complaint was that of low back pain. Coulter and Shekelle (2005) found that of the 76% back-related problems documented, 27% of them reported neck or cervical spine pain as their chief complaint. Low back pain came in after that at 22% and back/spine pain at 21%. Extremity complaints were reported in 13% of the study sample. A study conducted in 32 states in the USA and two Canadian provinces by Hawk *et al*. (2000) with a sample of 805 patients found that of the patients aged over 55 years, 1.2% complained of head pain, 8.5% of neck pain, 32.9% of back/spine pain, 3.1% for shoulder pain, 2.4% with arm/elbow/hand complaints, 5.6% with hip complaints, 2.7% with knee or ankle/foot complaints, 3.0% with extremity complaints, 0.8% with non-musculoskeletal complaints, 0.4% with other complaints and 35.5% had complaints in multiple locations. Of these individuals, 17.7% experienced pain for less than a week, 23.1% had pain for one to six weeks, 10.3% had the pain for six weeks to six months, 7.4% for six months to a year and the largest number (37.2%) had suffered with the condition for over a year. Of this sample group, 57.4% had pain only, 11.9% had non-painful symptoms (with symptoms of stiffness and/or numbness), 14.9% had both pain and non-pain, 7.5% were being seen for health maintenance and 5.7% were being seen for ‘other’ (Hawk *et al*., 2000).

Hunnisett and Cunliffe (2012) highlight the importance of Chiropractic care for the older adult. While degeneration in musculoskeletal health is inevitable as one ages, Chiropractic treatment can assist in delaying the process and where possible restore function. With older adults a more realistic goal is to manage musculoskeletal disorders rather than aim for a cure. Like most conditions, musculoskeletal complaints in older adults are most frequently chronic, therefore following a maintenance program can allow older adults to preserve functionality and assist in preventing any aggravations from arising and getting worse (Hunnisett and Cunliffe, 2012). This is an example of how Chiropractic can assist in decreasing the burden placed on a country's healthcare system.

Defining a chief complaint in an older adult may often be a rather difficult task due to the number of co-morbidities present, which emphasises the need for a thorough assessment (Killinger, 2012). Chiropractors are trained in diagnostics and are able to use a number of diagnostic procedures and tools to determine the nature of the patients' condition and which method of treatment will be most appropriate, and to assess if any contra-indications to the treatment are present (Hawk, 2002). These assessment methods include performing a physical examination, including neurological examinations and x-ray and laboratory evaluations if needed. Other forms of assessment a Chiropractor may do beyond standard medical diagnostics is assessing the musculoskeletal system of the patient (Hawk, 2002). Assessing the musculoskeletal system entails a biomechanical assessment which looks at joint mobility, postural assessment, and location of myofascial trigger points and tension within the muscle. In keeping with the holistic approach of Chiropractic the nutritional background, exercise habits and lifestyle practises of the patient may also be evaluated (Hawk, 2002).

To ensure complete well-being of the patient, Chiropractors are also able to send their patients for further tests, much like x-rays. The North American study by Coulter and Shekelle (2005) which collected data from five American sites and one Canadian site, found that 6% of patients (n = 1 275) were referred out for x-rays. In the study by Mootz *et al*. (2005), which sampled a total of 2 550 patients visiting Chiropractors in the American states of Arizona (n = 1 201), and Massachusetts (n = 1349) revealed that plain film radiographs were performed in 17% of the patients seen by Chiropractic practitioners in Arizona and 6% in Massachusetts. In both states MRI scans were done a mere one percent. In the study by Hawk *et al*. (2000), 62.1% of their sampled patients were sent for x-rays.

There are various techniques a Chiropractor can make use of to treat and manage their patients. Fall prevention is not one that is frequently used by all Chiropractors, but is a

very important aspect in the management of the older adult. The four most common practices are that of spinal manipulative therapy (SMT), exercise, dry needling and nutritional advice (Dougherty *et al*., 2012; Gleberzon, 2011). Chiropractors are best known for SMT, which is customarily a high-velocity and low-amplitude thrust or technique on the joint in question and is safe for older adults, even those that are frail. This technique allows for a therapeutic stimulus to be delivered to the joint complex without going beyond its limit and disrupting the anatomical integrity thereof (Dougherty *et al*., 2012; Gleberzon, 2011). Other treatment procedures that may be conducted by a Chiropractor include ultrasound, hot packs, ice packs, massage therapy, stretching and electrical stimulation. Procedures done on less than 5% of patients included traction, orthotic fitting, and acupressure. The recommendation of bed rest, weight loss and frequenting a homeopathy was also advised to less than 5% of the patients (Gleberzon, 2001). Gleberzon (2001) found that the most frequently given recommendations for continuation of care at home consisted of exercise for a minimum of 20 minutes three times weekly, the application of hot and/or cold packs, and nutritional advice.

Mootz *et al.* (2005) highlighted the types of treatment procedures performed by Chiropractors in two American States which saw an average of 1275 patients. Spinal manipulation was performed in over 80% of appointments in both states, and extremity manipulations in 10% of appointments (Mootz *et al*., 2005). Devices commonly used for treatment in these States include an activator gun, therapeutic ultrasound, electrical stimulation, manual traction, and hot/ cold packs. Soft tissue therapies were also common methods of treatment. In terms of rehabilitation exercises and stretches were frequently given to patients (Mootz *et al*., 2005).

Hawk *et al*. (2000), in their study which included Chiropractic practices in the USA and Canada found that the most common single use technique was that of the Activator which was used on 56.6% of patients. Manipulation performed on patients predominantly consisted of the diversified technique (23.5%). Other procedures included cryotheraphy (13.5%), ultrasound (12.3%), and hot packs (11.3%). Electrical stimulation, massage and corrective exercises were used in 5% to 10% of the practises. The least common procedures noted with less than 5% of practises were traction, orthotics, acupressure/acupuncture and the recommendation of rest. Therapies or instructions to continue at home included exercise (41.0%), the application of hot and cold packs (40.8%) and nutritional advice (24.5%) (Hawk *et al*., 2000).

Patients who frequent Chiropractors for treatment of pain disorders have seen vast benefits. Enyinnaya *et al*. (2012) mentioned how much those suffering from the effects

associated with OA have benefited from Chiropractic treatment with improved function and a decrease in pain levels. Spinal manipulation has also been advocated for the treatment of acute and chronic low back pain, chronic neck pain and chronic headaches (Gleberzon, 2001). According to Gleberzon (2001), age of the patient is not a relative or absolute contraindication to manipulation, including the manipulation of the cervical spine. When necessary, the manipulative technique is modified depending on the patient's presentation and tolerance, although it is recommended that there be more pressure and less force in an adjustive technique performed on an older adult. There are also several manipulative techniques a Chiropractor may be trained in which they could use as an alternate method. While age does not make adjusting the patient a contraindication, various age-related factors must be taken into consideration when treating an older person such as the presence of OP, the use of anticoagulants and any fractures. Contraindications should, therefore, rather be viewed per case presentation instead of the age presentation (Gleberzon, 2001).

Gleberzon (2001) states that Chiropractic care is not only cost effective but also safe and effective, with the total annual healthcare services costs (in the USA) of being under Chiropractic maintenance care being approximately a third of what older adults were spending on standard care.

Chiropratic care for older patients should include recommendations to exercise more. Exercise assists in maintaining musculoskeletal health which in turn increases mobility and decreases the risk of falling and frailty, one of the major consequences seen with ageing and ultimately leads to less emergency hospital visits (Hunnisett and Cunliffe, 2012).

Evidence-based medicine relies on the results of randomised clinical trials meta-analysis of those trials. Very few clinical trials include subjects over 75 years of age which leaves that portion of the population invisible to scientific medicine (Gleberzon, 2011). Hawk (2002) highlighted the fact that there is little data available on the effect of Chiropractic care on the health of older adults. Sadly, this is also true in South Africa as well. In South Africa, much of the medical research being conducted is focused on the ever concerning pandemic of HIV/ Aids (Lehohla, 2014).

With the little amount of research done in the area of managing older adults in the field of Chiropractic, it is crucial that Chiropractors make themselves more familiar with the variations in their health compared to younger people, and understand the appropriate management strategies (Dougherty *et al*., 2012).

2.9 CLINICAL PROFILING USING CLINICAL RECORDS

To “profile” means to outline or create baseline information about a person, an object or population group (Mosby’s Medical Dictionary, 2009; Masson *et al*., 2008). According to Dorland’s Medical Dictionary for Health Consumers (2007) the term clinical is reported as “pertaining to or founded on actual observation and treatment of patients”. A clinical profile may, therefore, be described as using the information from observing and treating patients of a certain population to provide the initial information or an outline about the population in question.

Although Chiropractic Therapy is used relatively extensively, there is a lack of good descriptive data of Chiropractors and the patients they treat (Coulter and Shekelle, 2005). Coulter and Shekelle (2005) state that the minimum data required to gain this information is through documenting patient demographics, their patterns of Chiropractic use, health status and the role of the Chiropractor in their care. The use of clinical records is one method of collecting this descriptive data by generating a clinical profile. Clinical records are good tools for research due to the wealth of information contained within them including the different stages of treatments or diagnostic procedures done, allowing them to serve an array of purposes (Harkema *et al*., 2005; Zhang and Patrick, 2006). With clinicians documenting patient information and treatments over extended periods of time, it also creates the possibility for epidemiological and longitudinal. In the majority of cases, due to the nature of the clinical records and sheer number of available records, it is often impossible to extract all the information from the clinical record of a single person (Harkema *et al*., 2005). Study dependent, extraction of information may only take place after several years due to what is being researched, and due to the parameters of the desired information. In the end, what results from the case is often an astounding amount of information including lab reports and other investigations sent for (Harkema *et al*., 2005). Clinical profiles are also able to assist in the improvement of patient care by evaluating treatment protocols created over time and determining which treatment is most beneficial for which condition (National Institute for Clinical Excellence, 2002).

2.10 TEACHING CLINICS AND THEIR IMPORTANCE

Chiropractic teaching clinics are vital in any Chiropractic programme. Teaching clinics are designed to assist students through supervised experiences in preparing them for work beyond the clinic in “real life” practice. This includes competency in their diagnostics skills and their ability to manage neuromusculoskeletal disorders therapeutically (Lishchyna and Mior, 2012; Kaeser *et al*., 2014). The objective of teaching clinics is to mimic clinical practice giving students the practical experience and thus, the competency and ability to

treat a variety of patients and their complaints once leaving the comfort of a teaching facility. Teaching clinics are frequented by an array of patients which is ideal for students, as this exposes them to various case opportunities allowing them to have a more insightful clinical education (Lishchyna and Mior, 2012; Kaeser *et al*., 2014). While the location of these clinics will also determine the type of patient that will present to the facility, a study conducted by Nyiendo *et al*. (1989) on the teaching clinics of six Chiropractic colleges in the USA found that there was no noteworthy distinctions in the types of complaints that the patients presented with; however, there was diversity in the socioeconomic status of the patients at the various clinics (Lishchyna and Mior, 2012). Often clinics involved in community outreach have been found to cater for a higher percentage of older adults, those of a lower economic status and population minorities. These clinics are crucial in developing experience and competency in the area of geriatric care for Chiropractic students (Killinger, 2004).

When looking at Chiropractic Therapy on an academic level, Killinger (2004) noted that education in both the medical and Chiropractic fields is similar in structure and topics. In the USA, it has been noted that per instructive programme the Chiropractic students have an extra 159 contact hours compared to those in medical programmes. While there is no documented information on geriatric coursework in the medical curricula, all accredited Chiropractic colleges are required to include a minimum of one course on geriatric care (Killinger, 2004). This is no different to the Chiropractic curricula in South Africa, with a module on geriatrics covered in the students' final academic year under the subject of Clinical Chiropractic V at Durban University of Technology (Durban University of Technology, 2018: 36). With the swift growth of the older population, more emphasis should be placed not only on the educational framework regarding those who are older but more importantly in the clinical training too. This is true for all healthcare professionals, not only those involved in Chiropractic (Killinger, 2004).

2.11 TEACHING CLINICS IN KWAZULU-NATAL

The DUT Chiropractic day clinic (CDC) is one of two main teaching clinics in South Africa, with the second one located at the University of Johannesburg (UJ) in Gauteng (Chiropractic Association of South Africa, 2018). Durban University of Technology is situated in Durban, KwaZulu-Natal (KZN). There are a further three community outreach clinics namely Marburg Haven, Cato Ridge and Seacow Lake, where the Chiropractic student interns of DUT are able to treat patients on a rotation basis either weekly or biweekly. Treatment is always done under the supervision of a qualified Chiropractor

acting as the clinician, who are either lecturers at DUT or Chiropractors working in private practise both at the DUT CDC and at the outside clinics.

At both institutes in South Africa, students begin their clinical experience in their fifth year of study. Once the students complete the DUT requirements of 35 new patients and 350 follow-up patients, as well as a Master's dissertation, they are then referred to as interns, as set out by the Allied Health Professions Council of South Africa, until they are able to register as a qualified Chiropractor. There are also junior and senior students in the clinic. Fifth year students are referred to as juniors, whereas those in sixth year and above are known as the senior student interns (Chiropractic Clinic, 2015).

Patients attending the DUT CDC pay a reduced fee in comparison to those attending private practise. In 2017, the consultation tariff of a fifth year student for an initial consultation was R130 and follow-up visits were R90 each. The consultation tariff of a sixth year student was R150 for the initial consultation and R110 for each follow-up treatment. Reduced fees are also awarded to those patients who cannot afford the fee (Chiropractic Clinic, 2015).

Attendance at the outside clinics free as these are community service sites. Any person who is deemed fit for Chiropractic treatment is able to attend the clinics, be it the DUT CDC or one of the outside clinics. People of all income brackets attend these facilities.

2.12 CONCLUSION

Chapter 2 looked at the older adult in great detail from a literature point of view, describing all the relevant information that has already been documented from previous research studies. The following chapter details the research design of this study.

CHAPTER 3: METHODOLOGY

3.1 STUDY DESIGN

The study paradigm was quantitative, and the design was a descriptive study involving a clinical profile. This clinical profile was a method of providing baseline data on the geriatric population attending the DUT CDC by evaluating and documenting the prevalence of the age-related diseases present, as well as their management protocol (Masson *et al*, 2008; Tiwari *et al.,* 2010).

The clinical profile involved extracting patient information pertaining to the demographics, co-morbidities, chief musculoskeletal complaint/s, referrals, patient education and concurrent treatment from other specialists at the initial consultation. In some cases, the patient had two chief complaints at the initial consult, both of which were documented. Follow-up visits relating to the patient's complaint/s at the initial consult were recorded, however the visits were no longer tallied once a new regional and/or physical was done or the patient had not returned after 3 months such that a new physical and regional examination was required to be completed. The management protocol prescribed was recorded with the concurrent follow-ups.

3.2 PERMISSION TO CONDUCT THE STUDY

Ethical clearance was granted to the researcher from the Institutional Research and Ethics Committee (IREC) (Appendix A) (IREC Reference Number: REC 106/16) of the Durban University of Technology. Permission to conduct the study at the DUT CDC was also obtained from the Clinic Director (Appendix B) and the Director of Research at DUT (Appendix C).

3.3 STUDY LOCATION

The Durban University of Technology (DUT) Chiropractic Day Clinic (CDC) is located at 11 Ritson Road, Berea, Durban 4001, South Africa.

3.4 STUDY POPULATION

Clinical records were used of patients that presented to the DUT CDC between the 18th of January 2010 and the 4th of December 2015 aged 65 years and older.

3.5 RECRUITMENT AND NOTICE

For the purposes of this study, no recruitment was necessary as the study was a profile of the clinical records already available at the DUT CDC. Furthermore, prior to the first consultation at the DUT CDC, every patient is required to complete and sign an information sheet pertaining to their personal details (Appendix D). This form has a section stating that through their attendance at the DUT CDC, their information may be utilised for research purposes either directly by participation or through data collection of their clinical records.

For ethical purposes a notice (Appendix E) was displayed in two visible areas of the clinic reception area for the duration of the data capturing process. This allowed patients to contact the receptionist and/ or the researcher should they not consent to having their information included in the study or if they required further information regarding the study.

3.6 SAMPLE CHARACTERISTICS

Clinical records pertaining to older individuals (65 years and older) were sampled. Data was extracted as necessary between period of the 18th of January 2010 and the 4th of December 2015.

3.7 SAMPLE SIZE

A probability analysis performed on the research by McDonald (2012) indicated that a minimum of 150 clinical records were required within the sampling time period from the 18th of January 2010 to the 4th of December 2015.

To meet the objectives of this study and gain insight into the average population size of the geriatrics visiting the DUT CDC, all clinical records were sampled within the sampling period.

3.8 INCLUSION AND EXCLUSION CRITERIA

3.8.1 Inclusion Criteria

- Clinical records pertaining to individuals 65 years of age and older at their initial consultation.
- New clinical records that met the age requirement and were opened at the DUT CDC between the 18th of January 2010 and the 4th of December 2015.

- Clinical records where the patients had given informed consent by signing the information sheet (Appendix D).
- Active clinical records. These are clinical records at the DUT CDC where the patient has actively come back for treatment not letting their file become dormant and being filed in the dormant section. The dormant clinical records were accessed in the event that there were insufficient active clinical records to make up the minimum sample size.

3.8.2 Exclusion Criteria

- Clinical records that were opened for any research studies at the DUT CDC between the 18th of January 2010 and the 4th of December 2015.

3.9 RESEARCH PROCEDURE

Once permission was granted by IREC (Appendix A) the Clinic Director (Appendix B) and the Director of Research at DUT (Appendix C), all the applicable research approval letters were sent to the Clinic Administration Staff after which the researcher was given authorization to gain access to the filing room. The notice (Appendix E) was hung up in two visible areas in the clinic reception area for patients to see. The notice was up for a week before data collection began and three weeks post completion of data collection, while the researcher was rechecking all the relevant clinical records.

Data collection, including the checking of the clinical records took place over seven months from May 2017 to November 2017. Upon commencement of data collection, the researcher initially went through the clinical records manually; thereafter, utilising the reception computer to find the relevant clinical records. The data on the computer depicted the clinical record numbers in numerical order as well as the birth date and year of the patient. Each applicable clinic record was then recorded in a recording book used by the researcher, allowing the researcher to keep track of each clinical record utilised. Thereafter, the respective records were manually extracted from the filing system and taken to a small area set up with a desk and chair in the filing room where it was ascertained that the patient information met the inclusion criteria. Once all the inclusion criteria had been met, respecting the patient's confidentiality i.e. not recording the patient's name, the researcher proceeded with the extraction of the relevant data from the patient file. The patient's clinical record number was given a code in the event that the researcher needed to refer back to the patient information.

The relevant data included the patient demographics (age, gender, marital status and occupation), a few lifestyle habits and blood pressure, the chief complaint/s and their signs and symptoms, prior screening tests relevant to the complaint/s, medication used, referrals, in-house tests, number of follow-up visits, patient education, concurrent treatment from other specialists and any co-morbidities presenting at the initial consultation, as well as the management protocol at each follow-up visit. The follow-up visits were no longer included once a new regional and/ or physical examination was completed or the patient had not returned to the clinic after a period of three months such that a new physical examination was required. Once all the data was extracted and captured the clinical record was returned back into the filing system.

A register with a "sign in and sign out" procedure was required from the Clinic administration where the patient file and time was recorded on removal from the filing system and again on its return. On completion, the register was placed in the clinicians file at the CDC's reception. The researcher made a similar register which included the code numbers which was kept with the researcher in the recording book.

3.10 DATA COLLECTION TOOL

The extracted data was immediately captured onto a pre-constructed data collection sheet (Appendix F). The data collection tool for this study (Appendix F) was adapted from the data collection tools used by McDonald (2012), Hitge (2014), Venketsamy (2007) and Hawk *et al.* (2000). The clinical records were not removed from the designated area and were available for consultations at all times.

During the data collection process the researcher found several complaints were mentioned that were not on the data collection tool. These were noted and another classification made for the relevant complaints, similarly occurring under the section of concurrent treatment by other specialists. Additionally, the blood pressure readings were written down and thereafter grouped into four categories namely: normal (<120/ <80), prehypertension (120-139/ 80- 89), stage 1 hypertension (140- 159/ 90- 99), and stage 2 hypertension (≥160/ ≥100) all mmHg (Bickley and Szilagyi, 2013: 124).

3.11 PILOT STUDY

A pilot study is a study conducted on a smaller scale to evaluate the design of the larger proposed study. Pilot studies have several purposes ranging from testing a study procedure, validating tools and recruitment estimation for example (Arain *et al.,* 2010).

A pilot study was performed to assess the feasibility of the study as well as the efficacy of the data collection tool. The pilot study was made up of five clinical records which met the inclusion criteria from the year 2016. Changes were made to the initial data collection sheet and then re-assessed using the same five clinical records from the first round of piloting. These changes included inserting an extra table for any prior screening tests done relevant to the second complaint, changing the order of the tables, as well as adding classifications for the “associated signs and symptoms” for both complaint 1 and 2.

3.12 ETHICAL CONSIDERATIONS

Gatekeeper permission for the study to be conducted at the DUT CDC was obtained from the Research Director at DUT (Appendix C), and permission to access the patient files was obtained from the DUT CDC Director (Appendix B).

Patient consent was not required due to the informed consent being signed prior to treatment stating that data contained in the respective files may be used for research purposes (Appendix D). The form is signed by every patient presenting to the DUT CDC at the first consultation.

A notice (Appendix E) was put up in a public area of the DUT CDC informing the patients that a research study was being conducted involving patient clinical records and should they wish for their information not to be used, they should inform the reception staff or the researcher thereof.

Patient confidentiality was maintained as no names were recorded throughout the data capturing process. A code was created for the clinical record, in the event that the researcher needed to refer back to the clinical record.

A confidentiality agreement was signed by the researcher, research supervisor and the DUT CDC director (Appendix G).

Information bias was prevented as all the clinical records meeting the inclusion criteria in the years between the 18th of January 2010 and the 4th of December 2015 were utilised.

Due to the nature of the study using patient information within clinical records, there was no contact between the patient and the researcher.

The clinical profile had no effect on the emotional, psychological or financial status of any of the patients whose records were included in the study.

On completion of the study, all paper records were stored with any other research documentation in the Chiropractic Department for a period of five years. The paper records will subsequently be destroyed as appropriate at the time by means of shredding.

3.13 DATA ANALYSIS

The data was analysed using SPSS version 24.0 with a significance of $p < 0.05$ for statistical relevance (Singh, 2015). Descriptive statistics such as categorical data and quantitative data were represented as frequencies and percentages and range, mean and standard deviation respectively. Comparisons were done using Pearson's Chi Square Test to determine correlation strength (Singh, 2015). To further determine relationships between variables, binary logistic regressions were done.

3.14 CONCLUSION

Chapter 3 described the detail of the research process, how the research was conducted, and what information was gathered. The study looked into the geriatric patients at the DUT CDC to provide baseline data on this population group frequenting the clinic. The results of the study will be presented in Chapter 4.

CHAPTER 4: RESULTS

4.1 INTRODUCTION

In this chapter the results and findings obtained from the clinical profile are presented. A data collection sheet was constructed (Appendix F) and was the primary tool that was used to document the data obtained from 397 clinical records of patients aged 65 years and older. The data collected from the findings was analysed with SPSS version 24.0. The results are presented as descriptive statistics in the form of graphs, cross tabulations and other figures for the quantitative data that was collected. Inferential techniques include the use of correlations and chi square test values which are interpreted using *p*-values and partial eta squared.

4.2 DESCRIPTIVE RESULTS

In all cases "n" represents the frequency/number within the category stated.

4.2.1 Prevalence of Visits by Geriatric Patients to the DUT CDC between 2010 and 2015

A total of 397 clinical records were evaluated within the sampling timeframe of the 18th of January 2010 and 4th of December 2015. The total number of geriatric patients attending the DUT CDC per year is shown in **Table 4.1**.

Table 4.1: Number of geriatric patients who frequented the DUT CDC per applicable year

Year	n	%
2010	46	11.6
2011	64	16.1
2012	63	15.9
2013	95	23.9
2014	77	19.4
2015	52	13.1
Total	397	100

4.2.2 Demographics of the Geriatric Patients Sampled at the DUT CDC

The demographics discussed in this study include patient age, gender, marital status and occupation.

4.2.2.1 Age

This study included all the clinical records of those patients aged 65 years and older in the pertinent years. **Table 4.2** depicts the number and percentage of geriatric patients per age group. The maximum age, mean and the standard deviation is shown in **Table 4.2**.

Table 4.2: Total number of geriatric patients per age group

Age Groups	n	%
65 – 69	181	45.6
70 – 74	117	29.5
75 – 79	69	17.4
80 – 84	19	4.8
85 – 89	7	1.8
90 – 94	4	1.0
Total	397	100

Table 4.3: Age maximum, mean and standard deviation

	n	Minimum	Maximum	Mean	Std. Deviation
Age	397	65	94	71,31	5,432

4.2.2.2 Gender

Table 4.4 illustrates the total number and percentage of males and females sampled.

Table 4.4: Gender

Gender	n	%
Male	171	43.1
Female	226	56.9
Total	397	100

4.2.2.3 Age vs. Gender

Table 4.5 represents the distribution of men and women within each age group.

Table 4.5: Age vs. gender distribution

	Gender (n)		Total
Age Groups	Male	Female	
65 – 69	77	104	181
70 – 74	48	69	117
75 – 79	35	34	69
80 – 84	8	11	19
85 – 89	3	4	7
9 0- 94	0	4	4
All Ages	171	226	397

4.2.2.4 Marital Status

Of the 397 clinical records sampled, 60 patients did not disclose their marital status. **Table 4.6** shows the percentage distribution and total numbers within each group.

Table 4.6: Marital status

Marital Status	n	%
Divorced	25	6.3
Single	22	5.5
Married	198	49.9
Widowed	92	23.2
Not Specified	60	15.1
Total	397	100

4.2.2.5 Occupation

Occupation was categorised into the following groups: employed, unemployed, and retired, the total numbers and percent. Within this category seven had not documented their employment status (**Table 4.7**). For the most part those who were unemployed were housewives.

Table 4.7: Occupation status

Occupation	n	%
Employed	60	15.1
Unemployed	80	20.1
Retired	250	63.0
Not Specified	7	1.8
Total	397	100

4.2.3 Lifestyle Factors within the Geriatric Population Presenting to the DUT CDC

The lifestyle factors of the presenting patients documented included: smoking, alcohol consumption, exercise and sleeping habits. Furthermore, BMI and BP values were recorded.

4.2.3.1 Smoking

Smoking was categorised into those who do not smoke, those who were former smokers, and those that do smoke. The data from these categories can be found in **Table 4.8.** The smoking habits of 10 patients were not recorded.

Table 4.8: Smoking habits

Smoking Habits	n	%
No	293	73.8
Formerly	54	13.6
Smoker	40	10.1
Not Specified	10	2.5
Total	397	100

4.2.3.2 Alcohol Consumption

Alcohol consumption was documented in the following categories: non- drinker, former, occasional, often, and daily. The alcohol consumption habits were not recorded for eight patients (**Table 4.9**). For the purposes of this study, an occasional drinker was deemed as someone who does not drink regularly. These were mainly people who drank at special occasions or less than four times a month. Those who were recorded as drinking often did so more than once a week but not daily and daily drinkers were those older adults who consumed a minimum of one alcoholic beverage a day.

Table 4.9: Alcohol consumption

Alcohol Consumption	n	%
No	256	64.5
Formerly	9	2.3
Occasionally	75	18.9
Often	26	6.5
Daily	23	5.8
Not Specified	8	2.0
Total	397	100

4.2.3.3 Exercise

In terms of exercise the findings were grouped into those who do not exercise, occasional exercisers and those who often exercise. To be classified as exercising one had to actively engage in a sport or an activity which required repetitive movement such as walking and gym. Housework and gardening was not recorded as exercise. Those who exercise occasionally did so less than three times a week. Those who exercised often exercised three times or more a week. The total number for each group and percentage thereof can be seen in **Table 4.10**.

Table 4.10: Exercise habits

Exercise Habits	n	%
No	154	38.8
Occasionally	125	31.5
Often	106	26.7
Not Specified	12	3.0
Total	397	100

4.2.3.4 Sleep Patterns

Sleep patterns were documented as normal, interrupted and insomniac. Those who had interrupted sleep woke up a minimum of once per night while those who were classified as insomniac frequently slept for four hours or less per night. Five patients did not specify their sleep patterns. The results in terms of numbers and percentage can be seen in **Table 4.11.**

Table 4.11: Sleep patterns

Sleep Patterns	n	%
Normal	225	56.7
Interrupted	132	33.2
Insomniac	35	8.8
Not Specified	5	1.3
Total	397	100

4.2.3.5 Body Mass Index (BMI)

The BMI of the patients was calculated with their documented height and body mass. It was then grouped into the categories of underweight (< 18.5), normal (18.5 - 24.9), overweight (25.0 - 29.9) and obese (30.0+) (Bickley and Szilagyi, 2013: 110). Unfortunately, the BMI could not be calculated for 88 of the patients as either one or both values required for calculating the BMI of the patient was missing from the patient's clinical record. The results recorded can be found in **Table 4.12.**

Table 4.12: BMI

BMI	n	%
Underweight	8	2.0
Normal	106	26.7
Overweight	109	27.5
Obese	86	21.7
Not Specified	88	22.2
Total	397	100

4.2.3.6 Blood Pressure (BP)

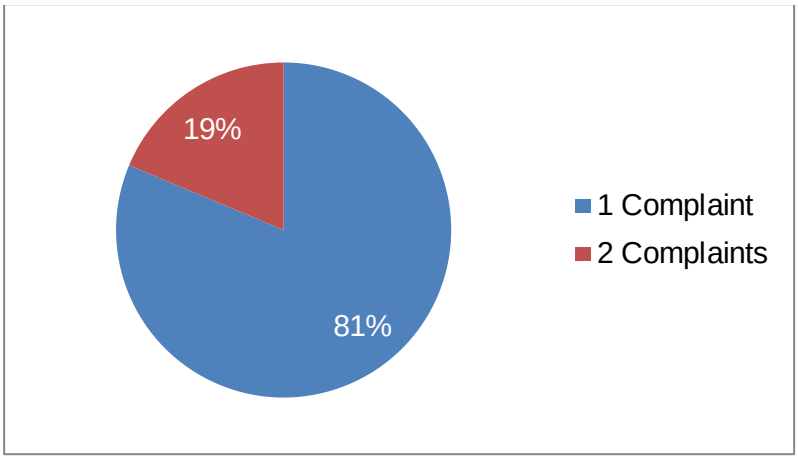
Table 4.13 presents the BP for the sampled population. BP was recorded and grouped into the following categories in mmHg: normal (<120/ <80), pre-hypertensive (120- 139/ 80- 89), Stage 1 Hypertension (140- 159/ 90- 99) and Stage 2 Hypertension (≥160/ ≥100) according to Bickley and Szilagyi (2013: 124). Three patients BP had not been recorded.

Table 4.13: BP

Blood Pressure	n	%
Normal	103	25.9
Pre-hypertensive	135	34.0
Stage 1 Hypertension	108	27.2
Stage 2 Hypertension	48	12.1
Not Specified	3	0.8
Total	397	100

4.2.4 The Number of Complaints, Type and Nature of the Complaints the Patient Presented with at the Initial Consultation

At the first consultation, the patient is generally asked if they have a primary and secondary complaint. **Figure 4.1** depicts the percent of patients with one or two complaints. The table below depicts the frequency of the complaints



Complaint	1	2
n	322	74

Figure 4.1: Pie chart and table illustrating the percentage and frequency of patients having one or two complaints

4.2.4.1 Complaint One

4.2.4.1.1 Location of Complaint One

Table 4.14 depicts the frequency, percentage and location of the main complaint the patient presented with. A variety of complaints were documented including one patient who attended the clinic for a check-up. It is interesting to note that seven patients sought out treatment specifically for having suffered a stroke and two patients for their chest pain which was mostly described as a cough.

Table 4.14: Location, frequency and percentage of Complaint One

	n	%		n	%
Low Back	145	36.5	Stroke	7	1.8
Neck	76	19.1	Upper Arm	5	1.3
Shoulder	41	10.3	Hand/ Fingers	4	1.0
Knee	24	6.0	Head	3	0.8
Mid back	21	5.3	Wrist	3	0.8
Hip	17	4.3	Lower Leg	3	0.8
Buttock	12	3.0	Elbow	2	0.5
Foot/ Toes	11	2.8	Chest	2	0.5
Thigh	10	2.5	Groin	1	0.3
Ankle	9	2.3	Check-up	1	0.3

4.2.4.1.2 Associated Signs and Symptoms for Complaint One

The nature of the pain for the complaint was documented in the form of pain only, stiffness only, numbness/tingling only, pain and stiffness, pain and numbness/tingling, stiffness and numbness/tingling and, lastly, all three together as pain, stiffness and numbness/tingling. For the purposes of this study, any referral of pain was included under “pain”. The findings can be found in **Figure 4.2**.

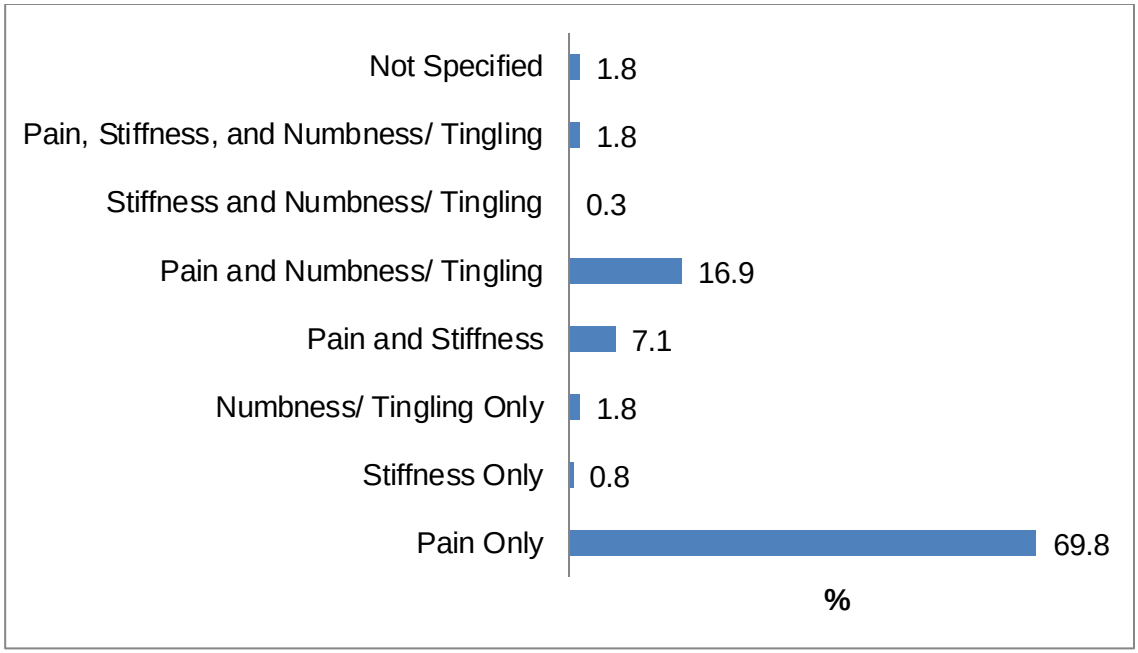


Figure 4.2: The nature of pain for Complaint One

4.2.4.1.3 Onset of Pain for Complaint One

The onset of pain is documented for both its initial onset (first time experiencing the pain) as well as the more recent onset thereof. In the data below, two patients had not described their onset of pain.

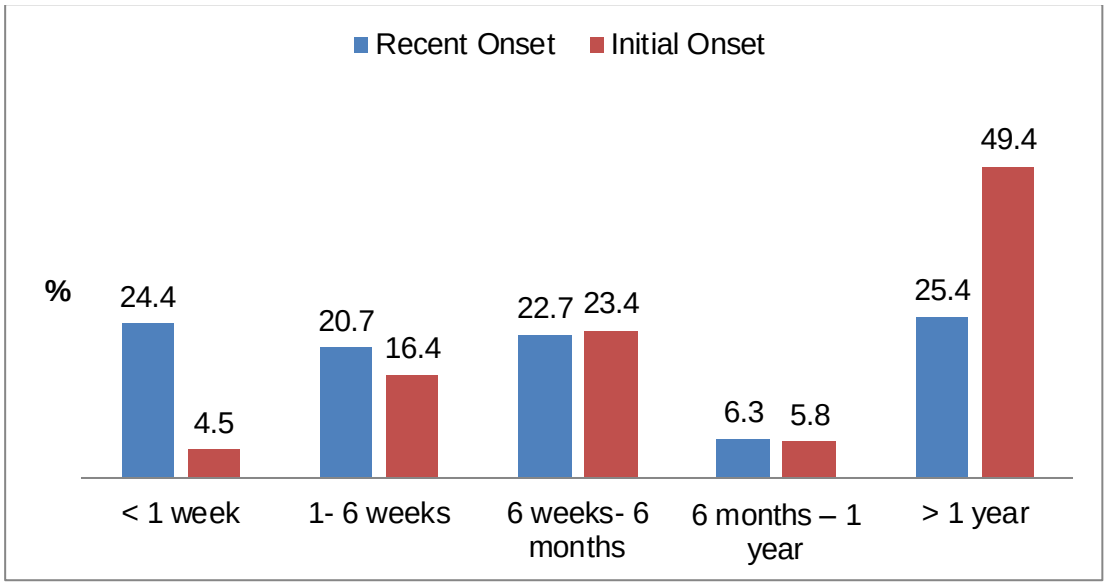


Figure 4.3: Onset of pain for Complaint One

4.2.4.1.4 Previous Screening Tests Relevant to Complaint One

The previous screening tests conducted for the complaint in question was recorded. Of the 397 patients in the sample, only 122 had a screening test or several screening tests conducted for their main complaint. The screening tests recorded were x-rays, CT scan, MRI scan, ultrasound, blood work and combinations thereof. The percentage of each test done for the 122 sampled patients can be seen in **Figure 4.4**.

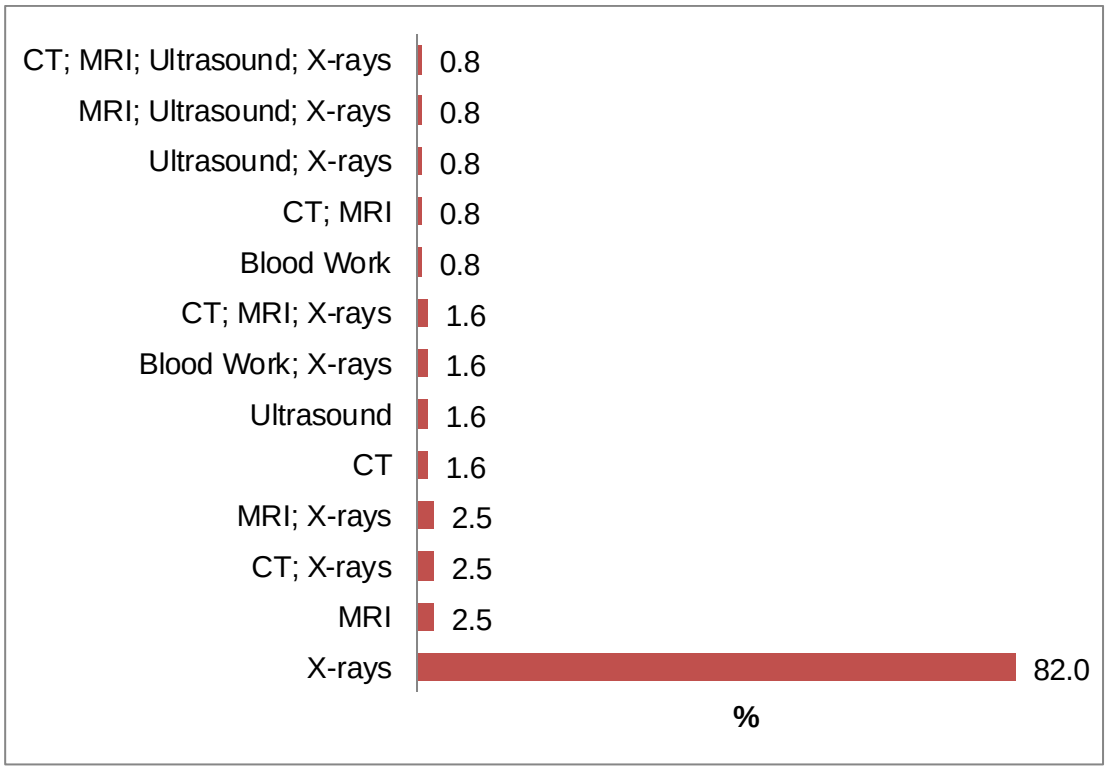


Figure 4.4: Previous screening tests conducted for Complaint One

4.2.4.2 Complaint Two

4.2.4.2.1 Location of Complaint Two

Seventy four of the 397 patients from the sample stated they had two complaints at the initial consultation. **Table 4.15** describes the location, frequency and percentage of the secondary complaint.

Table 4.15: Location, frequency and percentage of Complaint Two

	n	%		n	%
Low back	18	24.3	Hip	3	4.1
Mid back	13	17.6	Lower leg	3	4.1
Neck	9	12.2	Non-musculoskeletal	2	2.7
Shoulder	7	9.5	Head	1	1.4
Knee	4	5.4	Upper arm	1	1.4
Ankle	4	5.4	Thigh	1	1.4
Foot/ Toes	4	5.4	Chest	1	1.4
Buttock	3	4.1			

4.2.4.2.2 Associated Signs and Symptoms of Complaint Two

Only 72 of the 74 patients with two complaints specified the nature of their pain. Much like in Complaint One, the nature of the pain for the complaint was documented; however less variety in the nature of the pain was recorded as can be seen in **Figure 4.5**.

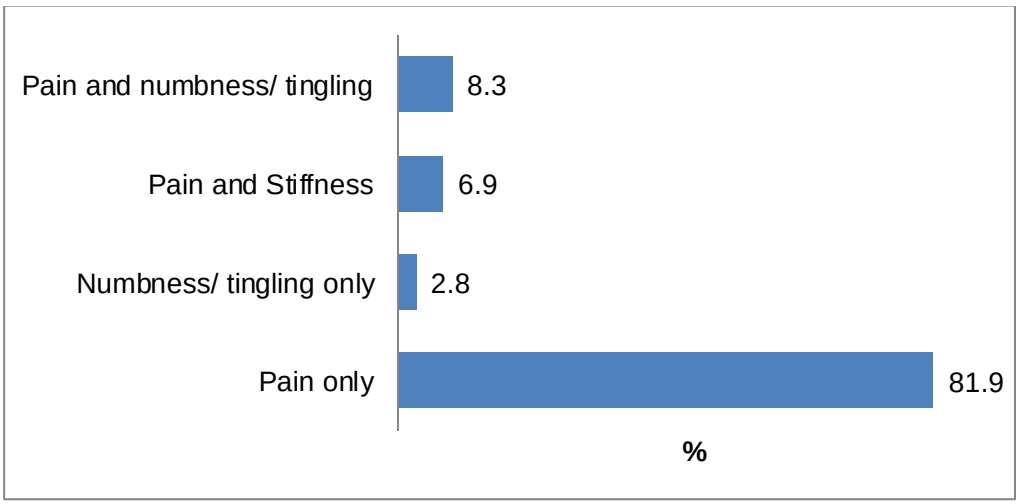


Figure 4.5: The nature of pain for Complaint Two

4.2.4.2.3 Onset of Pain for Complaint Two

The results for the onset of pain both recently and initially are similar to those in Complaint One. The onset of pain is documented for both its initial onset (first time experiencing the pain) as well as the more recent onset thereof. Only two patients had not stated their onset of pain. The results can be seen in **Figure 4.6**.

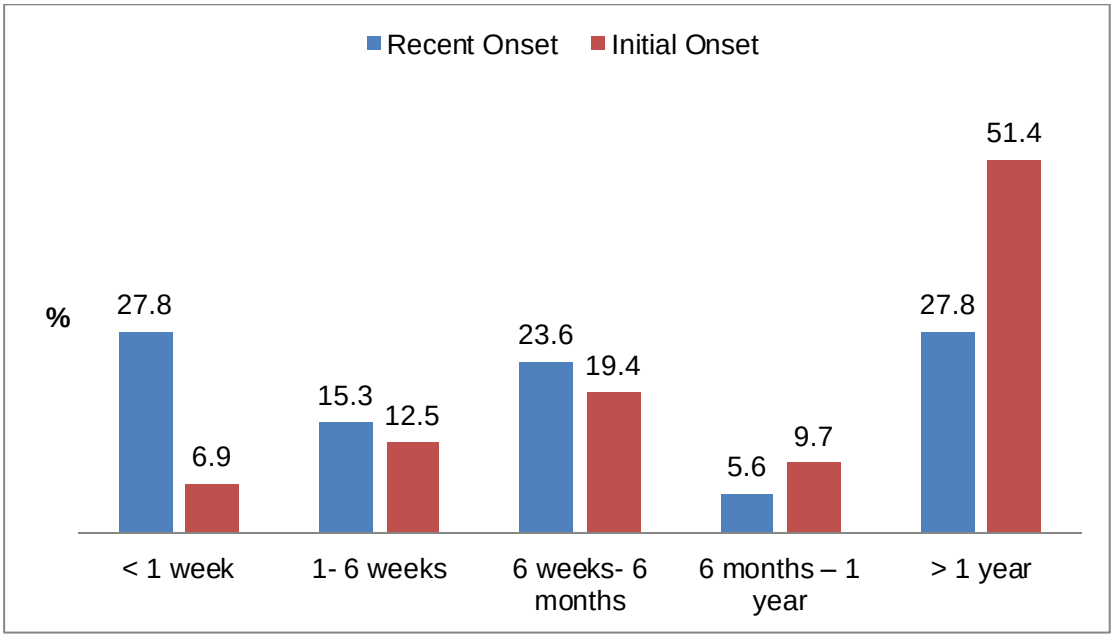


Figure 4.6: Onset of pain for Complaint Two

4.2.4.2.4 Prior Screening Tests Relevant to Complaint Two

Unlike in Complaint One, only 10 patients had their condition screened before frequenting the DUT CDC. As can be seen in **Figure 4.7**, only x-rays and blood work had been done.

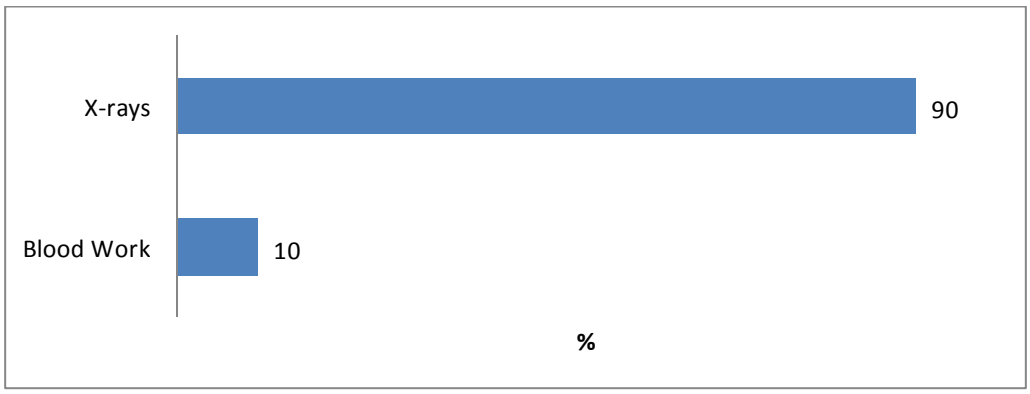


Figure 4.7: Prior screening tests for Complaint Two

4.2.5 Medication Use within the Presenting Population

4.2.5.1 Number of Medications ingested

The number of medications ingested (prescribed, over-the-counter and supplements/vitamins) per person was documented into groups which can be seen in **Table 4.16**. What must be noted and is included in these figures, is that several patients were taking multiple duplicates of medication i.e. they were taking two or more anti-hypertensives or anti-inflammatories.

Table 4.16: Number and percentage of medication consumed within groups

No. of Medications	n	%
0- 2	166	41.8
3- 5	171	43.1
6- 8	45	11.3
9- 11	11	2.8
12+	4	1.0
Total	397	100

Table 4.17 describes the minimum, maximum, mean and standard deviation of the medication consumed.

Table 4.17: Medication maximum, mean and standard deviation

	n	Minimum	Maximum	Mean	Std. Deviation
Medication	397	0	17	3,35	2,490

4.2.5.2 Types of Medication Consumed

Table 4.18 depicts the frequency and type of prescribed and over-the-counter medications consumed by the 397 patients sampled. Unknown drugs include those where the patient stated they were consuming a drug but did not know the name or that it could not be deciphered due to poor handwriting. **Table 4.19** represents the medication consumption by the patients in terms of supplements and vitamins. As the data was recorded from pre-recorded information, it is not known if all the medication was consumed by the patient at that given time or they were recounting all the medication consumed for a specific condition.

Table 4.18: Total number of prescribed and over the counter medication types consumed

Medication	n	Medication	n	Medication	n
Anti-hypertensive	194	Antihistamine	8	Antacid	2
NSAID	106	Anti-reflux	8	Heart failure	2
Cholesterol lowering	88	HRT	8	Diverticulitis	1
Anti-diabetic	72	Antibiotic	7	Leg cramping	1
Aspirin	66	Muscle relaxant	7	Digestive enzymes	1
Unknown	53	Gout	7	Hyperthyroid	1
Mild analgesic	45	Moderate analgesic	6	Antifungal	1
Analgesic combo	39	Eye drops	5	Anti-oestrogen	1
Diuretic	34	Histamine-2 blocker	4	Stool softener	1
Analgesic	29	Antispasmodic	4	Dementia	1
Vasodilator	24	Prostate care	4	Pancreatic enzymes	1
Hypothyroidism	23	Ulcer	4	Migraine	1
Anticoagulant	21	Nose spray	4	Antipsychotic	1
Arthritic pain	20	Anticholinergic	3	Chest pain	1
Severe analgesic	19	Heart medication	3	Anti-muscarinic	1
Antidepressive	19	Anticonvulsant	3	Skin treatment	1
Antianginal	14	Hydrocortisone	3	Parkinson's disease	1
Corticosteroid	12	Thyroid	3	Anti-venom	1
Anti-inflammatory	12	Anti-arrhythmic	3	Restless leg syndrome	1
Sleeping tablet	12	Sedative	3	Muscle pain	1
Proton pump inhibitor	11	Myasthenia gravis	2		
Inhaler	10	Chemotherapy	2		
Anxiolytic	10	Substance dependency	2		
Neuropathic analgesic	9	Glaucoma	2		
Asthma	9	Laxative	2		

Table 4.19: Total number of supplements and vitamins consumed

Supplement	n	Supplement	n
Vitamins	49	Venous supplement	2
Calcium Complex	33	Antioxidants	2
Omega oils	11	Joint support	1
Supplement	8	Eye supplement	1
Iron supplement	8	Potassium complex	1
Arnica	7	Sodium supplement	1
Homeopathic remedies	6	Herbal anti-hypertensive	1
Folic acid	4	Cognitive enhancer	1
Spirulina	4	Fibre	1
Magnesium complex	2	Immune supplement	1

4.2.6 Co-Morbidities Present in Sampled Patients

Table 4.20 depicts the mean, minimum, maximum and standard deviation documented for the total number of co-morbidities found in the sampled patients.

Table 4.20: Co-morbidity minimum, maximum, mean and standard deviation

	n	Minimum	Maximum	Mean	Std. Deviation
Total number co-morbidities	397	0	26	7,19	4,219

The following tables (**Table 4.21** through to **Table 4.35**) are representative of the total number and types of co-morbidities the patients suffered with in particular systems. The systems are as follows: abdominal and gastrointestinal (GIT), cardiac, dermatological, ears, endocrine, genitourinary, haematologic, musculoskeletal, neurologic, ocular, oncological, psychiatric, respiratory, vascular and other. Much like with the medication, it is not certain if the co-morbidities mentioned were all the co-morbidities they had experienced in their lifetime or only those that were affecting them at the time of the appointment.

Table 4.21: Abdominal and GIT

Condition	n	Condition	n	Condition	n
Constipation	73	Gum disorder	3	Gallbladder surgery	1
Reflux	26	Bloated	3	Haematchozia	1
Hernia	16	Oral sores	3	Pancreas resection	1
Dysphagia	13	Indigestion	3	Cholecystitis	1
Diarrhoea	10	Cramps	3	Oesophageal spasm	1
Ulcers	10	Odynophagia	2	Gastroenteritis	1
Diverticulitis	9	Intestinal cyst	2	Oesophageal narrowing	1
IBS	9	Diverticulosis	2	Oral thrush	1
Hiatus hernia	9	Haemorrhoidectomy	2	Paraoesophageal hernia	1
Cholecystectomy	9	Colectomy	2	Toothache	1
Pain	8	Flatulence	2	Gastritis	1
Nausea	7	Faecal incontinence	1	Oesophagitis	1
Inguinal hernia	7	Polyp	1	Dry mouth	1
Umbilical hernia	5	Colitis	1	Prolapsed bowel	1
Haemorrhoids	4	Gingivitis	1		
Hepatitis	4	Vomiting	1		

IBS= Irritable bowel syndrome

Table 4.22: Cardiac

Condition	n	Condition	n
Hypertension	204	Valve replacement	4
Chest Pain	32	Tachycardia	4
Palpitations	30	Postural hypotension	4
Heart surgery	28	Murmur	3
Angina	21	Heart failure	2
Arrhythmia	10	Ventral septal defect	1
Myocardial infarct	8	Carotid stenosis	1
Hypotension	7	Ischaemic heart disease	1
Heart disease	7	Aneurysm	1

Table 4.23: Dermatological

Condition	n	Condition	n
Rash	14	Sores	1
Eczema	11	Discolouration	1
Psoriasis	7	Infection	1
Itching	6	Sensitivity	1
Shingles	6	Scabies	1
Sunspots	6	Allergies	1
Bruising	6	Hives	1
Vitiligo	4	Bullous pemphigoid	1
Cellulitis	4	Senile purpura	1
Lipoma	3	Scarring	1
Fungal infection	3	Actinic keratosis	1
Neck Lump	2	Skin changes	1
Discolouration	2	Lumps	1
Seborhea	1		

Table 4.24: Ears

Condition	n	Condition	n
Decreased hearing	51	Itching	2
Tinnitus	33	Tympanoplasty	2
Unilateral hearing loss	17	Discharge	2
Unilateral deafness	8	Cochlear implant	1
Pain	7	Infection	1

Table 4.25: Endocrine

Condition	n	Condition	n
Diabetes	91	Prediabetes	4
Hypothyroidism	16	Hyperthyroidism	2
Thyroidectomy	14	Thyroid surgery	2
Polydipsia	11	Change in appetite	1
Cold intolerance	7	Thymectomy	1
Perspiration	5	Pancreatitis	1
Heat intolerance	5	Thyroid nodules	1
Anorexia	5	Polyphagia	1
Thyroid disorder	5		

Table 4.26: Genitourinary

Condition	n	Condition	n	Condition	n
Hysterectomy	77	Dribbling	4	Renal cyst	1
Nocturia	52	UTI	4	Prostate biopsy	1
Polyuria	36	Infection	3	Decreased libido	1
Dysuria	11	Itching	3	Flank pain	1
Urgency	11	Renal failure	2	Bladder disorder	1
Prostate surgery	10	Haematuria	2	Fungal infection	1
Incontinence	10	Prostatitis	2	Cyst	1
Benign prostatic hypertrophy	9	Vasectomy	2	Kidney disease	1
Prostatectomy	8	Overactive bladder	1	Nephrectomy	1
Hesitancy	5	Odour	1	Genital warts	1
Prostate disorder	5	Pelvic pain	1	Bladder infection	1
Erectile dysfunction	5	Pain	1		

UTI- Urinary Tract Infection

Table 4.27: Haematological

Condition	n	Condition	n
Ease of bruising	37	Leukopaenia	1
Ease of bleeding	13	Porphyria	1
Anaemia	13	Thalassemia minor	1
Malaria	2	Decreased clotting	1
Transfusion	2	Haematocrit disorder	1
Clotting	2		

Table 4.28: Musculoskeletal

Condition	n	Condition	n	Condition	n
Arthritides	72	Mid back pain	5	Trigger finger	1
Neck pain	47	Knee weakness	4	Atrophy	1
Spine surgery	26	Ankle pain	4	Bakers cyst	1
Low back pain	24	Leg pain	4	Hand stiffness	1
Knee pain	19	Hip replacement	4	Knee stiffness	1
Neck stiffness	16	Stiffness	4	Hip dislocation	1
Gout	11	Carpal tunnel syndrome	3	Finger nodules	1
Shoulder pain	11	Fibromyalgia	3	Foot pain	1
Knee replacement	10	Wrist pain	3	Groin pain	1
Myalgia	10	Leg weakness	3	Finger pain	1
Hip Pain	10	Arm pain	2	Scheuermann's disease	1
Osteoporosis	9	Hand pain	2	Neck immobility	1
Herniated disc	8	Osteopenia	2	Knee swelling	1
Cramping	8	Elbow pain	2	Spinal stenosis	1
Ankle swelling	6	Scoliosis	2	Leg amputation	1
Fractured vertebrae	6	Femoral abscess	1	Discitis	1
Thumb pain	5	Ankle weakness	1		

Arthritides include arthritis, rheumatoid arthritis, rheumatism and arthralgia

Table 4.29: Neurological

Condition	n	Condition	n	Condition	n
Headaches	82	Bell's palsy	2	Guillain-Barré syndrome	1
Parasthesia	70	Parkinson's disease	2	Aphasia	1
Stroke	26	Sensory changes	2	Trigeminal neuralgia	1
Weakness	15	Myalgic encephalopathy	1	Diabetic neuropathy	1
Polio	6	Brain surgery	1	Hemiparesis	1
Blackout	6	Epileptic fit	1	Hemiplegia	1
Memory loss	6	Cerebral palsy	1	Foot Drop	1
Migraine	5	Disorientation	1	Phantom leg	1
Tremor	5	Encephalopathy	1	Cerebral malaria	1
TIA	4	Dementia	1	Encephalitis	1
Restless leg syndrome	3	Basal ganglia calcification	1	Cauda equina syndrome	1
Myasthenia gravis	2	Brain lesions	1		
Slurred speech	2	Brain atrophy	1		

TIA – Transient ischaemic attack

Table 4.30: Ocular

Condition	n	Condition	n
Cataract	21	Retinal detachment	2
Blurred vision	12	Unilateral vision changes	2
Vision changes	11	Corneal transplant	2
Glaucoma	10	Lens replacement	2
Unilateral blindness	5	Nystagmus	1
Pain	4	Pressure	1
Macular degeneration	4	Scotoma	1
Refractive errors	4	Unilateral vision loss	1
Diplopia	3	Kayser-Fleischer rings	1
Haemorrhaging	3	Spots	1
Loss of vision	2	Eye surgery	1
Tearing	2	Xanthelasma	1
Astigmatism	2	Discharge	1

Table 4.31: Oncological

Condition	n	Condition	n
Prostate cancer	5	Throat cancer	1
Melanoma	4	Breast cancer	1
Skin cancer	3	Kidney cancer	1
Mastectomy	2	Myeloma	1
Colon cancer	2	Squamous cell carcinoma	1
Basal cell carcinoma	2	Lymphoma	1
Leukaemia remission	1	Uterine cancer	1
Sigmoid tumour resection	1	Brain tumour	1
Sarcoma	1	Cancer	1

Table 4.32: Psychiatric

Condition	n	Condition	n
Depression	34	Claustrophobia	2
Anxiety	21	Nervous breakdown	1
Stress	14	Sadness	1
Panic Disorder	3	Schizophrenia	1

Table 4.33: Respiratory

Condition	n	Condition	n
Cough	34	Emphysema	4
Dyspnoea	31	Sleep Apnoea	2
Asthma	27	Bronchopneumonia	2
Dyspnoea w/ activity	15	Pneumonia	2
Sputum	15	Pulmonary Embolism	1
Wheezing	6	Chest Tightness	1
Bronchitis	6	Pulmonary Oedema	1
TB	5	Pulmonary Polypectomy	1

w/- with
TB – Tuberculosis

Table 4.34: Vascular

Condition	n	Condition	n
Varicose veins	44	Poor circulation	2
Claudication	40	Calf swelling	1
Cold extremities	19	VBA calcification	1
Oedema	12	Aortic calcification	1
Unilateral oedema	4	Raynaud's syndrome	1
Spider veins	3	VBA insufficiency	1
Deep vein thrombosis	3		

VBA – Vertebrobasilar artery

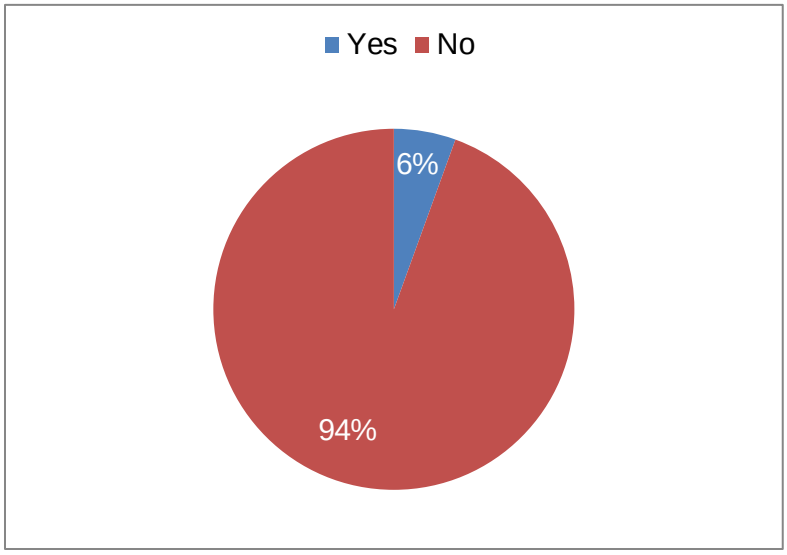
Table 4.35: Other

Condition	n	Condition	n	Condition	n
Cholesterol	73	General pain	5	Decreased smell	1
Dizziness	56	Light-Headedness	4	Facial hypersensitivity	1
Sinusitis	55	Rhinitis	3	Mammary cysts	1
Fatigue	55	Night sweats	3	Lymphadenopathy	1
Weight loss	33	Night pain	3	Typhoid	1
Balance	13	Low energy	2	Fungal infection	1
Weight gain	13	Fainting	1	Breast Pain	1
Post nasal drip	11	Nasal polypectomy	1	Lead poisoning	1
Hayfever	9	Tick bite fever	1	Polypectomy	1
Nose bleeds	7	Weight change	1	Tapeworm	1
Fever	5	Hair loss	1		

4.2.7 In-House Testing

In-house tests are those which the Chiropractic student is able to do on site in the DUT CDC without requiring a referral.

Figure 4.8 represents the percentage of patients who had an in-house test done and the table below indicated the frequency of these percentages.



In- House Testing	Yes	No
N	22	375

Figure 4.8: Percentage of In-House tests done

Yes represents those who had an in-house test done and No represents those who did not.

Figure 4.9 depicts the percentage of the types of in-house tests done. In-house tests conducted at the DUT CDC include random glucose tests and urinalysis.

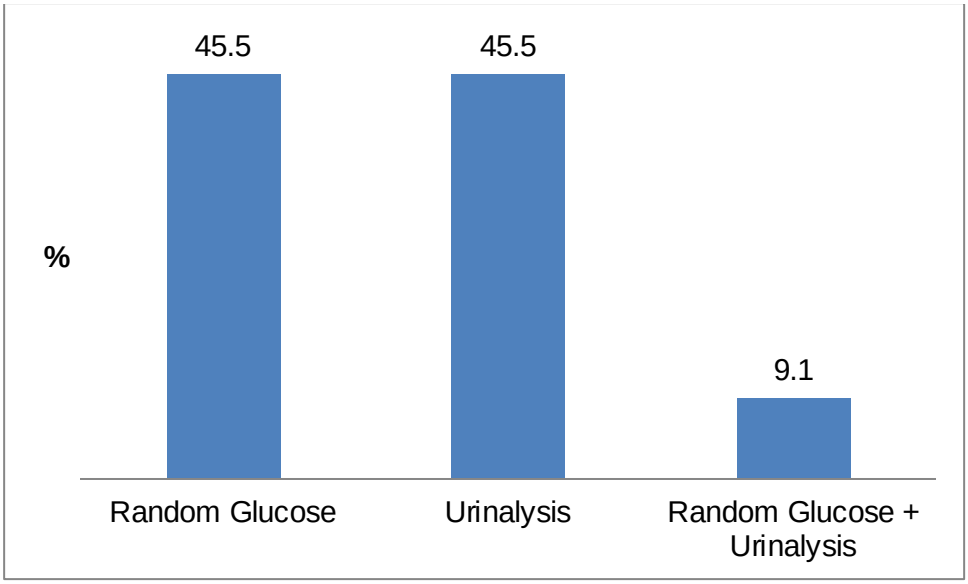


Figure 4.9: Types of in-house tests conducted

4.2.8 Concurrent Treatment by Other Specialists

Figure 4.10 depicts the percentage of patients who disclosed receiving treatment by other specialists.

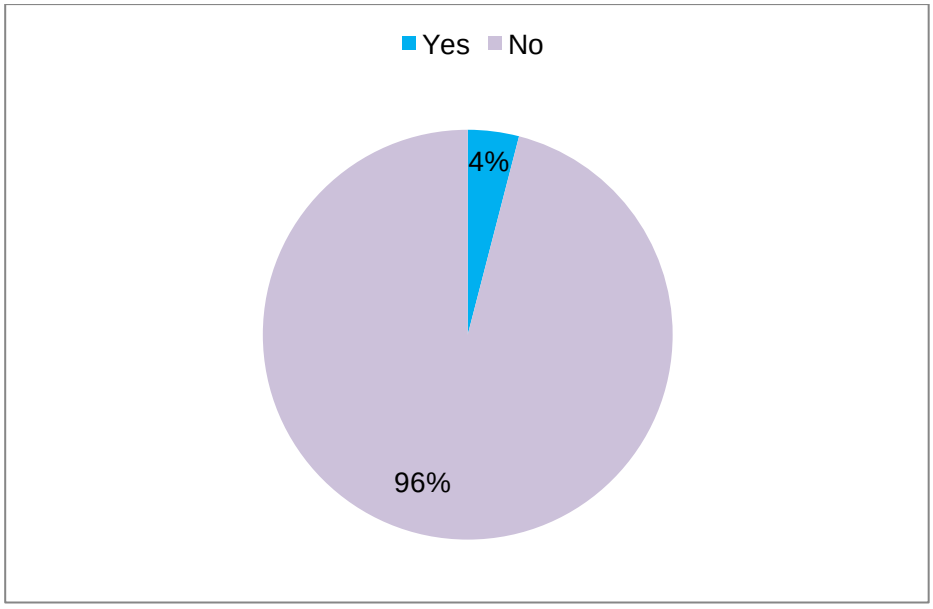


Figure 4.10: Concurrent treatment by other specialists

Figure 4.11 illustrates the type of specialists the patients were receiving concurrent treatment from, and the proportion in which they are used. Physical Therapist includes Physiotherapy, Biokinetics, and Occupational Therapy.

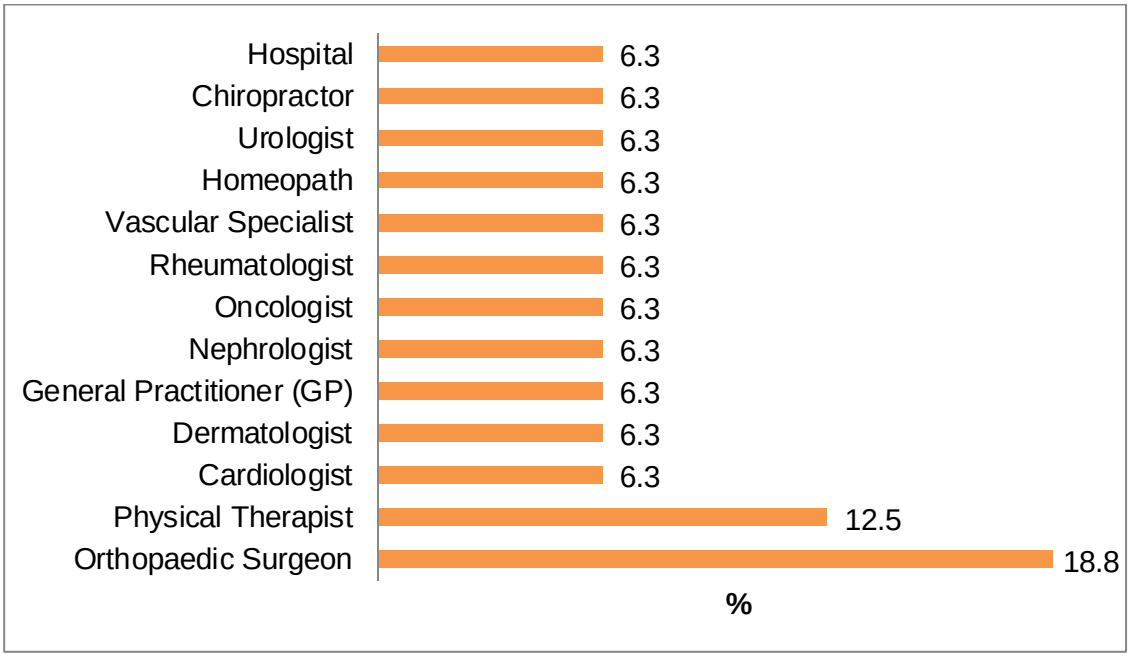


Figure 4.11: Concurrent treatment from other specialists

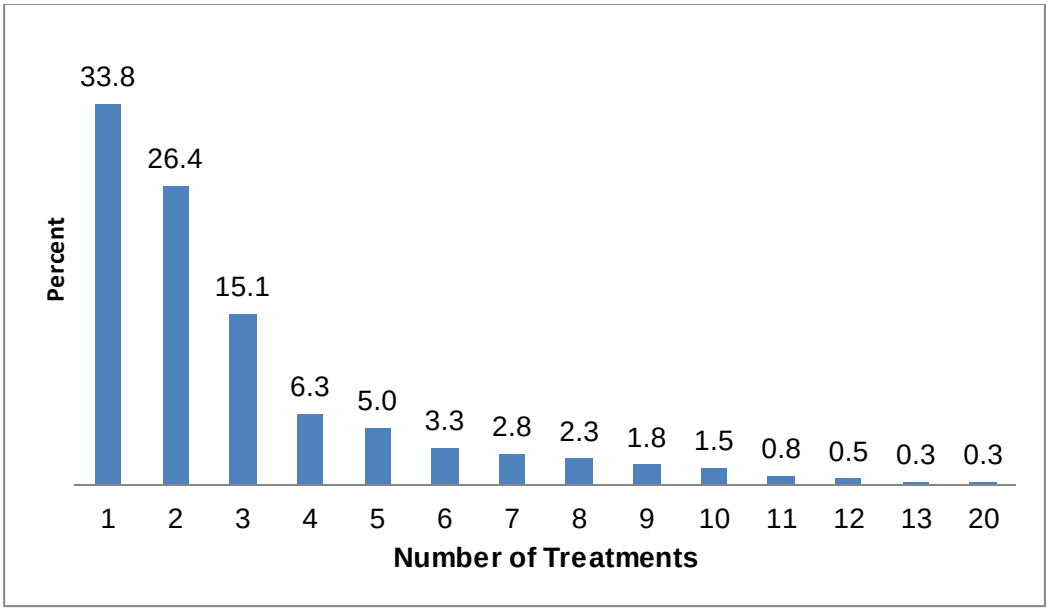
4.2.9 Number of Treatments per Patient

Table 4.36 looks at the values for the minimum, maximum, mean and standard deviation for the number of treatments for the 397 patients sampled.

Table 4.36: Number of treatments minimum, maximum, mean and standard deviation

	n	Minimum	Maximum	Mean	Std. Deviation
Total number of treatments	397	1	20	2,94	2,545

Figure 4.12 depicts the number of total treatments received per person. The table below shows the data in terms of frequency.



Treatment	1	2	3	4	5	6	7	8	9	10	11	12	13	20
n	134	105	60	25	20	13	11	9	7	6	3	2	1	1

Figure 4.12: Percent and frequency of the number of treatments

4.2.10 Management Protocol for the Main Complaint of the Patients Attending the DUT CDC

The following tables (**Table 4.37 – 4.48**) look at how the main complaint (Complaint One) was treated at each visit. In all cases, the top three main complaints were looked at separately while the remaining 17 complaints (**Table 4.14**) were classified under “other”.

Table 4.49 depicts the summary of the previous table in terms of the total type of treatments per method for each region. This excludes the total of “no treatments”.

In all cases, the horizontal rows represent the total treatments with the described method per visit, whereas, the vertical columns represent treatments with the method specific for the location of the complaint.

4.2.10.1 Assistive Devices and Treatment

Assistive devices include Leander Traction, drop pieces, the activator gun, blocking, manual traction and unspecified traction. Treatment with assistive devices per location per visit can be found in **Table 4.37**.

Table 4.37: Assistive devices and the treatment of the main complaint

Assistive Devices	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	24	5	0	7	36
Visit 2	21	3	1	6	31
Visit 3	19	1	0	4	24
Visit 4	10	1	0	3	14
Visit 5+6	7	0	0	2	9
Visit 7+8	6	1	0	1	8
Visit 9+10	4	0	0	1	5
Visit > 11	2	0	0	1	3
Total	93	11	1	25	130

4.2.10.2 Cryotherapy and Treatment

In **Table 4.38** the use of cold packs or other unspecified methods of cold therapy is described per treatment per location.

Table 4.38: Cryotherapy and treatment of the main complaint

Cryotherapy	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	9	4	10	25	48
Visit 2	5	2	7	17	31
Visit 3	3	1	5	15	24
Visit 4	1	3	3	6	13
Visit 5+6	1	3	3	4	11
Visit 7+8	3	1	2	2	8
Visit 9+10	2	0	0	1	3
Visit >11	0	0	0	0	0
Total	24	14	30	70	138

4.2.10.3 Dry Needling and Treatment

The frequency of dry needling implemented per visit per treatment area is described in **Table 4.93**.

Table 4.39: Dry needling and treatment of the main complaint

Dry Needling	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	59	38	27	44	168
Visit 2	41	25	17	37	120
Visit 3	25	11	11	28	75
Visit 4	16	10	7	10	43
Visit 5+6	16	9	6	10	41
Visit 7+8	12	3	5	4	24
Visit 9+10	5	1	4	2	12
Visit >11	2	0	0	1	3
Total	176	97	77	136	486

4.2.10.4 Electromodalities and Treatment

Electromodalities include the use of transcutaneous electrical nerve stimulation (TENS), interferential current (IFC), therapeutic ultrasound and laser therapy.

Table 4.40: Electromodalaties and treatment of the main complaint

Electro-Modalities	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	62	29	25	56	172
Visit 2	53	22	17	46	138
Visit 3	27	14	9	33	83
Visit 4	21	10	5	20	56
Visit 5+6	13	7	5	20	45
Visit 7+8	9	3	2	9	23
Visit 9+10	3	1	2	3	9
Visit >11	1	0	0	3	4
Total	189	86	65	190	530

4.2.10.5 Extremity Manipulation and Treatment

In terms of manipulations, the DUT Chiropractic programme teaches the diversified method, therefore all manipulations are conducted according to the diversified technique. The number of extremity adjustments done per visit per region is described in **Table 4.41**. In some cases, an extremity adjustment was done in a non-extremity location e.g. for low back pain. In these cases, permission was granted by the attending clinician for the student to perform an extremity adjustment to assist with treatment of the main complaint.

Table 4.41: Extremity manipulation and treatment of the main complaint

Extremity Manipulation	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	0	0	8	24	32
Visit 2	1	0	3	21	25
Visit 3	0	0	2	13	15
Visit 4	1	0	1	8	10
Visit 5+6	1	0	1	3	5
Visit 7+8	1	0	1	2	4
Visit 9+10	0	0	1	0	1
Visit >11	0	0	0	0	0
Total	4	0	17	71	92

4.2.10.6 Heath Therapy and Treatment

Table 4.42 describes the frequency use of heath therapy such as the use of a wheat bag or other unspecified methods of warming, per visit per treatment location.

Table 4.42: Health therapy and treatment of the main complaint

Heath Therapy	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	16	15	3	10	44
Visit 2	16	11	5	13	45
Visit 3	11	9	3	10	33
Visit 4	9	7	1	7	24
Visit 5+6	5	11	1	6	23
Visit 7+8	3	3	2	2	10
Visit 9+10	1	1	0	0	2
Visit >11	0	0	0	0	0
Total	61	57	15	48	181

4.2.10.7 Mobilisation and Treatment

Table 4.43 shows how often a mobilisation technique was performed per area per treatment.

Table 4.43: Mobilisation and treatment of the main complaint

Mobilisation	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	52	26	21	59	158
Visit 2	45	17	14	42	118
Visit 3	27	9	8	33	77
Visit 4	18	12	5	20	55
Visit 5+6	17	9	5	13	44
Visit 7+8	11	5	3	7	26
Visit 9+10	5	2	3	4	14
Visit >11	2	0	0	1	3
Total	177	80	59	179	495

4.2.10.8 Soft Tissue Therapy and Treatment

Soft tissue therapy includes cross friction, ischaemic compression, massage and myofascial release. The frequency of soft tissue therapies done per area per visit can be seen in **Table 4.44**.

Table 4.44: Soft tissue therapy and treatment of the main complaint

Soft Tissue Therapy	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	94	60	25	70	249
Visit 2	58	30	14	57	159
Visit 3	36	20	8	34	98
Visit 4	20	14	2	23	59
Visit 5+6	18	9	4	14	45
Visit 7+8	11	4	4	7	26
Visit 9+10	5	1	3	4	13
Visit >11	1	0	0	3	4
Total	243	138	60	212	653

4.2.10.9 Spinal Manipulation and Treatment

In terms of manipulation, the DUT Chiropractic programme teaches the diversified technique, therefore all manipulations conducted were according to the diversified technique. The frequency of spinal manipulations done per main complaint per visit is described in **Table 4.45**.

Table 4.45: Spinal manipulation and treatment of the main complaint

Spinal Manipulation	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	80	42	10	38	170
Visit 2	52	23	6	32	113
Visit 3	27	16	3	19	65
Visit 4	14	8	1	9	32
Visit 5+6	11	6	1	9	27
Visit 7+8	8	1	1	4	14
Visit 9+10	5	0	0	2	7
Visit >11	1	0	0	2	3
Total	198	96	22	115	431

4.2.10.10 Stretches and Treatment

Stretches include static, proprioceptive neuromuscular facilitation (PNF) and unspecified stretches. The frequency of stretches done per area per visit is depicted in **Table 4.46**.

Table 4.46: Stretches and treatment of the main complaint

Stretches	Low Back (n = 145)	Neck (n = 76)	Shoulder (n =41)	Other (n = 135)	Total
Visit 1	39	30	15	30	114
Visit 2	31	17	4	28	80
Visit 3	24	10	4	18	56
Visit 4	13	9	1	6	29
Visit 5+6	12	7	2	6	27
Visit 7+8	9	1	2	4	16
Visit 9+10	4	0	2	0	6
Visit >11	0	0	0	1	1
Total	132	74	30	93	329

4.2.10.11 Other Methods of Treatment

Treatment methods that were recorded under "other" include strapping, resisted isometrics, ball exercises, exercise, acupuncture, immobilization, rehabilitation and foam matt exercises. The number of other methods per visit per area is described in **Table 4.47.**

Table 4.47: Other methods of treatment for the main complaint

Other	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	2	3	3	12	20
Visit 2	1	4	1	8	14
Visit 3	3	3	0	7	13
Visit 4	3	3	0	6	12
Visit 5+6	1	2	0	3	6
Visit 7+8	1	2	0	2	5
Visit 9+10	0	1	0	1	2
Visit >11	0	0	0	0	0
Total	11	18	4	39	72

4.2.10.12 Cases of No Treatment

In some instances, no treatment was done for the area of complaint. The reasons may include the patient not being a Chiropractic patient, meaning their complaint was not treatable using Chiropractic methods. Another reason may have been that the patient presented with red flags such that they were referred out initially for a further screening test or to another specialist. The frequency of no treatments per visit per area is described in **Table 4.48**.

Table 4.48: Cases of no treatment for the main complaint

No Treatment	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	9	2	2	16	29
Visit 2	2	0	0	3	5
Visit 3	1	0	0	2	3
Visit 4	0	0	0	0	0
Visit 5+6	1	0	0	0	1
Visit 7+8	0	0	0	0	0
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	13	2	2	21	38

4.2.10.13 Total Treatments for each Method per Region

Table 4.49 below depicts the total treatments using each method per region.

Table 4.49: Total type of treatments for each method per region

Treatment method	Total Number of Treatments for each Region (n)				
	Low Back	Neck	Shoulder	Other	Total
Assistive devices	93	11	1	25	130
Cryotherapy	24	14	30	70	138
Dry needling	176	97	77	136	486
Electromodalities	189	86	65	190	530
Extremity manipulation	4	0	17	71	92
Heat therapy	61	57	15	48	181
Mobilisation	177	80	59	179	495
Soft tissue therapy	243	138	60	212	653
Spinal manipulation	198	96	22	115	431
Stretches	132	74	30	93	392
Other	11	18	4	39	72

4.2.11 Referrals Out for Presenting Main Complaints

This section (**Table 4.50** through to **Table 4.55**) describes the referrals done for the main complaint. The top three main complaints are described separately, with the remaining 17 being included under “other”; these can be found in **Table 4.14**.

Table 4.56 depicts the total type of referrals done for each region. In all cases, the horizontal rows represent the total referrals done for said screening method at that visit, whereas the vertical columns represent the total number of referrals for the location of the complaint using said screening method.

4.2.11.1 CT Scan Referrals

The number of referrals for CT scans per area per visit is documented in **Table 4.50**.

Table 4.50: Referrals for CT scans

CT	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	0	0	0	0	0
Visit 2	0	0	0	0	0
Visit 3	0	0	0	0	0
Visit 4	0	0	0	0	0
Visit 5+6	0	0	0	0	0
Visit 7+8	0	0	0	0	0
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	0	0	0	0	0

4.2.11.2 Blood Work Referrals

In some cases patients were referred out for blood tests. The number of referrals for blood work per area per visit can be seen in **Table 4.51**.

Table 4.51: Referrals for blood work

Blood Work	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	4	1	0	1	6
Visit 2	0	0	1	0	1
Visit 3	0	0	0	0	0
Visit 4	0	0	0	0	0
Visit 5+6	0	0	0	0	0
Visit 7+8	0	0	0	0	0
Visit 9+10	1	0	0	0	1
Visit >11	0	0	0	0	0
Total	5	1	1	1	8

4.2.11.3 MRI Scan Referrals

Referrals for MRI scans per area per visit can be seen in **Table 4.52**.

Table 4.52: Referrals for MRI scans

MRI	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	0	0	0	0	0
Visit 2	0	0	0	0	0
Visit 3	0	0	0	0	0
Visit 4	0	0	0	0	0
Visit 5+6	0	0	0	0	0
Visit 7+8	0	0	0	0	0
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	0	0	0	0	0

4.2.11.4 Referrals to Outside Specialists

Table 4.53 below depicts the number of outside specialist referrals per complaint per visit.

Table 4.53: Outside specialist referrals

Outside Specialist	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	7	6	1	16	30
Visit 2	2	0	1	3	6
Visit 3	4	0	0	4	8
Visit 4	1	0	0	0	1
Visit 5+6	0	0	0	0	0
Visit 7+8	0	0	0	0	0
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	14	6	2	23	45

4.2.11.5 Referrals for Ultrasound Examinations

The frequency of ultrasound referrals per complaint per visit is shown in **Table 4.54**.

Table 4.54: Ultrasound examination referrals

Ultrasound	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	0	1	0	1	2
Visit 2	0	0	0	0	0
Visit 3	0	0	0	0	0
Visit 4	0	0	0	0	0
Visit 5+6	0	0	1	0	1
Visit 7+8	0	0	0	0	0
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	0	1	1	1	3

4.2.11.6 Referrals for X-ray Examinations

Table 4.55 illustrates the frequency of x-ray referrals for the presenting complaint per visit.

Table 4.55: X-ray examination referrals

X-rays	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	20	6	2	10	38
Visit 2	3	1	1	4	9
Visit 3	2	0	0	2	4
Visit 4	0	0	0	2	2
Visit 5+6	3	2	0	0	5
Visit 7+8	0	0	1	0	1
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	28	9	4	18	59

4.2.11.7 Total Referrals per Region for each Visit

Table 4.56 depicts the total number of referrals done for each area of complaint.

Table 4.56: Total number of referrals per region

Type of Referral	Total Number of Referrals for Each Region (n)				
	Low Back	Neck	Shoulder	Other	Total
CT scan	0	0	0	0	0
Blood work	5	1	1	1	8
MRI scan	0	0	0	0	0
Outside specialist	14	6	2	23	45
Ultrasound	0	1	1	1	3
X- Ray	28	9	4	18	59

4.2.12 Education and Home Treatment Given for Presenting Complaints

This section (**Table 4.57** through to **Table 4.63**) describes the type of education and home treatment given to the patient for the main complaint. The top three main complaints are described separately and the remaining 17 are included under “other” which can be found in **Table 4.14**.

Table 4.64 depicts the total for education and home therapies per region. In all cases the horizontal rows represent the total recommendations given for said method at that visit, and the vertical columns represent the total number of recommendations for the location of the complaint using said method.

4.2.12.1 Home Treatment and Cryotherapy

Table 4.57 depicts the frequency that cryotherapeutic treatments were recommended to the patients for continued care at home after each visit.

Table 4.57: Home treatment using cryotherapy

Cryotherapy	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	8	4	4	14	30
Visit 2	7	2	4	7	20
Visit 3	3	2	2	8	15
Visit 4	0	0	2	3	5
Visit 5+6	1	1	2	2	6
Visit 7+8	1	0	3	1	5
Visit 9+10	1	0	1	0	2
Visit >11	0	0	0	1	1
Total	21	9	18	36	84

4.2.12.2 Home Treatment and Exercise

Table 4.58 illustrates the number of times the patient was given an exercise or exercises to do at home after each visit.

Table 4.58: Home treatment and exercise

Exercise	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	19	7	8	20	54
Visit 2	20	7	4	16	47
Visit 3	11	5	4	14	34
Visit 4	8	2	2	8	20
Visit 5+6	8	2	3	8	21
Visit 7+8	5	0	4	2	11
Visit 9+10	3	0	2	1	6
Visit >11	3	0	0	1	4
Total	77	23	27	70	197

4.2.12.3 Home Treatment and Heat Therapy

Table 4.59 shows how often the patients were given advice on continuation of heat therapy at home after each visit.

Table 4.59: Home treatment using heat therapy

Heat Therapy	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	11	9	3	8	31
Visit 2	7	6	2	3	18
Visit 3	2	4	1	2	9
Visit 4	3	2	1	0	6
Visit 5+6	1	2	1	0	4
Visit 7+8	1	2	2	0	5
Visit 9+10	1	0	1	0	2
Visit >11	0	0	0	1	1
Total	26	25	11	14	76

4.2.12.4 Nutritional Advice

The number of visits advice was given on nutrition such as food or vitamin consumption is depicted in **Table 4.60**.

Table 4.60: Nutritional advice given to patients

Nutritional Advice	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	7	1	0	5	13
Visit 2	1	0	0	4	5
Visit 3	2	0	0	4	6
Visit 4	2	0	0	0	2
Visit 5+6	0	0	0	2	2
Visit 7+8	1	0	0	1	2
Visit 9+10	0	0	0	0	0
Visit >11	0	0	0	0	0
Total	13	1	0	16	30

4.2.12.5 Postural Advice

Postural advice includes advice on correct sleeping positions. The frequency of postural advice given to patients is shown in **Table 4.61**.

Table 4.61: Postural advice given to patients

Postural Advice	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	14	4	3	4	25
Visit 2	5	1	2	2	10
Visit 3	2	1	1	1	5
Visit 4	2	0	1	0	3
Visit 5+6	2	0	1	0	3
Visit 7+8	0	0	0	0	0
Visit 9+10	0	1	0	0	1
Visit >11	0	0	0	1	1
Total	25	7	8	8	48

4.2.12.6 Stretching Advice and Recommendations

Stretching advice included static stretches, PNF and unspecified stretches. The frequency in which stretching advice was given per area to continue at home is illustrated in **Table 4.62**.

Table 4.62: Stretching advice given to patients

Stretching	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	56	33	15	24	128
Visit 2	41	22	10	21	94
Visit 3	22	13	2	21	58
Visit 4	12	5	3	8	28
Visit 5+6	8	4	1	10	23
Visit 7+8	5	2	1	3	11
Visit 9+10	3	1	0	2	6
Visit >11	1	0	0	2	3
Total	148	80	32	91	351

4.2.12.7 Other Recommendations and Education Given to the Patients

"Other" incorporated several recommendations and suggestions which include the following: proprioceptive techniques, orthotics, rest/activity avoidance, use of NSAIDs/anti-inflammatories, lifestyle changes, weight loss, pillow use, TENS, soft tissue therapy, strapping, education on shoes, Pilates, dancing, mobilisations, unspecified education, advice on further investigations and arthritis/degeneration and writing. The number of times Other methods of treatment were given to be continued at home can be seen in **Table 4.63**.

Table 4.63: Other methods of education and home treatments

Other	Low Back (n = 145)	Neck (n = 76)	Shoulder (n = 41)	Other (n = 135)	Total
Visit 1	6	2	8	17	33
Visit 2	4	2	7	11	24
Visit 3	4	0	2	12	18
Visit 4	5	1	1	5	12
Visit 5+6	4	0	2	4	10
Visit 7+8	2	0	2	1	5
Visit 9+10	1	0	1	0	2
Visit >11	0	0	0	1	1
Total	26	5	23	51	105

4.2.12.8 Total Education and Home Therapies given per Region

Table 4.64 depicts the totals for each area of advice given per region.

Table 4.64: Total for education and home therapies per region

Education and Home Therapy	Total for Each Region (n)				
	Low Back	Neck	Shoulder	Other	Total
Cryotherapy	21	9	18	36	84
Exercise	77	23	27	70	197
Heat Therapy	26	25	11	14	76
Nutritional advice	13	1	0	16	30
Postural advice	25	7	8	8	48
Stretching	148	80	32	91	351
Other	26	5	23	51	105

4.3 INTEFERENTIAL RESULTS

4.3.1 Total Medication and Total Co-morbidities

The significance between total medication and the total co-morbidities was calculated and can be seen in **Table 4.65**.

Table 4.65: Total medication vs total co-morbidities

Variable 1	Variable 2	Correlation Coefficient *r*	p- value
Total medication	Total co-morbidities	0.469	< 0.001

There is a strong positive correlation between the variables. As one increases, so does the other.

4.3.2 Total Co-Morbidities and Patient Demographics and Total Medication

Table 4.66 looks at the total co-morbidities and demographics which includes the grouping of gender and occupation and total medication to determine their significance and affect they have on one another.

Table 4.66: Total co-morbidities vs demographics (including gender and occupation combined) and total medication

Variable 1	Variable 2	p- value	Partial Eta Squared
Total Co-Morbidities	Age	0.400	.002
	Gender	0.430	.002
	Marital status	0.178	.006
	Occupation	0.066	.011
	Gender and occupation	0.384	.561
	Total medication	< 0.001	.273

The combination of gender and occupation has a large effect on the number of total co-morbidities (partial η^2 = 0.561), with total medication also playing a large role in the number of total co-morbidities (partial η^2 = 0.273). [partial η^2 > 0.12 is a large effect].

4.3.3 Total Co-Morbidities, Patient Demographics, and Main Complaint

Table 4.67 looks at the relationship between the total co-morbidities, the patient demographics and the main complaint and their significance.

Table 4.67: Total co-morbidities vs patient demographics and the main complaint

Variable 1	Variable 2	p- value	Partial Eta Squared
Total Co-morbidities	Age	0.186	.005
	Gender	0.041	.013
	Marital Status	0.285	.004
	Occupation	0.067	.010
	Complaint 1	0.905	.002

Of the above values there is a significant relationship between total co-morbidities and gender ($p < 0.05$).

4.3.4 Main Complaint and BP

Table 4.68 describes the correlation between the main complaint and blood pressure.

Table 4.68: Main complaint and BP correlation

	Number of Main Complaints per BP Classification					
	Normal	Prehypertensive	Stage 1 HT	Stage 2 HT	Total	p- value
Low back pain	40	54	33	16	143	0.422
Neck	18	24	23	11	76	0.777
Shoulder	16	11	12	2	41	0.127
Other	29	46	40	19	134	0.444

There is no significant relationship between each of the areas and BP classification (all $p > 0.05$).

4.3.5 Age and Gender compared with Total Co-morbidities and Medication

Table 4.69 through to **Table 4.72** describe the significance and where applicable the relationship between the gender, age and total co-morbidities and total medication consumption.

4.3.5.1 Age and Total Co-Morbidities

Table 4.69 describes the relationship between age and the total co-morbidities of the patients.

Table 4.69: Age and total co-morbidity significance

Variable 1	Variable 2	Correlation Coefficient *r*	p- value
Age	Total co-morbidities	0.469	0.058

A mild relationship is seen between age and the total co-morbidities.

4.3.5.2 Gender and Total Co-Morbidities

Table 4.70 describes the relationship between gender and total co-morbidities.

Table 4.70: Gender and total co-morbidity significance

Variable 1	Variable 2	p- value	Partial Eta Squared
Gender	Total co-morbidities	0.011	.016

A significance relationship is found between gender and total co-morbidities ($p < 0.05$).

4.3.5.3 Age and Total Medication

The significance between age and total medications is described in **Table. 4.71**.

Table 4.71: Age and total medication significance

Variable 1	Variable 2	Correlation Coefficient *r*	p- value
Age	Total Medications	0.076	0.130

There is no significant relationship between age and total medications ($p > 0.05$).

4.3.5.4 Gender and Total Medication

The relationship between gender and total medication is described in **Table 4.72.**

Table 4.72: Gender and total medication significance

Variable 1	Variable 2	p- value	Partial Eta Squared
Gender	Total Medications	0.035	.011

There is a significant relationship between gender and total medication ($p < 0.05$).

4.3.6 Gender versus number of Medications ingested

Table 4.73 demonstrates medication consumption per grouping in each gender category.

Table 4.73: Gender versus medication consumed in groupings

	Gender (n)			p- value
Total Medication	Male	Female	Total	
0- 2	82	84	166	
3- 5	71	100	171	0.071
6- 8	12	33	45	
9- 11	4	7	11	
12+	2	2	4	

There is no significant relationship between gender and (grouped) total medication ($p > 0.05$).

4.3.7 Headache Frequency within Gender and Age Groups

Table 4.74 and **Table 4.75** depict the frequency of headaches within the gender and age groups.

Table 4.74: Headache prevalence within gender

Headaches	Gender (n)		
	Male	Female	Total
Yes	25	57	82
No	146	169	315

Table 4.75: Headaches and age groups

Headaches	Age in Groups (n)						Total
	65 - 69	70 - 74	75 – 79	80 - 84	85 - 89	90 - 94	
Yes	31	32	10	7	2	0	82
No	150	85	59	12	5	4	315

4.3.8 Urination and Sleeping Patterns Significance

Table 4.76 highlights the significance between polyuria and nocturia in comparison to the sleeping patterns of the patients.

Table 4.76: Urination and sleeping patterns

	Sleep patterns (n)			Total	p- value
Polyuria	Normal	Interrupted	Insomniac		
No	211	116	29	356	0.032
Yes	14	16	6	36	
Nocturia					
No	218	90	32	340	< 0.001
Yes	7	42	3	52	

For both polyuria and nocturia there is a significant relationship with sleeping patterns ($p < 0.05$).

4.3.9 Demographics and Lifestyle Habits

The following tables (**Table 4.77** through to **Table 4.82**) illustrate the relationships between gender, marital status and occupation with lifestyle habits and BMI and BP.

4.3.9.1 Demographics and Smoking

Table 4.77 depicts the relationship between the patient demographics and smoking.

Table 4.77: Demographics and smoking

		Smoking (n)			p- value
		No	Formerly	Smoker	
Gender	Male	108	33	27	< 0.001
	Female	185	21	13	
	Total	293	54	40	
Marital Status	Divorced	20	3	2	0.540
	Single	19	1	2	
	Married	136	35	23	
	Widowed	68	11	8	
	Total	243	50	35	
Occupation	Employed	48	6	6	0.006
	Unemployed	71	4	4	
	Retired	168	44	29	
	Total	287	54	39	

There is a significant relationship between gender and smoking as well as occupation and smoking ($p < 0.05$).

4.3.9.2 Demographics and Alcohol Consumption

The relationship between patient demographics and alcohol consumption are described in **Table 4.78**.

Table 4.78: Demographics and alcohol consumption

		Alcohol Use (n)					p- value
		No	Formerly	Occasionally	Often	Daily	
Gender	Male	92	7	42	17	10	< 0.001
	Female	164	2	33	9	13	
	Total	256	9	75	26	23	
Marital Status	Divorced	14	0	7	1	3	0.304
	Single	14	0	5	0	3	
	Married	118	8	44	13	12	
	Widowed	62	0	15	8	4	
	Total	208	8	71	22	22	
Occupation	Employed	27	1	21	6	5	< 0.001
	Unemployed	69	0	6	3	1	
	Retired	156	7	47	17	17	
	Total	252	8	74	26	23	

There is a significant relationship between gender and alcohol consumption as well as occupation and alcohol consumption ($p < 0.05$).

4.3.9.3 Demographics and Exercise

Table 4.79 depicts the relationship between patient demographics and their exercise habits.

Table 4.79: Demographics and exercise

		Exercise (n)			p- value
		No	Occasionally	Often	
Gender	Male	48	67	52	< 0.001
	Female	106	58	54	
	Total	154	125	106	
Marital Status	Divorced	7	9	9	0.479
	Single	10	6	5	
	Married	68	70	55	
	Widowed	41	25	22	
	Total	126	110	91	
Occupation	Employed	12	23	24	< 0.001
	Unemployed	48	17	12	
	Retired	90	83	69	
	Total	150	123	105	

There is a significant relationship between both gender and exercise as well as occupation and exercise ($p < 0.05$).

4.3.9.4 Demographics and Sleep Patterns

The relationship between the patient demographics and their sleep patterns are described in **Table 4.80**.

Table 4.80: Demographics and sleep patterns

		Sleep Patterns (n)			p- value
		Normal	Interrupted	Insomniac	
Gender	Male	95	60	13	0.648
	Female	130	72	22	
	Total	225	132	35	
Marital Status	Divorced	17	8	0	0.174
	Single	9	12	1	
	Married	116	59	19	
	Widowed	48	33	10	
	Total	190	112	30	
Occupation	Employed	35	22	3	0.379
	Unemployed	49	21	10	
	Retired	136	87	22	
	Total	220	130	35	

There are no significant relationships noted between the above variables.

4.3.9.5 Demographics and BMI

The relationship between patient demographics and their BMI is described in **Table 4.81**.

Table 4.81: Demographics and BMI

		BMI (n)				p- value
		Underweight	Normal	Overweight	Obese	
Gender	Male	3	55	45	36	0.367
	Female	5	51	64	50	
	Total	8	106	109	86	
Marital Status	Divorced	0	9	6	5	0.769
	Single	1	6	3	6	
	Married	3	56	59	40	
	Widowed	3	21	23	18	
	Total	7	92	91	69	
Occupation	Employed	1	20	16	13	0.926
	Unemployed	2	18	22	20	
	Retired	5	67	69	51	
	Total	8	105	107	84	

There are no significant relationships observed between any of the above variables.

4.3.9.6 Demographics and Blood Pressure

Table 4.82 describes the relationship between patient demographics and their BP readings.

Table 4.82: Demographics and BP

		BP (n)				p- value
		Normal	Pre-hypertension	Stage 1 HT	Stage 2 HT	
Gender	Male	44	52	46	28	0.126
	Female	59	83	62	20	
	Total	103	135	108	48	
Marital Status	Divorced	8	9	5	3	0.102
	Single	5	13	4	0	
	Married	44	74	54	25	
	Widowed	27	21	30	12	
	Total	84	117	93	40	
Occupation	Employed	13	29	12	6	0.033
	Unemployed	19	32	25	4	
	Retired	67	72	71	37	
	Total	99	133	108	47	

There is a significant relationship between occupation and BP ($p < 0.05$).

4.4 CONCLUSION

Chapter 4 illustrated the descriptive and interferential results of the data captured from the study. The chapter that follows describes these result findings with those from the literature.

CHAPTER 5: DISCUSSION

5.1 INTRODUCTION

This descriptive study looked at the clinical records pertaining to patients aged 65 years and older who attended the DUT CDC between the years 2010 to 2015. This study was conducted in order to assist in providing information on this vulnerable group particularly in a Chiropractic setting. Most studies focus only on one area, however, this study looked at the older adult as a whole. Chapter 5 discusses the analytical and statistical results found in Chapter 4 with reference to the available literature.

5.2 DISTRIBUTION OF GERIATRIC PATIENTS

Unfortunately, very little research has been conducted on older adults in a Chiropractic setting, particularly in South Africa. The study conducted by Hawk *et al*. (2000) was the most similar profiling study in terms of population sample and data researched. The data collection tool used in this study was based largely on their research due to the similarity of the study and for comparability. Additionally, few studies have been conducted looking at statistical data on those specifically aged over 65 years, therefore data used for comparing may include those with ages younger than 65 years, however as close to 65 years old as possible. In some instances, there was no statistical data found by the researcher, which opens up further avenues for research.

With a lack of standardised criteria in terms of defining a specific age for when a person is "old" and with pensionable age having grown to be the default age, this study has taken 65 years of age to be the minimum age for a geriatric patient (WHO, 2002).

5.3 INTERPRETATION OF THE DATA

5.3.1 Visit Distribution between the Years 2010 and 2015

Objective one was to establish the number of geriatric patients presenting at the DUT CDC between January 2010 and December 2015. It was found that 397 patients meeting the research criteria had presented to the DUT CDC in those years for Chiropractic treatment. As can be seen in **Table 4.1**, the year where the most geriatric patients visited was in 2013 with 95 patients (23.9%). In 2010, the least number of patients visited with only 46 patients (11.6%) 65 years of age and older having attended the clinic. The reasons for this pyramidal trend are unknown. It could be due to the trend in advertising or

that more research was conducted in the DUT CDC in the time period between 2013 and 2014 where the form of advertisement would have word of mouth referral from research participants.

5.3.2 Patient Demographics

Objective Two was to describe the demographics (age, gender, marital status and occupation) of geriatric patients seen at the DUT CDC.

5.3.2.1 Age

The oldest patient to have visited the DUT CDC in the five years which formed part of the study was 94 years of age, with the average age of patients in this time frame being 71 years of old. **Table 4.2** details the number of visitors per age group. It can be seen that more than half of the patients are aged between 65 to 74 years of age (45.6% and 29.5%).

A similarity can also be observed in the study by Hawk *et al*. (2000) where those aged between 65 to 74 years of age made up the largest percent of patients sampled in their study (39.4%). May (2003) stated that the pattern of ageing within the South African population is following that of a developing country, in that South Africa has one of the most rapidly growing older person populations in Africa. This is supported further in the study by May (2003) who found that the population group increasing the fastest in size are those aged between 64 to 73 years.

Similar results were documented in the study by Pienaar *et* al. (2004), however the oldest documented individual in their study conducted at a South African old age home was 101 years of age. Their sample also started with those 65 years of age, with a mean age of 78 years being found.

5.3.2.2 Gender

Statistics in the South African 2011 Census and 2016 Community Survey have shown that South Africa has a feminised older population, meaning there are more, older female adults compared to older males (Lehohla, 2014; Statistics South Africa, 2016). Pienaar *et al*. (2004), Hawk *et al*. (2000), and Noh *et al*. (2016) also found that their samples were highly feminised. In this study it can be seen that 10% more of the sampled clinical record were female patients which agrees with this notion (**Table 4.4**). The reason for this feminisation may also be due to more women tending to seek medical care than men.

5.3.2.3 Age vs Gender

In the American and Canadian study by Hawk *et al.* (2000), females were the most represented gender in their age categories which were 55 to 64, 65 to 74, 75 to 84 and 85+ years. When looking at the distribution of males and females within each age group in the current study (**Table 4.5**), it is evident there are generally more women than men within each age category. The only exception is the age group 75 to 79 years where there is one more male than female patient. **Table 4.5** also suggests that females have a greater longevity than men, as there were only women in the older than 90 years of age group.

5.3.2.4 Marital Status

Of the patients who attended the DUT CDC in the years 2010 to 2015 and disclosed their marital status, 49.9% were married and nearly a quarter (23.2%) were widowed. Less than 10% were divorced and single respectively (**Table 4.6**). Even though Hawk *et al.*'s (2000) study started at 55 years of age, the findings in this study are relatively close to the findings in their study, although only 2.9% of their sample was single.

In the study by Pienaar *et al*. (2004), the results were vastly different. In his South African sample of older adults, 67.2% were widowed, 26.4% married, 4.6% single and only 1.8% divorced. These findings also correlate to the 2011 Census, where marriage was the most common form of union amongst its older population (Lehohla, 2014).

In the Korean study conducted by Noh *et al*. (2016), more than three quarters stated they were still married (77.1%) and only 22.9% were not married, findings which illustrate that marriage was also the most common form of union; however, there were fewer unmarried individuals in their study.

5.3.2.5 Occupation

Of the patients sampled 63% were retired (**Table 4.7**), 15.1% were still employed and 20.1% unemployed. It had been observed that the majority of those who were unemployed were housewives. Few studies have included the occupation status of older adults, but most include level of education, which was unfortunately unattainable in this study.

Hawk *et al*. (2000) found that 68.0% of those aged over 55 years had retired, compared to Noh *et al*. (2016) who found that far more of their participants were employed (59.7%), compared to those who were unemployed (40.3%). However, this study included middle

aged individuals which would contribute to this disparity in data between their study and this study.

5.3.3 Lifestyle Factors

Lifestyle factors discussed in this section include smoking habits, alcohol consumption, and exercise habits, sleeping patterns as well as BMI and BP.

5.3.3.1 Smoking

The number and percentage of patients and their smoking habits was presented in **Table 4.8**. These were recorded as non-smoker, former smoker and current smoker. Reddy *et al*. (2015) stated that smoking tobacco in low and middle income countries was slightly increased in comparison to those from higher income countries, therefore, it was surprising to find almost three quarters of the sample stated they do not smoke (73.8%). Reddy *et al.* (2015) had also stated that 13.6% were former smokers, while only 10.1% still smoked at the time of the consultation, whereas only 5.6% of the sampled population in the study population in the study by Pienaar *et al*. (2004) still smoked.

Hawk *et al*. (2000) conducted their study in the first world countries of Canada and the United States of America, and found that the number of non-smokers was much less at 52.2%. Former smokers made up 32.4% of their sample and smokers 12.7%.

Lugo *et al*. (2013) looked at the smoking prevalence in 17 European countries and their findings showed the overall smoking for those over 65 years of age was at 11.5%. In their study, 23.5% of the sampled population were former smokers.

In the Korean study, Noh *et al*. (2016) found similar results, in that 68.5% were non-smokers, 15.3% former smokers; however, there were more current smokers in their study than this one, at 16.2%.

Table 4.77 highlighted certain demographics and smoking habits. There were more male smokers than female smokers, which is similar to the study by Lugo *et al*. (2013), in which they found that smoking was more prevalent in men than women. This was also shown in the study by Reddy *et al.* (2015).

We can see for both gender and occupation that there is a significance relationship between smoking and gender, and smoking and the patient's occupation ($p < 0.001$) (**Table 4.77**). Reddy *et al*. (2015) found the same result between gender and smoking ($p < 0.001$) in their study on the prevalence of tobacco use among adults in South Africa. The researcher could not find statistical data comparing smoking and patient occupation.

International studies compared the level of education or income bracket with the smoking habits of the sampled population.

5.3.3.2 Alcohol Consumption

Alcohol consumption was categorised into those who do not drink alcohol, former alcohol consumers, occasional consumers, often and daily consumers (**Table 4.9**). In the study population 64.5% did not consume alcohol, 18.9% were occasional drinkers, 6.5% drink often and 5.8% of the sample drank alcohol daily. A mere 2.3% were former drinkers. The total percentage of those who had ever drunk alcohol was 31.2%.

Pienaar *et al*. (2004) found that 50.5% of the older adults in a South African old age home still drank alcohol. The American and Canadian study by Hawk *et al*. (2000) had similar proportions for alcohol consumption; they found that 36.6% of their sample never consumed alcohol, 8.9% were former alcohol consumers, 42.1% were occasional drinkers and 7.1% still drank daily.

The results differed marginally when compared to the Korean study by Noh *et al*. (2016). In their study 65.5% were classified as normal drinkers according to the Korean version of the Alcohol Use Disorder Identification Test developed by the WHO. Heavy drinkers came in at 30.5% and 4% were found to be alcohol dependent.

The study by Stevenson *et al.* (2015) in New Zealand reported that men (56.8%) were more likely to engage in hazardous drinking than women (32.3%) ($p < 0.001$). The Croatian study by Rusac (2015) reported similar findings in that 63.3% of the sampled older adults did not consume alcohol, 33.0% drank occasionally and 3.7% drank almost every day, having also found that older men were more likely to consume more alcohol than older women ($p < 0.01$).

Table 4.78 shows that there are more men in the categories former, occasional and those who drink often, whereas there are more female daily drinkers than male daily drinkers.

Similarly, the findings with smoking in relation to gender and occupation show that there is a strong significance between these two variables and alcohol consumption ($p < 0.001$). Stevenson *et al.* (2015) and Rusac (2015) document comparable findings in their studies.

Once again, statistical data was not found by the researcher when comparing patient occupation and drinking habits because alcohol consumption was more commonly compared with the income bracket or level of education.

5.3.3.3 Exercise

Exercise plays a role in maintaining longevity and ageing "successfully" as it decreases the onset of disability in an older adult, therefore, prolonging the onset of a dependent life. Chronic pain is also diminished in those who exercise (Stubbs *et al*., 2013; Anton *et al*., 2015; Pienaar *et al*., 2004). A further reason why exercise is important for older adults is to maintain muscle mass and muscle strength and endurance and prevent the accumulation of adipose tissue (see 5.3.3.5). Regular exercise also inhibits the onset of sarcopenia and the deviant posture.

This study looked only at exercise activities such as walking and running unlike the study by Pienaar *et al*. (2004), where they took any form of activity into consideration, including housework. In this study, 38.8% of the study sample did not exercise, 31.5% were those who exercised occasionally (less than twice a week), while those who exercised often (three times or more a week) were found to make up 26.7% of the sample. Only three percent had not specified their exercise habits (**Table 4.10**). Exercise is important particularly as one ages, as it maintains cardiorespiratory health, and decreases osteoporosis and constipation.

While Pienaar *et al.* (2004) included activities of daily living within their scope of exercise, they found that 67.9% of their study sample exercised daily while 80% participated in some form of exercise. When compared to Hawk *et al*. (2000), it was found that only 50.2% of those over 55 years of age continued to exercise regularly.

Combining those who exercised occasionally and often from this study it can be said that 58.2% of the sample population exercised relatively regularly, making this a close comparison to the study by Hawk *et al*. (2000).

Noh *et al*. (2016) did not give sub-classifications in their study, it was however noted that 36.2% exercised regularly, whereas 62.8% of their sample did not, which does not compare to the findings in this study.

Table 4.79 reveals that there are slightly more women who exercise "often" compared to men. In terms of exercise, there is a significance relationship between both gender and occupation and exercise ($p < 0.001$) (**Table 4.79**). In contrast, the American study conducted by Watson *et al*. (2016) found that men (25.5%) aged over 50 years were less likely to be inactive compared to women (29.4%) ($p < 0.05$). It was mentioned further that inactivity increased with age, with 25.4% of those aged between 50 to 64 years being inactive, whereas 35.3% in the 75 years and older age group did not exercise.

Unfortunately, the researcher could not find statistical evidence on occupation and amount of exercise done.

5.3.3.4 Sleeping Patterns

As elucidated by Cooke and Ancoli-Israel (2011), we know that sleep becomes far more interrupted as one ages, therefore, the older adult requires to more sleep during the day to make up for the unfulfilling sleep experienced during the night. The causes for this sleep disturbance can be numerous including psychological issues, musculoskeletal pain and physiological changes.

This clinical profile looked into the sleeping patterns of the older adults at the DUT CDC (**Table 4.11**) and found that a large percentage of the sample classified their sleep as normal (56.7%), meaning they experienced “solid” sleep with no interruptions. However, 33.2% of the sample stated having interrupted sleep. The most common reasons for interruption were pain and the desire to void ones bladder. Only 8.8% of the sample stated they were “insomniacs”, often sleeping for four hours or less per night.

The sleeping patterns vs polyuria and nocturia was also compared (**Table 4.76**) and a significance of $p = 0.032$ was found for polyuria and $p < 0.001$ was noted for nocturia, thus, indicating a significance relationship between the increased need to urinate and sleep changes, particularly for nocturia. Similar findings were observed in a Korean questionnaire-based study which determined a statistical significance in those with overactive bladders and nocturia ($p < 0.004$) (Yoo *et al.*, 2010).

In terms of demographics, there is no significant relationship between these variables and sleeping patterns (**Table 4.80**). However, it can be seen (**Table 4.80**) that more women suffer from interrupted sleep or are insomniacs which is in keeping with the study by Cooke and Ancoli-Israel (2011).

5.3.3.5 BMI

Calculating an individual’s BMI is a method of determining if that individual is at a healthy body mass or not. Navaratnarajah and Jackson (2017), Boss and Seegmiller (1981) and Alvisn and Hughes (2015) discuss the physiological changes which occur within the body as individuals age. One of these changes includes the loss of muscle mass. Some muscle mass may be lost simply due to muscle atrophy and the loss of muscle cells, whereas in others the muscle may be infiltrated with fat and collagen.

The BMI of the sample was calculated in 309 of the sample patients (Table 4.12) and it was found that only two percent of the sample was underweight, 26.7% were normal, 27.5% were classified as overweight and 21.7% were obese. In terms of BMI, Hawk et al. (2000) found that 38.6% of the population over 55 years of age were overweight and 20.6% were obese. When comparing the results of this study to that of Hawk *et al.* (2000), that study found a greater number of their sample were overweight, but there is similarity in the findings of obese patients. Greater similarity was established between the results from the study by Noh et al. (2016) and this study (5% underweight, 43% normal, 29% overweight, 22% and 1% severely obese). The values which differed most were for those classified as being normal in weight.

Table 4.81 shows that there are more older women who are both overweight and obese in comparison to men. In terms of demographics, there is no significance found between these variables and patient BMI (**Table 4.81**). When comparing this to the research by Noh *et al.* (2016), it can be seen that this study shows that there are more, older women who are overweight and obese than men, and there were no statistically significant relationships, unlike Noh *et al.* (2016) who determined a significance of $p < 0.01$. In both Noh *et al.* (2016) and this study, there was no significant difference between BMI and occupation of the sampled populace. Xue, Head and McMunn (2017) discerned no significance between retirement and BMI ($p > 0.05$).

5.3.3.6 BP

Increased BP is a common finding in older adults due to physiological changes which take place within the CVS. The changes that occur within the CVS ultimately lead to stiffened vessels and an increased resistance within the system and the cardiac afterload (Navaratnarajah and Jackson, 2017). While peripheral resistance is the greatest contributor to a rise in the BP in young adults, for older adults it is often central arterial stiffness (Lionakis *et al.,* 2012). This rise in BP has been one of the major contributors to mortality and morbidity within the older population (Lionakis *et al.*, 2012).

Table 4.13 depicts the BP findings within the sampled population using the classification by Bickley and Szilagyi (2013). Pre-hypertension was found to occur most at 34%, followed by stage one hypertension with 27.2%, normal BP at 25.9% and lastly stage two hypertension which was found to be 12.1%. Blood pressure had not been recorded for three patients.

Associations between the main complaints and BP were calculated with no significance found (**Table 4.68**). When looking at only the top three complaints (low back, neck and

shoulder), it can be seen that the largest group of patients found to have stage two hypertension were those suffering with low back pain (n = 16). Of the 76 patients with neck pain as the primary complaint, only 11 patients complaining of neck pain had stage two hypertension.

Hawk *et al*. (2000) found that 9.7% of those aged over 55 years old had hypertension. Lionakis *et al*. (2012) stated that after the age of 65 years, more women were found to suffer from hypertension than men. In terms of gender, there are more women with pre-hypertension and stage one hypertension than men; however, more men had stage two hypertension than women (**Table 4.82**).

Table 4.82 looks at associations between the patient's gender, marital status, and occupation with BP. The only significance noted was between the patient's occupation and BP (p = 0.033). Upon doing a linear regression analysis on 1 084 Chinese participants, Xue, Head and McMunn (2017) found that the rate at which systolic blood pressure increases was lower post-retirement and there was a decrease in the diastolic blood pressure post-retirement. It was also observed that these blood pressure changes upon retirement were less significant in women than for men (systolic blood pressure $p < 0.01$, and diastolic blood pressure $p < 0.03$). However, in this study, there was no significance when comparing gender and blood pressure.

5.3.4 Nature and Presentation of the Patient Complaint

5.3.4.1 Number of Complaints

At the DUT CDC patients may discuss two regions of complaint for treatment at their initial consultation; **Figure 4.1** shows the variance in those with one versus two complaints. The majority of the patients reported needing treatment for one region (81%), while 19% had two areas of complaint at the initial consult.

5.3.4.2 Region of Complaints

The WHO has reported that back pain is one of the four major musculoskeletal diseases (Fejer and Ruhe, 2012). Killinger (2004) and Evans, Ndetan and Hawk (2010) mentioned that one of the main reasons for people (including older people) to seek treatment from a Chiropractor is for back pain, in particular low back pain.

Part of Objective Three was to determine the chief musculoskeletal complaint that geriatric patients treated at the DUT CDC presented with.

For both the main complaint (Complaint One) and the secondary complaint (Complaint Two) (**Tables 4.14** and **4.15**), low back pain was the most commonly reported area requiring treatment (36.5% and 24.3% respectively). These figures indicate that of the sampled population, 60.8% suffered from low back pain, whether it was their main or secondary complaint. For Complaint One, the neck (19.1%) and the shoulders (10.3%) were the next two most common sites for treatment. In contrast, it was noted that the mid-back (17.6%) and the neck (12.2%) were the next most common sites in need of treatment for Complaint Two. When looking at the mid-back in Complaint One, it only came in as the fifth most treated area (5.3%) after the knee (6%) which was fourth.

These findings correlate with the literature in that back/spine pain is the most common reason to seek Chiropractic care; even though mid-back pain does not feature in the top three places for Complaint One, it does feature in the top five areas of complaint.

These findings differ slightly from those of Coulter and Shekelle (2005) in that they found the neck to be the number one complaint (27%) in contrast to low back pain at only 22% and back/spine pain which occurred in 21% of their sample. Extremity cases made up 13%, which is dissimilar to the findings of this study as the number of extremity cases was considerably more than that of Coulter and Shekelle (2005).

It must be noted that 2% of the patients who visited the clinic did so due to the residual effects of having experienced a stroke. One patient presented for a check-up/maintenance therapy, which is what Hunnisett and Cunliffe (2012) promote.

5.3.4.3 Nature of Pain

The nature of pain was documented in this study as pain only, stiffness only, numbness/tingling only and combinations thereof (**Figure 4.2** and **Figure 4.5**). The pain only category also included the referral of pain and was not limited to localised pain only.

Far greater combinations of the three were documented in relation to Complaint One (**Figure 4.2**). However, pain only was the greatest documented sign and symptom at 69.8%. The second most documented nature of the complaint was pain and numbness/tingling (16.9%) and the third was pain with stiffness (7.1%). Only 1.8% had had a combination of all three classifications.

For Complaint Two (**Figure 4.5**), far fewer combinations of these three categories were seen. Pain only was present in 81.9% of the secondary complaint, pain and numbness/tingling in 8.3% and pain and stiffness in 6.9%. This corresponds to the

findings in Complaint One. It must be mentioned that pain is present in the top three documented signs and symptoms for both Complaint One and Complaint Two.

In the American and Canadian study by Hawk *et al*. (2000), 57.4% of their sample had painful symptoms and 14.9% had painful and non-painful symptoms (where non-painful symptoms were those of stiffness and/or numbness), and 11.9% had non-painful symptoms only. The findings of this study are similar to those of Hawk *et al*. (2000), where painful symptoms were the most documented symptom, a combination of both painful and non-painful were the second most commonly occurring with non-painful symptoms being found in only a small proportion of the sample.

5.3.4.4 Onset of Pain

For both Complaints One and Two, the initial and recent onset of pain was documented (the initial onset meaning when they first experienced the pain and recent onset being the latest episode of pain). **Figure 4.3** shows the onset of pain for Complaint One and **Figure 4.6** that for Complaint Two.

The findings for both the initial and recent onset of pain for Complaints One and Two are very similar in that approximately 50% of the sample the initial onset for their complaint was over a year ago, indicating their pain is chronic. An average of 26% stated their most recent onset of pain was within the preceding week. This demonstrates the possibility of having an acute exacerbation of pain in a chronic condition. On average, 26% of patients stated that their most recent onset of pain was a year or more previous, meaning they had been suffering with the pain for a year or more before consulting the DUT CDC for treatment. Very few patients stated that their pain occurred between six months and a year previously. An average of 6% of the cases stated that their pain was the first episode for that region.

Hawk *et al*. (2000) documented similar findings in their study (pain present for a week or less = 17.7%; pain present for one to six weeks = 23.1%, pain present for six weeks to six months = 10.3%; pain present for six months to one year = 7.4% and pain present for a year or more = 37.2%). The greatest difference between the findings from Hawk *et al*. (2000) and this study was in the six week to six month category. Hawk *et al*. (2000) found that 10.3% of the sample fell into this category, whereas this study found almost double as many patients (23%) in this category. These results further indicate that the majority of the older patients presenting to the DUT CDC do in fact suffer with chronic pain as the literature suggests (Hunnisett and Cunliffe, 2012).

5.3.4.5 Prior Screening Tests Performed

Chiropractors are trained to evaluate x-ray and laboratory findings (Hawk, 2002), thus student interns at the DUT CDC ask their patients if they have had any screening tests done before their initial consultation. **Figure 4.4** and **Figure 4.7** display what prior tests the patients had done before their initial Chiropractic consultation at the DUT CDC. X-ray examinations were done in over 80% of the patients who had been sent for a screening test prior to their first treatment at the DUT CDC. For the rest, less than 3% had an MRI, CT scan, blood work, ultrasound or a combination thereof done. For Complaint Two, only x-rays (90%) and blood work (10%) had been done.

5.3.5 Medication Use

Table 4.16 has provided the number of medications consumed. It can be seen that 43.1% of patients consume three to five medications (including prescription, over-the-counter and supplements), followed closely by those consuming zero to two medications at 41.8%. It is alarming to note that 15.1% of the patients consume six or more drugs. The average number of medicines consumed in this study three drugs, with the most drugs being consumed being 17 (**Table 4.17**).

Jin *et al*. (2016) did a study on older adults of the Republic of Korea, a developing country much like South Africa, which investigated their medication consumption and found 60.3% of the population sampled took three or more prescription medications. Killinger (2012) stated that the average American takes between six to eight drugs.

Unfortunately, many medication names were not documented in the clinical record of this study but rather what type of drug they were taking, thus they were grouped for their functionality and could not be differentiated from prescribed and over-the-counter medications.

In terms of prescription and over the counter drugs, a variety of 70 drugs was recorded (**Table 4.18**). The top three consumed were anti-hypertensives (n = 194), NSAIDs (n = 106) and cholesterol lowering drugs (n = 88). Anti-diabetic medication and aspirin were in the top five consumed medications (n = 72 and n = 66 respectively). These findings correlate with those of Gelberzon (2001) in which he stated that many medical doctors simply prescribe NSAIDs to their patients for their pain.

There were 20 variations of supplements and vitamins recorded with the top three being vitamins, a calcium complex and Omega oils (n = 49, n = 3 and n = 11 respectively) (**Table 4.19**).

Hawk *et al*. (2000) looked at the consumption of aspirin, non-aspirin analgesics and prescribed medication (20.4%, 16.9% and 14.5% respectively). In the current study aspirin placed fifth in the list of medications consumed. In terms of analgesics, there were several variations recorded and many of them featured in the top 20 consumed medications.

Table 4.71 and **Table 4.72** show where there is any significance between the age and gender of the patients and the total medication consumed. Between age and total medications, it can be seen that there is no significance. However, when looking at gender and total medications there is a significance relationship $p = 0.035$.

Table 4.73 highlights the total medication consumption per gender. In all cases women take more medication than men, particularly those taking between three and eight drugs, which is similar to the report by Lehohla (2014).

5.3.6 Co-Morbidities Documented

Objective Four of this study was to document co-morbidities that geriatric patients may present with at the initial consultation.

Table 4.20 shows that the minimum number of co-morbidities the patients presented with is zero, whereas the maximum is 26, with the mean number being seven.

The variety of the co-morbidities documented can be found in **Table 4.21** through to **Table 4.35**.

Weigel *et al*. (2010) list the most common co-morbidities seen in the geriatric patients as being cancer, arthritis, heart disease, diabetes, lung disease, hip fractures and hypertension. The five most prevalent co-morbidities in this study are hypertension (n = 204), diabetes (n = 91), headaches (n = 82), hysterectomies (n = 77) and constipation (n = 73). Arthritides are seventh with 72 cases documented.

Table 4.66 shows the comparison between the demographics, medication and total medication and it can be seen that there is no significance in any of the factors other than the medication and co-morbidities. What can be seen looking at the partial eta squared result (.561) is that when gender and occupation are combined and evaluated these both have an effect on the total amount of co-morbidities.

Table 4.69 and **Table 4.70** show the associations between the total co-morbidities and the age and gender of the patients. Lehohla (2014) and Battula *et al*. (2015) state that with age, the prevalence of disease and disorder increase with nearly every four in five

older adults suffering with a co-morbidity. The results from this study show only a slight significance between the age and total co-morbidities of the patient (p = 0.058) (**Table 4.69**).

Table 4.66 shows that there is significant relationship when looking at patient gender along with the other demographics and the main complaint. When gender and total co-morbidities are viewed on their own, there is greater significance noted (p = 0.011), however gender has no effect on the total co-morbidities (**Table 4.70**).

Hershey and Bednarczyk (2013) and Semenov (2015) highlight that headaches are not uncommon in the older population, however, the type of headaches found in the older adult is different. While in all cases the prevalence of headaches decrease in both genders, they remain more common in women than men.

5.3.6.1 Medication versus Co-Morbidities

The highest number of co-morbidities documented is 26 and the highest number of consumed medications is 17. These numbers are incredibly high and concerning.

Table 4.65 and **Table 4.66** show a p-value of < 0.001 meaning there is a strong significance between the total number of co-morbidities and the number of medications consumed. With a partial eta squared test of .273, it can be seen that total amount of medication consumed has an effect on the number of co-morbidities. No statistical evidence was found by the researcher regarding the total consumption of medication and the total number of co-morbidities in the general older population.

Battula *et al*. (2015) suggest other non-pharmacological methods of treatment should be promoted in order to avoid polypharmacy and the increased risks of adverse drug reactions associated with high medication consumption. Barat, Andreasen, and Damsgaard (2001) state that the biggest complication seen in medication non-compliance is exacerbation of a concurrent condition, which is increased in cases of polypharmacy, which is shown by the above results.

5.3.7 In-House Testing

One of the other services the DUT CDC offers is in-house testing which includes random glucose tests and urinalysis. Unfortunately, the results of these tests were not available. It was documented that only 6%of the presenting patients had either one or both of these in-house tests done (**Figure 4.8**). **Figure 4.9** describes which tests were done;

approximately 45% had only a urinalysis or only a random glucose test done, while nearly 10% had both their glucose and urine tested.

Unfortunately, the researcher was unable to find any comparable data or information with regards to in-house testing done.

5.3.8 Concurrent Treatment by Specialists

In all the studies found pertaining to Chiropractic treatment of the geriatric patient, the researchers only documented the previous treatment the patient had prior to their Chiropractic treatment. In this study, the concurrent treatment by other specialists was documented. **Figure 4.10** shows that 4% of the sampled patients disclosed continued treatment with other specialists and the type of specialist seen is shown in **Figure 4.11**. In 19% of the cases they were being treated concurrently by orthopaedic surgeons while 13% were still seeing a physiotherapist. The remaining patients were consulting 11 other types of specialist including cardiologists, rheumatologists, vascular specialists and oncologists.

5.3.9 Type and Number of Treatment

The other portion of Objective Three was to determine the chief musculoskeletal complaint and management protocol for geriatric patients treated at the DUT CDC.

The average number of treatments per person is three as can be seen in **Table 4.36**, and the maximum number of treatments a patient had in this sampling time frame was 20. **Figure 4.12** shows that 33.8% patients had one treatment. Almost half of those patients (15.1%) continued to receive three treatments. Less than 10% of the sample had four or more treatments.

Table 4.37 through to **Table 4.47** reveal how the regions were treated at each visit. In general, the numbers diminished after each visit. The instances where there was a “spike” in the treatment method was around the fifth and sixth treatment. This could be due to the philosophy, where unless there was an adverse reaction or the patient did not like the method of treatment, it is suggested to maintain treatment protocol until the fourth treatment. If there had not been any changes to the patient’s condition by then, it is encouraged to try a different treatment approach.

Table 4.48 indicates the number of patients who had not received any treatment at the particular visit, which occurred mainly at the first visit. Only nine patients did not receive any treatment after the first treatment.

Table 4.49 summarises all treatments patients received and what can be observed is soft tissue therapies was performed the most (n = 653) followed by electro-modalities (n = 530), and mobilisations (n = 495), dry needling (n = 486) and spinal adjustments (SMT) (n = 431). It must be mentioned that many extremities were mobilised rather than adjusted.

Gleberzon (2011) and Dougherty *et al*. (2012) discussed the four most common methods of treatments performed by Chiropractors. These are SMT, exercise, dry needling and nutritional advice. The findings in this study do not correlate much with the statements by either Gleberzon (2011) or Dougherty *et al*. (2012). As we can see by the results of this study, soft tissue therapies were more commonly performed for the older adult.

Mootz *et al*. (2005) indicated that spinal manipulations were also the predominant method of treatment in their study. Thereafter, the most common method of treatments were the use of electro-modalities, soft tissue therapy, hot and cold therapy, stretching and exercise, assistive devices, extremity adjustments and lastly acupuncture. In the Hawk *et al*. (2000) study, assistive devices were also used frequently, followed by spinal manipulations, cryotherapy, ultrasound and heat therapy.

5.3.10 Referrals Out of the Clinic

Often when a red flag is present, or the patient does not appear to have a condition which may be treated with Chiropractic treatment, they are referred out for other screening tests or to other specialists.

Table 4.50 through to **Table 4.55** shows what conditions were referred for which investigation after each visit. It must be noted that the patient was not specifically sent out for a CT scan or an MRI scan for any condition (**Table 4.50** and **Table 4.52**). This may largely be due to chiropractors not being allowed to refer for these scans directly in South Africa, as the patient has to go through the relevant specialist for that condition.

When changing the management approach after the fourth “unsuccessful” treatment, referral to either an outside specialist or for a screening test is often arranged. This trend can be seen in blood work, ultrasound and x-ray referrals, as in all three cases screening test requests increased after the fourth visit. For outside specialists, these referrals peaked in the third visit.

When looking at the total number of referrals (**Table 4.56**), the screening test largely requested was that of an x-ray (n = 59). Many patients (n = 45) were sent to outside specialists.

In the study by Coulter and Shekelle (2005), 6% of the patients in their research had been referred for x-rays. Mootz *et al.* (2005) did an American based study which looked at Chiropractic practises in two American States and found 17% of the patients in Arizona practises and 6% of the patients in Massachusetts practises had been sent out for x-rays. Haw *et al*. (2000) noted that 62.1% of their sample had been sent for x-rays.

Only 1% of the patients in both Arizona and Massachusetts had been sent for MRI scans (Mootz *et al*., 2005).

5.3.11 Home Education and Treatment

Continued treatment at home and certain lifestyle changes is vital for progress of the patient's condition. In this section we discuss what education and home treatments were given to the patient after their visits. **Table 4.57** through to **Table 4.63** look at each recommendation per visit. The numbers per home therapy generally decrease with each visit for the type of treatment/s given and referrals out.

Table 4.64 demonstrates the total recommendations given. For all areas of complaint, stretching was the most recommended home treatment for patients (n = 351), followed by exercise (n = 197). Home therapies which fell into the category of "other" came in third (n = 105). It is alarming to note the advice least given to patients was that of nutritional advice (n = 30).

Gleberzon (2001) stated that the most commonly prescribed home treatments are exercise, the use of hot or cold packs and nutritional advice which does not correlate much with the findings of this study. In Chiropractic practises in Arizona and Massachusetts, exercise was recommended to 9% and 20% of their patients respectively, while nutritional supplements were sold to an average of 3% of patients (Mootz *et al*., 2005). Unfortunately, nutritional supplements are not allowed to be sold at the DUT CDC and therefore there is no comparable data with regards to the sale thereof. Home therapies in the study by Hawk *et al*. (2000) included exercise (41.0%), hot and cold therapy (40.8%) and nutritional advice (24.5%).

5.3.12 Demographics, Chief Complaint and Co-Morbidities

Objective Five was to determine association between the demographics, chief complaint and co-morbidities (**Table 4.68**). The only significant value is for gender within this grouping (p = 0.041). None of these variables have an effect on one another as seen by looking at the partial eta squared values. Therefore demographics, co-morbidities and chief complaint have very little effect on one another.

Unfortunately, the researcher was unable to find any comparable data to these findings, thus opening up avenues for further research.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

There is currently no data available to look at the frequency of geriatric patient visits to the DUT CDC prior to 2010, therefore it cannot be ascertained whether or not there is any significance in relation to those patient visits in the years sampled. The DUT CDC is in the city which could also play a negative role in the older patient numbers frequenting the clinic. As Lehohla (2014) stated, many older adults reside in rural areas or move back to rural areas, while the younger folk move into the urban areas. Fortunately, with there being three external community clinics run in rural settings which are located in different areas within the province, it is possible to educate these citizens on the benefits of Chiropractic care.

In terms of patient demographics, in general the patient data found in the clinical records follow suit with the available research. The population sample was for majority female, which reflects our feminised population (Lehohla, 2014). The most common union was marriage, and as the pensionable age was utilised for the age bracket researched, with the majority of the sample being retired.

Lifestyle factors which included the patients smoking habits, alcohol consumption, exercise and sleeping patterns, as well as their BMI and BP values were also similar to the findings of other research studies conducted on these issues. Reddy *et al*. (2015) reported that individuals from low and middle income countries like South Africa tend to smoke more; it was surprising to find so many patients in this study stating that they were not smokers. Likewise, with many patients suffering from chronic pain and disease, and several studies confirming a positive correlation between exercise and pain reduction, it was alarming to note that there were so many patients who did not exercise, or were no longer exercising. Unfortunately, as described by Cooke and Ancoli-Israel (2011) changes in sleeping pattern are normal with increased age, which includes more frequent urination at night in particular, which was found to be the case in this study as well. With the knowledge that muscle mass diminishes with age and instead is often infiltrated with fat and collagen, it was unanticipated to find that the distribution of body mass was relatively evenly between those groups classified as normal, overweight and obese. What is even more unexpected was finding that there were more women who stated that they exercise “often” and that there were also more women who classified as overweight and obese in this study.

It is normal for an individual's blood pressure to rise slightly as one grows older; this study found that almost half of the sampled population was still hypertensive even though they were medicated. However, if we look more specifically at the patient co-morbidities it can be seen that 204 patients stated they suffer from hypertension with only 194 counts of anti-hypertensive medication being consumed. Some patients said that they consumed more than one anti-hypertensive. These values are concerning, and the findings indicate that several patients did not have their hypertension under control, as not only were some patients not medicated, but many of those who were medicated were taking several drugs for their hypertension. While the circumstances are not known, this is distressing as it suggests that patients are not being prescribed their medication adequately which may result in unnecessary polypharmacy, or there is medication non-compliance taking place.

The average number of co-morbidities found per person was seven, so it was surprising to find so few patients describing two areas of complaint at the initial treatment. What this study does confirm is that low back pain is definitely the number one reason for a patient to seek out Chiropractic care, closely followed by other spinal complaints. There were also many more cases of extremity complaints than the literature suggested. Regarding the character of pain, most patients said it was localised and referred pain, or otherwise there was numbness/tingling and pain. The majority of the patients were chronic sufferers of pain with a large portion having an acute exacerbation of the chronic pain.

As shown from the literature, South Africa is a country with a low socio-economic status with a fragmented health care system benefiting only the wealthy (Lehohla, 2014; Bradshaw and Steyn, 2001; Brown, 2012). Even for those who may possibly afford the costs for expensive medical scans such as MRI or CT scans, there are few institutions providing access to these systems. For that reason, x-rays are still the most frequently ordered screening test for many conditions. This is evident in this study because the most common previous screening test was an x-ray, and the most common referral screening test was an x-ray. However, the findings reveal that only 59 of the 397 patients in the study had been referred for an x-ray related to one of their treatments, indicating one of two things. Firstly, the student interns are not unnecessarily sending the patients off for an examination thus not exposing them to harmful radiation. Secondly it portrays good diagnostic skills, for students at the DUT CDC are taught an x-ray should only be used to confirm a diagnosis and not make a diagnosis.

The core of Chiropractic Therapy is that of treating a patient in a holistic manner, meaning it approaches treating the patient in a non-surgical manner which is also drug free (Hunnisett and Cunliffe, 2012). Therefore, it is alarming to find there are so many patients

ingesting several types of drugs with some cases taking as many as 17, and a few using supplements and vitamins. What this indicates is a low health literacy amongst the older adults visiting the DUT CDC. Non-steroidal anti-inflammatories are the second most ingested drug in this sample, which is consistent with the study by Gleberzon (2001) who states that many medical doctors simply prescribe an NSAID to their patients for the pain, therefore veering off the patient centred approach that Chiropractic is striving for. A patient centred approach is treatment focusing on the goals of the patient and does not look at a disease specific approach (Arcury *et al.,* 2006).

The literature on the health of older adults indicates that in general patients suffer from several co-morbidities. Weigel *et al.* (2010) describes the more commonly occurring co-morbidities in older adults, many which overlap with the findings in this study. Pienaar *et al*. (2004) stated in their research that few healthcare practitioners recommend and prescribe exercise as a form of treatment for their patients. Larsson *et al*. (2016) list several co-morbidities that are found to be diminished in a population which exercises. Many of these co-morbidities are present in this sample study, implying that with an appropriate exercise regimen the prevalence of these diseases and disorders may be lowered in an individual. Considering that there is a significant correlation between total medication consumption and total co-morbidities observed, exercising may also decrease the need for several medications, thus reducing the possibility of adverse side effects due to polypharmacy.

Furthermore, when looking at the number of co-morbidities and types in each system, and then correlating these findings with the number of and types of supplements and vitamins the patients are taking, very few patients are assisting their body with natural remedies. Patient diet was not evaluated in this study, but it cannot be guaranteed that the patient is eating correctly and consuming the correct amount of nutrients in their diet to avoid the need for vitamins and supplements.

We know from the study that patient demographics, main complaint and co-morbidities do not have much of an effect on one another, the only demographic having an effect being gender. Bradshaw and Steyn (2001) and Naidoo *et al*. (2015) state that there is a correlation between poverty and illness correspond to one another, but unfortunately patients' residential situation and income status was not documented in the files used as data for this study, thus it could not be ascertained if this statement is true in terms of patient presentation at the clinic.

Very little information was captured regarding the nature of the concurrent treatment rendered by other specialists. Many patients were recorded as ingesting several drugs,

many of which would require a prescription, but this does not match up to the number of patients receiving concurrent treatment by other specialists. As there is no specific section in the clinic paperwork requiring this to be asked it cannot be determined whether or not the student interns were asking this as a question and simply not recording it, or if this question was not being asked. To know how the patient is being treated as a whole and who is managing certain conditions is important; this is an area which does not receive enough attention.

In general, the treatments described in the literature are similar to those rendered at the DUT CDC as well. Dougherty *et al*. (2012) mentioned that while the approach may need to be altered, spinal manipulation is safe to use on older adults. What we found in this study though is that the treatment of choice was soft tissue therapy and the use of electro-modalities. Another interesting finding was that dry needling was used more frequently than spinal manipulation, considering that dry needling is more invasive and many older adults bleed more easily, whereas spinal manipulations is not an invasive technique. There also were also not many cases of assistive devices used in the treatment.

Continued treatment at home is an important part of patient management, which fortunately for the most part includes exercise. Of the studies which describe the home treatments and education given to patients, nutritional advice is one of the most frequent forms of advice. Unfortunately, this is a finding we do not see in this research study – it does come up, but is the least frequent form of advice. Dougherty *et al*. (2012) highlighted that fall prevention is a very important aspect in treatment of the older adult, one that was not documented in this study.

Lishchyna and Mior (2012) stated that that teaching clinics are designed to assist students in preparing them for work beyond the clinic setting. Teaching clinics are also documented as being frequented by an array of patients exposing them to many clinical cases (Kaeser *et al*., 2014). The findings from this study confirm this in that the data indicates a wide range of patients frequented the DUT CDC from patients experiencing low back pain to those wanting treatment for the physical side effects of having had a stroke. However, it is not known if this matches the patient presentation and characteristics seen in private Chiropractic practises in South Africa.

6.2 Limitations

Limitations related to the performance and completion of this study included the following:

- This clinical profile looked at patient records from previous years, therefore, requiring the researcher to rely on the subjective and objective recording of the data recorded by the Chiropractic student interns involved in documenting the information.

- The data was extracted from only one clinic in KZN, namely the DUT CDC.

- Patients are not requested to state their ethnicity so it was not possible to consider this demographic variable. This was the same for their area of residence as well.

- This is the first study of its kind done at the DUT CDC and therefore there is little data available for comparability.

- Similarly, little research is done internationally on the older adult in Chiropractic thus the pool of research articles available for comparing data was small.

6.3 Recommendations

Following the findings of this study, the following recommendations are proposed:

- For better data comparison and accuracy, it is suggested that this study be repeated on a five year cycle. This will assist in generating updated data on the older population and their attendance at the DUT CDC.

- Doing a study similar in nature in private practises. In doing so one would gain insight into older adults attending private practise and whether or not they present differently or receive different care.

- Reviewing the component in the academic course related to geriatric patients in the light of these results. Patient education should be emphasised, particularly nutrition, exercise, and fall prevention. Addressing these areas can assist in creating a healthier lifestyle and prolonging independent living for each individual.

- Formulating this study as a questionnaire would allow for more specificity in all areas, as well as allowing scope for more personal questions such as level of education and income bracket.

- The University of Johannesburg could conduct a study similar to this one in their Chiropractic clinic to determine any differences in patient presentation in another South African teaching clinic.

- Updating the clinic paperwork or possibly creating paperwork specific to those who are older in age, so the style of questioning may pertain more to this population subset and produce more accurate data.

REFERENCES

Aalami, O.O., Fang, T.D., Song, H.M. and Nacamuli, R.P. 2003. Physiological features of aging persons. *Archives of Surgery*, 138(10): 1068-1076.

Alvis, B.D. and Hughes, C.G. 2015. Physiology considerations in the geriatric patient. *Anesthesiology Clinics*, 33(3): 447-456.

Anton, S.D., Woods, A.J., Ashizawa, T., Barb, D., Buford, T.W., Carter, C.S., Clark, D.J., Cohen, R.A., Corbett, D.B., Cruz-Almeida, Y., Dotson, V., Ebner, N., Efron, P.A., Fillingim, R.B., Foster, T.C., Gundermann, D.M., Joseph, A., Karabetian, C., Leeuwenburgh, C., Manini, T.M., Marsiske, M., Mankowski, R.T., Mutchie, H.L., Perri, M.G., Ranka, S., Rashidi, P., Sandesara, B., Scarpace, P.J., Sibille, K.T., Solberg, L.M., Someya, S., Uphold, C., Wohlgemuth, S., Wu, S.S. and Pahor, M. 2015. Successful aging: Advancing the science of physical independence in older adults. *Ageing Research Reviews*, 24(B): 304-327.

Arain, M., Campbell, M.J., Cooper, C.L. and Lancaster, G.A. 2010. What is a pilot study or feasibility study? A review of current practice and editorial policy. *BMC Medical Research Methodology,* 10(67): 1-7.

Arcury, T.A., Bell, R.A., Snively, B.M., Smith, S.L., Skelly, A.H., Wetmore, L.K. and Quandt, S.A. 2006. Complementary and alternative medicine use as health self-management: Rural older adults with diabetes. *The Journals of Gerontology,* Series B, 61(2): S62-S70.

Astin, J., Pelletier, K.R., Marie, A. and Haskell, W.L. 2000. Complementary and alternative medicine among elderly persons: One-year analysis of a blue shield Medicare supplement. *The Journals of Gerontology*, Series A, 55(1): M4-M9.

Avers, D., Brown, M., Chui, K., Wong R. and Lusardi M. 2011. Editor's message: Use of the term "elderly". *Journal of Geriatric Physical Therapy,* 34(4): 153-154.

Barat, I., Andreasen, F. and Damsgaard, E.M.S. 2001. Drug therapy in the elderly: What doctors believe and patients actually do. *British Journal of Clinical Pharmacology,* 51(6): 615-622.

Battula, P., Reddy, T.M., Shekar, K.C., Durga Prasad, T.S., Dhanunjaya, S. and Ranganayakulu, D. 2015. A review on older people. *Pharmacy Practice,* 3: 1-5.

Bickley, L.S. and Szilagyi, P.G. 2013. *Bates' guide to physical examination and history taking.* 11th ed. Philadelphia: Wolters Kluwer Health and Lippincott Williams & Wilkins.

Boss, G.R. and Seegmiller, J.E. 1981. Age-related physiological changes and their clinical significance. *Western Journal of Medicine*, 135(6): 434-440.

Bradshaw, D. and Steyn, K. 2001. *Poverty and chronic diseases in South Africa.* MRC Technical Report. Cape Town: South African Medical Research Council and World Health Organization.

Brown, R. 2012. A health care system in transformation: making the case for chiropractic. *Chiropractic & Manual Therapies,* 20(37): 1-8.

Buckingham, R., Potter, J. and Wagg, A. 2012. Clinical audit of healthcare. In: Sinclair, A.J., Morley, J.E. and Vellas, B. eds. *Principles and practice of geriatric medicine.* 5th ed. Oxford: John Wiley.

Cambron, J.A., Cramer, G.D. and Winterstein, J. 2007. Patient perceptions of chiropractic treatment for primary care disorders. *Journal of Manipulative and Physiological Therapeutics*, 30(1): 11-16.

Chiropractic Association of South Africa. 2018. Student Info 2018. Available: http://chiropractic.co.za/students/student-info/ (Accessed 13 February 2018).

Chiropractic Clinic2015. Clinic manual. Available: http://www.dut.ac.za/clinics/chiropractic/ (Accessed 13 November 2015).

Cooke, J.R. and Ancoli-Israel, S. 2011. Normal and abnormal sleep in the elderly. *Handbook of Clinical Neurology*, 98: 653-665.

Coulter, I.D. and Shekelle, P.G. 2005. Chiropractic in North America: A descriptive analysis. *Journal of Manipulative and Physiological Therapeutics*, 28(2): 83-89.

Dorland's Medical Dictionary for Health Consumers. 2007. *Clinical*. Saunders. Available: https://medical-dictionary.thefreedictionary.com/clinical (Accessed 29 January 2018).

Dougherty, P., Hawk, C., Weiner, D.K., Gleberzon, B., Andrew, K. and Killinger, L. 2012. The role of chiropractic care in older adults. *Chiropractic and Manual Therapies* 20(3): 1-9.

Durban University of Technology, Faculty of Health Sciences. 2018. 2018 Handbook: Chiropractic and Somatology. Clinical Chiropractic V (MTCHR1: CLCH501). Department

of Chiropractic, Faculty of Health Sciences, Durban University of Technology. Available: http://www.dut.ac.za/wp-content/uploads/handbooks/HSC%20Chiro%20&%20Soma.pdf (Accessed 8 May 2018).

English Oxford Living Dictionaries. *Geriatric*. Oxford University Press. Available: https://en.oxforddictionaries.com/definition/geriatric (Accessed 11 December 2017).

Enyinnaya, E., Anderson, J.G., Merwin, E.I. and Taylor, A.G. 2012. Chiropractic use, health care expenditures, and health outcomes for rural and nonrural individuals with arthritis. *Journal of Manipulative and Physiological Therapeutics,* 35(7): 515-524.

Evans Jr, M.W., Ndetan, H. and Hawk, C. 2010. Use of chiropractic or osteopathic manipulation by adults aged 50 and older: An analysis of data from the 2007 National Health Interview Survey. *Topics in Integrative Health Care*, 1(2).

Fejer, R. and Ruhe, A. 2012. What is the prevalence of musculoskeletal problems in the elderly population in developed countries? A systematic critical literature review. *Chiropractic & Manual Therapies,* 20(31): 1- 52.

Félix-Redondo, F.J., Grau, M. and Fernández-Bergés, D. 2013. Cholesterol and cardiovascular disease in the elderly. Facts and gaps. *Aging and Disease*, 4(3): 154-169.

Fried, L.P., Ferrucci, L., Darer, J., Williamson, J.D. and Anderson, G. 2004. Untangling the concepts of disability, frailty, and comorbidity: Implications for improved targeting and care. *The Journals of Gerontology,* Series A, 59(3): 255-263.

Gestuvo, M.K. 2012. Health maintenance in older adults: Combining evidence and individual preferences. *Mount Sinai Journal of Medicine*, 79(5):560-578.

Gleberzon, B. 2001. Chiropractic care of the older person: Developing an evidence-based approach. *Journal of the Canadian Chiropractic Association,* 45(3): 156-171.

Gleberzon, B. 2011. A narrative review of the published chiropractic literature regarding older patients from 2001-2010. *Journal of the Canadian Chiropractic Association,* 55(2): 76-95.

Harkema, H., Roberts, I., Gaizauskas, R. and Hepple, M. 2005. Information extraction from clinical records. In: Cox, S.J. and Walker, D.W. eds. *Proceedings of the 4th UK e-Science All Hands Meeting*. . Nottingham, UK: EPSRC.

Hawk, C., Long, C.R., Boulanger, K.T., Morshhauser, E. and Fuhr, A.W. 2000. Chiropractic care for patients aged 55 years and older: Report from a practice-based research program. *Journal of the American Geriatrics Society,* 48(5): 534-545.

Hawk, C. 2002. An evidence-based look at chiropractic. *Journal of Gerontological Nursing,* 28(4): 6-9.

Hawk, C., Schneider, M., Dougherty, P., Gleberzon, B.J. and Killinger, L.Z. 2010. Best practices recommendations for chiropractic care for older adults: Results of a consensus process. *Journal of Manipulative and Physiological Therapeutics,* 33(6): 464-473.

Hitge, C. 2014. Patients at Marburg Haven Clinic: A demographical and disease profile. M. Tech.: Chiropractic, Durban University of Technology.

Hershey, L.A. and Bednarczyk, E.M. 2013. Treatment of headache in the elderly. *Current Treatment Options in Neurology*, 15(1): 56-62.

Hunnisett, A. and Cunliffe C. 2012. Chiropractic treatment as a primary care intervention for better musculoskeletal health in the aging population in the United Kingdom: An opinion and positioning paper. *Frontiers in Physiology,* 3(87): 1-4.

Jin, H., Kim, Y. and Rhie, S.J. 2016. Factors affecting medication adherence in elderly people. *Patient Preference and Adherence,* 10: 2117-2125.

Kaeser, M.A., Hawk, C. and Anderson, M. 2014. Patient characteristics upon initial presentation to chiropractic teaching clinics: A descriptive study conducted at one university*. The Journal of Chiropractic Education,* 28(2): 146-151.

Kaye, A.D., Baluch, A. and Scott, J.T. 2010. Pain management in the elderly population: A review. *The Ochsner Journal,* 10(3): 179-187.

Killinger, L. 2012. Diagnostic challenges in the older patient. *Chiropractic & Manual Therapies,* 20(28): 1-7.

Killinger, L.Z. 2004. Chiropractic and geriatrics: A review of the training, role, and scope of chiropractic in caring for aging patients. *Clinics in Geriatric Medicine,* 20(2): 223-235.

Knight, J., Nigam, Y. and Hore, N. 2017. Anatomy and physiology of ageing 10: The musculoskeletal system. *Nursing Times*, 113(11): 60-63. Available: https://www.nursingtimes.net/roles/older-people-nurses/anatomy-and-physiology-of-ageing-10-the-musculoskeletal-system/7021849.article (Accessed 3 May 2018).

Larsson, C., Ekvall Hansson, E., Sundquist, K. and Jakobsson, U. 2016. Impact of pain characteristics and fear-avoidance beliefs on physical activity levels among older adults with chronic pain: A population-based, longitudinal study. *BMC Geriatrics*, 16(50).

Lehohla, P. 2004. *Perceived health and other health indicators in South Africa.* Pretoria: Statistics South Africa.

Lehohla, P. 2014. *Census 2011: Profile of older persons in South Africa*. Pretoria: Statistics South Africa.

Lehohla, P. 2011. *2011 Census*. Available: http://www.statssa.gov.za/?page_id=3839 (Accessed 21 December 2017).

Lionakis, N., Mendrinos, D., Sanidas, E., Favatas, G. and Georgopoulou, M. 2012. Hypertension in the elderly. *World Journal of Cardiology*, 4(5): 135-147.

Lishchyna, N. and Mior, S. 2012. Demographic and clinical characteristics of new patients presenting to a community teaching clinic. *The Journal of Chiropractic Education*, 26(2): 161-168.

Lugo, A., La Vecchia, C., Boccia, S., Murisic, B. and Gallus, S. 2013. Patterns of smoking prevalence among the elderly in Europe. *International Journal of Environmental Research and Public Health*, 10: 4418-4431.

Mahomed, F. 2007. Chiropractic patients in South Africa: A demographic and descriptive profile. M. Tech.: Chiropractic, Durban University of Technology.

Masson, J., Pearce, J., Bader, K., Joyner, O., Marsden, J. and Westlake, D. 2008. Care profiling study. *Ministry of Justice Research Series,* 4/08. Bristol, UK: Ministry of Justice.

May, J. 2003. Chronic poverty and older people in South Africa. *Chronic Poverty Research Centre Working Paper 25*. Durban: University of Natal School of Development Studies.

Mayo Clinic. 2018. *Arteriosclerosis / atherosclerosis.* Available: https://www.mayoclinic.org/diseases-conditions/arteriosclerosis-atherosclerosis/symptoms-causes/syc-20350569 (Accessed 22 October 2018).

McDonald, M.L. 2012. Demographic characteristics of patients attending DUT Chiropractic Day Clinic: A comparison of trends between 1994 and 2011. M. Tech.: Chiropractic, Durban University of Technology.

Melis, R., Marengoni, A., Angleman, S. and Fratiglioni, L. 2014. Incidence and predictors of multimorbidity in the elderly: A population-based longitudinal study. *PLOS ONE,* 9(7).

Molina, N. 2008. Chiropractic effective in relieving pains from geriatric conditions. *Dynamic Chiropractic,* 26(10): 40.

Mootz, R.D., Cherkin, D.C., Odegard, C.E., Eisenberg, D.M., Barassi, J.P. and Deyo, R.A. 2005. Characteristics of chiropractic practitioners, patients, and encounters in Massachusetts and Arizona. *Journal of Manipulative and Physiological Therapeutics*, 28(9): 645-653.

Mosby's Medical Dictionary. 2009. *Profile.* 9th ed. Elsevier. Available: https://medical-dictionary.thefreedictionary.com/profile (Accessed 27 January 2018).

Naidoo, I., Charlton, K.E., Esterhuisen, T.M. and Cassim, B. 2015. High risk of malnutrition associated with depressive symptoms in older South Africans living in KwaZulu-Natal, South Africa: A cross-sectional survey. *Journal of Health, Population and Nutrition*, 33(19)

National Institute for Clinical Excellence. 2002. *Principles for best practise in clinical audit.* Abingdon, UK: Radcliffe Medical Press.

Navaratnarajah, A. and Jackson, S.H.D. 2017. The physiology of ageing. *Medicine*, 45(1): 6-10.

Noh, J.-W., Kim, J., Park, J., Oh, I-H. and Kwon, Y.D. 2016. Age and gender differential relationship between employment status and body mass index among middle-aged and elderly adults: A cross-sectional study. *BMJ Open*, 6.

Ntulu, N. 2016. Health literacy is essential. *The New Age Online.* Available: http://www.thenewage.co.za/health-literacy-is-essential-2/ (Accessed 16 January 2018).

Nyiendo, J., Phillips, R.B., Meeker, W.C., Konsler, G., Jansen, R. and Menon, M. 1989. A comparison of patients and patient complaints at six chiropractic college teaching clinics. *Journal of Manipulative and Physiological Therapeutics*, 12(2): 79-85.

Nyundu, T. and Naidoo, K. 2016. Traditional healers, their services and the ambivalence of South African youth. *Commonwealth Youth and Development*, 14(1): 144–155.

Online Etymology Dictionary. 2018. *Chiropractic*. Available: https://www.etymonline.com/word/chiropractic (Accessed 11 January 2018).

Orimo, H., Ito, H., Suzuki, T., Araki, A., Hosoi, T. and Sawabe, M. 2006. Reviewing the definition of "elderly". *Geriatrics & Gerontology International,* 6(3): 149-158.

Pienaar, P.E., De Swart, M., De Vries, M. and Roos, H. 2004. Physical activity knowledge, attitudes and practices of the elderly in Bloemfontein old age homes. *South African Family Practice*, 46(8): 17-19.

Putnam, M. 2015. Replacing 'the elderly' with 'older adults' in JGSW publications. *Journal of Gerontological Social Work,* 58(3): 229-231.

Queiroz Ribeiro, A., Lopes Salgado, S.M., Soleira Gomes, I., Siqueira Fogal, A., Oliveira Martinho, K., Fernandes Almeida, L.F. and Cândido de Oliveira, W. 2016. Prevalence and factors associated with physical inactivity among the elderly: a population-based study. *Brazilian Journal of Geriatrics and Gerontology*, 19(3): 483-493.

Reddy, P., Zuma, K., Shisana, O., Jonas, K. and Sewpaul, R. 2015. Prevalence of tobacco use among adults in South Africa: Results from the first South African National Health and Nutrition Examination Survey. *South African Medical Journal*, 105(8): 648-655.

Rusac, S. 2015. Elderly abuse and alcohol consumption. *Collegium Antropologicum*, 39(4): 869-875.

Salive, M.E. 2013. Multimorbidity in older adults. *Epidemiological Reviews*, 35(1): 75-83.

Stang, A. 2012. Impact of hysterectomy on age-specific incidence of cervical and uterine cancer in Germany and other countries. *European Journal of Public Health*, 23(5): 879-883.

Stang, A., Kluttig, A., Moebus, S., Völzke, H., Berger, K., Greiser, K.H., Stöckl, D., Jöckel, K.H. and Meisinger, C. 2014. Educational level, prevalence of hysterectomy, and age at amenorrhoea: A cross-sectional analysis of 9536 women from six population-based cohort studies in Germany. *BMC Women's Health*, 14(10).

Semenov, I.A. 2015. Headache in the elderly. *Disease-a-Month*, 61: 249-250.

Statistics South Africa. 2016. *Community Survey 2016*. Available: http://www.statssa.gov.za/?page_id=6283 (Accessed 21 December 2017).

Stevenson, B.S., Stephens, C., Dulin, P., Kostick, M. and Alpass, F. 2015. Alcohol consumption among older adults in Aotearoa/New Zealand: A comparison of 'baby boomers' and 'over-65s'. *Health and Psychology and Behavioral Medicine*, 3(1): 366-378.

Stubbs, B., Binnekade, T.T., Soundy, A., Schofield, P., Huijnen, I.P.J. and Eggermont, L.H.P. 2013. Are older adults with chronic musculoskeletal pain less active than older adults without pain? A systematic review and meta-analysis. *Pain Medicine*, 14(9): 1316-1331.

Tiwari, S., Sinha, A.K., Patwardhan, A., Gehlot, S., Gambhir, I.S. and Mohapatra, S.C. 2010. Prevalence of health problems among elderly: A study in a rural population of Varansai. *Indian Journal of Preventative and Social Medicine,* 41(3/4): 226-230.

Truter, I. 2007. African traditional healers: Cultural and religious beliefs intertwined in a holistic way. *South African Pharmaceutical Journal*, 74(8): 56-60.

United Nations, Department of Economic and Social Affairs, Population Division. 2013. *World population ageing 2013*. New York: UN DESA. Available: http://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2013.pdf (Accessed 23 April 2015).

Venketsamy, Y. 2007. A retrospective cross-sectional survey of cervical cases recorded at the Durban University of Technology Chiropractic Day Clinic (1995-2005). M.Tech.: Chiropractic, Durban University of Technology.

Wardrop, M. 2009. 'Elderly' no longer acceptable word for older people. *The Telegraph.* Available: http://www.telegraph.co.uk/news/uknews/4596139/Elderly-no-longer-acceptable-word-for-older-people.html (Accessed 12 December 2017).

Watson, R. 2008. Research into ageing and older people. *Journal of Nursing Management,* 16: 99-104.

Watson, K.B., Carlson, S.A., Gunn, J.P., Galuska, D.A., O'Connor, A., Greenlund, K.J. and Fulton, J.E. 2016. Physical inactivity among adults aged 50 years and older: United States, 2014. *Morbidity and Mortality Weekly Report*, 65(36): 954-958.

Weigel, P., Hockenberry, J.M., Bentler, S.E., Obrizan, M., Kaskie, B., Jones, M.P., Ohsfeldt, R.L., Rosenthal, G.E., Wallace, R.B. and Wolinsky, F.D. 2010. A longitudinal study of chiropractic among older adults in the United States. *Chiropractic & Osteopathy,* 18(34): 1- 4.

Woolf, A. and Pfleger, B. 2003. Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization,* 81(9): 646-656.

World Health Organization. 2002. *Proposed working definition of an older person in Africa for the MDS Project*. Available: http://www.who.int/healthinfo/survey/ageingdefnolder/en/ (Accessed 12 December 2017).

World Health Organization Regional Office for South- East Asia. 2017. *Elderly population*. Available: http://www.searo.who.int/entity/health_situation_trends/data/chi/elderly-population/en/ (Accessed 12 December 2017).

Xue, B., Head, J. and McMunn, A. 2017. The Associations Between Retirement and Cardiovascular Disease Risk Factors in China: A 20-Year Prospective Study. *American Journal of Epidemiology*, 185 (8): 688-696.

Yoo, S. S., Shim, B.S., Lee, D.H., Lee, H.W. and Yoon, H. 2010. A Correlation between Nocturia and Sleep: A Questionnaire Based Analysis. *Korean Journal of Urology*, 10: 757-762.

Zaichick, V. and Zaichick, S. 2016. Age-Related Changes in Concentration and Histological Distribution of 54 Trace Elements in Nonhyperplastic Prostate of Adults. *International Archives of Urology ad Complications*, 2 (2)

Zhang, Y. and Patrick, J. 2006. Extracting Patient Clinical Profiles from Case Reports (online). *Proceeding of the 2006 Australasian Language Technology Workshop (ALTW2006)*.

APPENDIXES

Appendix A: IREC Reference Number

DUT DURBAN UNIVERSITY OF TECHNOLOGY

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

8 February 2017

IREC Reference Number: **REC 106/16**

Ms C A Schirmer
4 Bridget Road
Gillits
3610

Dear Ms Schirmer

A clinical profile of geriatric patients at a chiropractic teaching clinic in KwaZulu Natal

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the questionnaire has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letters.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Yours Sincerely,

[redacted]

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2017 -02- 08
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

Appendix B: Permission to Use the DUT CDC as a Research Site

MEMORANDUM

To : Prof Ross
Chair : RHDC

Prof Adam
Chair : IREC

From : Dr Charmaine Korporaal
Clinic Director : FoHS Clinic

Date : 01.08.2016

Re : Request for permission to use the Chiropractic Day Clinic for research purposes

---

Permission is hereby granted to :

Ms Carissa Schirmer (Student Number: 21121441)

Research title : "A clinical profile of geriatric patients at a chiropractic teaching clinic in KwaZulu Natal".

It is requested that Ms Schirmer submit a copy of her RHDC / IREC approved proposal to the Clinic Administrators before she starts with her research in order that any special procedures with regards to her research can be implemented prior to the commencement of her seeing patients.

Thank you for your time.

Kind regards

[redacted]

Dr Charmaine Korporaal

Clinic Director : FoHS Clinic

Cc: Mrs Pat van den Berg : Chiropractic Day Clinic
Dr L O'Connor : Research co-ordinator
Dr D Varatharajullu : Research supervisor

Appendix C: Permission to Conduct Research at DUT

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732946
E-mail: moyos@dut.ac.za

24th October 2016

Ms Carissa Schirmer
c/o Department of Chiropractic
Faculty of Health Sciences
Durban University of Technology

Dear Ms Schirmer

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research Committee (IRC) has granted full permission for you to conduct your research "A clinical profile of geriatric patients at a chiropractic teaching clinic in KwaZulu Natal" at the Durban University of Technology.

We would be grateful if a summary of your key research findings can be submitted to the IRC on completion of your studies.

Kindest regards.
Yours sincerely

[redacted]

PROF. S. MOYO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT

Appendix D: New Patient Information Sheet

DUT DURBAN UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CHIROPRACTIC AND SOMATOLOGY

CHIROPRACTIC PROGRAMME

Chiropractic Day Clinic

CONFIDENTIAL PATIENT INFORMATION

Date: _____ Title: _____

Male / Female: _____ Initials: _____

Surname: _____ I.D. number: _____

First name: _____ Marital status: _____

Birthdate: _____ Medical aid: _____

Occupation: _____ M/A number: _____

Med doctor: _____ Last visit: _____

Chiropractor: _____ Last visit: _____

Postal address: _____ Residential address: _____

Tel - work: _____ Tel - home: _____

Cell number: _____

Employer: _____

Employer's address: _____

NB: Please ensure that you supply your Medical Aid No for refund purposes

FINANCIAL INFORMATION

The current fee schedule of the Chiropractic Day Clinic is :

Student (5th Year Students)		Student (6th Year Students)	
Initial visit:	R 130.00	Initial visit:	R 150.00
Subsequent visits	R 90.00	Subsequent visits	R 110.00

All consumables (e.g. needles) : Prices are available on request at the reception desk.

PTO for more information and in order to sign for consent.

Medical Aid schemes pay in varying degrees for coverage of Chiropractic Services. This coverage is therefore medical aid dependant and we request that you check with your medical aid in this respect. **The DUT Chiropractic Day Clinic is contracted out of medical aid**, which means that we run on a **strictly cash only basis**, whereby you are requested to pay cash in advance of services rendered. You will be sent a monthly statement which you must submit to your medical aid for them to refund you directly. This statement will be sent out at the **end of each month.**

Charges are **not** applicable to **research patients**

Medico-Legal Reports:
As the Chiropractic Day Clinic is a teaching facility we are not in a position to generate any reports required for medico-legal purposes, claims that relate to injury on duty (IOD) or workman's compensation

Report of findings:
It is imperative that the student treating you explains fully your diagnosed condition, both as an educational requirement for the student but also, **and more importantly**, such that you are able to make an informed decision about the type of treatment that you wish to receive.

Treatment options:
It is imperative that the student explains all treatment options that are available for you based on the diagnosed condition/(s) that was/were given to you in respect of the above.

Risks/Benefits:
The student must explain to your satisfaction/understanding all risks and benefits in relation to treatment of your reported diagnosis/condition(s).

As a Patient at this, the Chiropractic Day Clinic, I understand that I am attending an educational facility and I give my permission to allow observation, and if necessary the video recording of supervised examination and treatment by Doctors of Chiropractic and Students. In addition I, as the patient note, that information generated through my attendance of the clinic, may be used for research purposes (either through my direct participation in the research or alternatively through data collected in my patient file).

By signing this form I agree that

a) I understand and take full financial responsibility for consultations.
b) I understand that I cannot request records for medico legal reasons.
c) I understand that should I be on medical aid, that my diagnosis and treatment information will be shared for the purposes of medical aid reimbursing me according to that which I am contractually bound in terms of my medical cover (and that only a written request or instruction from myself will be accepted in terms of discontinuing this practice by my health care provider – the Chiropractic Day Clinic).
d) Should I need to be referred that my medical information (pertinent to my condition) will be shared with the doctor / specialist to whom I have been referred.
e) I understand that with my attendance at the Chiropractic Day Clinic, that my medical information will be discussed between the student responsible for my care and the supervising clinician who is responsible for overall oversight of my care.

Date:		**Patient Signature:**	
Parent/legal guardian signature: (in the case of patient's who are under the age of 12 years and those requiring assistance between the ages of 12-18 years)			
Relationship of guardian to the minor:			
Date:		**Student Signature:**	
Date:		**Clinician Signature:**	

By signing this section of the form I agree that (to be completed after you have been assessed and prior to your treatment / referral):

a) The student has discussed with me to my satisfaction, and I fully understand, my / my minor child's diagnosed condition(s) that I have.
b) The student has discussed with me to my satisfaction, and I fully understand all treatment and/or non treatment options and their relative successes and/or failures as applicable to the diagnosed condition(s).
c) I am making an informed decision with regard to, and will submit to / consent to my minor child being submitted to, the treatment protocol as explained.

Based on the above I therefore give consent for the treatment of my named complaint by signing the form hereunder:

Date:		**Patient Signature:**	
Parent/legal guardian signature: (in the case of patient's who are under the age of 12 years and those requiring assistance between the ages of 12-18 years)			
Relationship of guardian to the minor:			
Date:		**Student Signature:**	
Date:		**Clinician Signature:**	

Appendix E: Notice

Dear Patient/s

Please note: A research study titled:

A clinical profile of geriatric patients at a chiropractic teaching clinic in KwaZulu-Natal

is currently being conducted on patient files at the Durban University of Technology Chiropractic Day Clinic over the next month.

Kindly notify the reception should you wish to not have your file included in the study.

If you have any queries,

Please contact:

Carissa Schirmer

076 707 9471

Data Collection Sheet

1. Year of Consultation:	1.1. 2010	1.2. 2011	1.3. 2012	1.4. 2013	1.5. 2014	1.6. 2015
2. Age:						
3. Gender:	3.1. Male	3.2. Female				
4. Marital Status:	4.1. Divorced	4.2. Single	4.3. Married	4.4. Widowed	Other:	
5. Occupation:	5.1. Employed	5.2. Unemployed	5.3. Retired	Other:		
6. Smoker:	6.1. No	6.2. Formerly	6.3. Smoker			
7. Alcohol Use:	7.1. No	7.2. Formerly	7.3. Occasionally	7.4. Often	7.5. Daily	
8. Exercise:	8.1. No	8.2. Occasionally	8.3. Often			
9. Sleep patterns:	9.1. Normal	9.2. Interrupted	9.3. Insomniac			
10. BMI:	10.1. Underweight	10.2. Normal	10.3. Overweight	10.4. Obese		
11. Blood Pressure:						

12. Number of Complaints on initial consultation	12.1. 1	12.2. 2

13. Complaint 1:					
13.1. Head	13.2. Neck	13.3. Mid back	13.4. Low Back	13.5. Shoulder	13.6. Upper Arm
13.7. Elbow	13.8. Forearm	13.9. Wrist	13.10. Hand/ Fingers	13.11. Buttock	13.12. Hip
13.13. Thigh	13.14. Knee	13.15. Lower Leg	13.16. Ankle	13.17. Foot/ Toes	
13.18. Non-musculoskeletal					
Other:					

14. Associated signs and symptoms complaint 1:	14.1. Pain only	14.2. Stiffness only	14.3. Numbness/ tingling only	14.4. Pain and Stiffness
	14.5. Pain and numbness/ tingling	14.6. Stiffness and numbness/ tingling	14.7. Pain, stiffness, and numbness/ tingling	

15. Initial onset of Pain	**Complaint 1:**			
15.1. < 1 week	15.2. 1- 6 weeks	15.3. 6 weeks- 6 months	15.4. 6 months – 1 year	15.5. > 1 year
16. Recent onset of Pain	**Complaint 1:**			
16.1. < 1 week	16.2. 1- 6 weeks	16.3. 6 weeks- 6 months	16.4. 6 months – 1 year	16.5. > 1 year

17. Complaint 2					
17.1. Head	17.2. Neck	17.3. Mid back	17.4. Low Back	17.5. Shoulder	17.6. Upper Arm
17.7. Elbow	17.8. Forearm	17.9. Wrist	17.10. Hand/ Fingers	17.11. Buttock	17.12. Hip
17.13. Thigh	17.14. Knee	17.15. Lower Leg	17.16. Ankle	17.17. Foot/ Toes	
17.18. Non-musculoskeletal					
Other:					

18. Associated signs and symptoms complaint 2:	18.1. Pain only	18.2. Stiffness only	18.3. Numbness/ tingling only	18.4. Pain and Stiffness
	18.5. Pain and numbness/ tingling	18.6. Stiffness and numbness/ tingling	18.7. Pain, stiffness, and numbness/ tingling	

19. Initial onset of Pain	**Complaint 2:**			
19.1. < 1 week	19.2. 1- 6 weeks	19.3. 6 weeks- 6 months	19.4. 6 months – 1 year	19.5. > 1 year
20. Recent onset of Pain	**Complaint 2:**			
20.1. < 1 week	20.2. 1- 6 weeks	20.3. 6 weeks- 6 months	20.4. 6 months – 1 year	20.5. > 1 year

21. Previous screening tests relevant to condition 1:	21.1. CT	21.2. Blood Work	21.3. MRI	21.4. Ultrasound	21.5. X- rays	Other:

22. Previous screening tests relevant to condition 2:	22.1. CT	22.2. Blood Work	22.3. MRI	22.4. Ultrasound	22.5. X-rays	Other:

23. Medication:		

24. Co- Morbidities:				
24.1. Abdominal				
24.2. Cardiac				
24.3. Dermatological				
24.4. Ears				
24.5. Endocrine				
24.6. Genitourinary				
24.7. Haematological				
24.8. Musculoskeletal				
24.9. Neurological				
24.10. Ocular				
24.11. Oncological				
24.12. Psychiatric				
24.13. Respiratory				
24.14. Vascular				
Other:				

25. In House Test:	25.1. Yes	25.2. No

26. If yes, Which in House Test:	26.1. Random Glucose	26.2. Urinalysis

27. Treatment from other specialists:	27.1. Yes	27.2. No

28. Which Specialists:	
28.1. Cardiologist	
28.2. Dermatologist	
28.3. Endocrinologist	
28.4. Gastroenterologist	
28.5. General Practitioner (GP)	
28.6. Nephrologist	
28.7. Neurologist	
28.8. Oncologist	
28.9. Otorhinologist (ENT)	
28.10. Physical Therapist	
28.11. Psychiatrist	
28.12. Rheumatologist	
Other:	

29. Total number of treatments:	

30. Management:	Visit 1	Visit 2	Visit 3	Visit 4	Visits 5 +6:	Visits 7+8:	Visit 9+10:	>11 Visits:
30.1. Assisted Devices								
30.2. Cryotherapy								
30.3. Dry Needling								
30.4. Electro Modalities								
30.5. Extremity Manipulation								
30.6. Heat Therapy								
30.7. Mobilisation								
30.8. Soft Tissue Therapy								
30.9. Spinal Manipulation								
30.10. Stretches								
30.11. No Treatment								
Other:								

31. Referred out:	31.1. Yes	31.2. No

32. Referred for:	Visit 1:	Visit 2:	Visit 3:	Visit 4:	Visits 5+6:	Visits 7+8:	Visit 9+10:	>11 Visits:
32.1. CT								
32.2. Blood Work								
32.3. MRI								
32.4. Outside Specialist								
32.5. Ultrasound								
32.6. X- Rays								
Other:								

33. Education:	Visit 1:	Visit 2:	Visit 3:	Visit 4:	Visits 5+6:	Visits 7+8:	Visit 9+10:	> 11 Visits:
33.1. Cryotherapy								
33.2. Exercise								
33.3. Heat Therapy								
33.4. Nutritional Advice								
33.5. Postural Advice								
33.6. Stretching								
33.7. No Education								
Other:								

Appendix G: Confidentiality Statement and Protocol Agreement

CONFIDENTIALITY STATEMENT AND PROTOCOL AGRREMENT FOR RESEARCH DATA COLLECTION AT THE DURBAN UNIVERSITY OF TECHNOLOGY CHIROPRACTIC DAY CLINIC

1. All information contained in the clinical records that will be used for research purposes will be kept private and confidential by the researcher, and research supervisor. This is especially binding to any information that may identify any of the patients.

2. None of the information shall be communicated to any other individual or organisation other than the research supervisor.

3. The staff and administration of the CDC will not will reveal the identity of the researcher, and research supervisor to any individual or organisation other than the CDC staff directly involved with handling of CDC clinical records.

4. The researcher will assess relevant CDC clinical records during the standard operating hours of the CDC. No clinical record will be removed from the premises whilst data capturing takes place.

5. The information and extrapolation of such to be used will be made public in terms of a dissertation/thesis and/or journal publication, which will in no way identify any of the patients whose clinical records would have been assessed/sampled.

CDC Director:

_____Signature: _____

Researcher's Name:

_____Signature:_____

Supervisor's Name:

_____Signature:_____