

**An investigation into the diagnosis and management of
patients presenting with selected headaches by
chiropractors in the greater Durban area**

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compliance for a Master's Degree in Technology:
Chiropractic**

By

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**I, Stefan Kleingeld, do declare that this dissertation is a representation of my own work in both
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ABSTRACT

Introduction

There is a worldwide need for research into headaches in order to improve and add to the current model of literature to develop more efficient management strategies for headaches. Headaches can present clinically similarly and present a diagnostic challenge. Currently it is not known what the clinical accuracy of headache diagnosis is or which management strategies chiropractors prefer to use in practice to manage certain headaches. The aim of this study was to investigate the diagnosis of certain headaches by chiropractors in the greater Durban area and to determine how certain headaches commonly treated by chiropractors were managed.

Methodology

Based on the quantitative paradigm, this is a descriptive questionnaire based study involving a population of 88 chiropractors practicing in the greater Durban area. The final sample size was 63, a response rate of 72%. The questionnaire was developed specifically for this study and was validated by an expert group and tested by a pilot study to ensure construct and face validity. Data regarding demographic information, diagnostic approach to cervicogenic headache (CEH), intracranial haemorrhage, meningitis, migraine (MEH) and tension type headache (TTH) and management of CEH, TTH and MEH was collected from the sample. SPSS version 22 was used to analyse the data. Descriptive statistics were reported in frequency tables. Continuous variables were compared between independent categories using one way ANOVA tests. Trends were shown in cross tabulations and interpreted descriptively where Chi square tests could not be calculated.

Results

The sample size consisted of 63 chiropractors in the greater Durban area, South-Africa, of which 49.2% (31) were male and 50.8% (32) were female. The mean age was 37 years (range 25 to 71 years). The majority of the sample had between six- to nine years of practice experience, with the majority being in full time practice (82.5% (52)). The majority (92.1% (58)) of the sample had graduated from DUT. Seventeen

point five percent (11) of the sample had additional tertiary qualifications, the most common of which was a Master's degree of Medical Sciences (Sports Medicine), with a total of 19 additional short courses being reported by 79.4% (50) of the sample. Seventy five point one percent (41) of the sample indicated usage of chiropractic specific journals, with 38.1% (24) of the sample indicating that these journals had an impact on the way they manage headaches in practice. Seventy seven point eight percent (49) of the sample attended health related conferences on a regular basis, with 38.1% (24) of the sample indicating that these conferences influenced their management of headaches in practice. Seventeen point five percent (11) of the sample had practiced internationally, with a range of international practice from one month to 12 years. The majority of the sample indicated that they practiced according to a combination of mixer and evidence based philosophy.

The accuracy of diagnostic outcome for meningitis was 98.4% (62), TTH was 47.6% (30), MEH was 82.5% (52), CEH was 82.5% (52) and intracranial haemorrhage was 30.2% (19).

The results for the management of CEH, TTH and MEH indicated that a minimum of 98.6% (62) would adjust a patient with these headaches; the sample predominantly preferred application of specific adjustments to fixated segments in the cervical and thoracic spine. A minimum of 66.7% (42) regarded spinal manipulative therapy (SMT) as the primary focus of treatment across all three headaches. The most commonly selected modality to be used in conjunction with SMT was massage therapy (with a minimum selection frequency of 68.3% (43) across CEH, MEH and TTH). Massage therapy was the most commonly selected modality to be used when SMT is contra-indicated (minimum selection frequency of 61.9% (40) across CEH, MEH and TTH). A minimum of 98.4% (62) of the sample indicated that they would treat MFPTs if associated with headaches, most commonly using dry needling.

For the majority of the sample, the interval of choice for a second appointment was two to three days and the number of treatments expected for relief of symptoms was two to three treatments. Further investigations were considered necessary by the majority of the sample after seven days without any relief of symptoms. The majority of the sample recommended pain free care. Regarding patient advice and

education, there was agreement on postural and ergonomic advice, home stretching, stress management techniques and proprioceptive exercises. If treatment goals were not obtained, the majority of the sample agreed to change the treatment plan, reassess all of the previous findings and if necessary refer the patient to another non-chiropractic health care provider.

Conclusion

Based on the case scenarios used in this study, meningitis, CEH and MEH were accurately diagnosed by the majority of the sample. There appeared to be some confusion with regard to the diagnosis of TTH as nearly half of the sample confused it for CEH. The accuracy with regard to the diagnosis of intracranial haemorrhage was concerning as the minority of the sample correctly diagnosed this condition.

A relatively similar approach was used by chiropractors to treat headaches, with relatively little change in the treatment options between CEH, TTH and MEH. Most of the treatment methods, used by most of the sample, have moderate evidence for efficacy in treatment of musculoskeletal conditions. The management options chosen by the majority of the sample could be of potential benefit for the management of the respective headaches.

Few differences were noted with regard to the impact of demographic information on the diagnostic outcome and management approaches. Some, but not enough, evidence indicates that the older participants provided less accurate diagnoses. The headaches which were less accurately diagnosed possibly due to an age difference were meningitis, TTH and MEH. With regard to management of headaches the only statistically significant differences were noted for the management of TTH for which age appeared to influence the specificity of adjustments used in TTH.

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LIST OF ABBREVIATIONS

AHPCSA	Allied Health Professions Council of South-Africa
CASA	Chiropractic Association of South-Africa
CEH	Cervicogenic headache
CTTH	Chronic tension type headache
CSF	Cerebrospinal fluid
CT	Computed tomography
CVA	Cerebro-vascular accident
EBP	Evidence based practice
ETTH	Episodic tension type headache
ESR	Erythrocyte sedimentation rate
FBC	Full blood count
HIV	Human immune virus
HVLA	High velocity low amplitude
IFC	Interferential current
IASTM	Instrument assisted soft tissue mobilisation
IC	Ischaemic compression
KT	Kinesio tape
LP	Lumbar puncture
MEH	Migraine headache
MFTPs	Myofascial trigger points
MRI	Magnetic resonance imaging
SMT	Spinal manipulative therapy
T.E.N.S	Trans-cutaneous electrical nervous stimulation
TMJ	Temporomandibular joint
TTH	Tension type headache

LIST OF DEFINITIONS

Modalities:

Activator therapy:

A form of instrument assisted manipulation. It is used as a diagnostic and treatment approach to address musculoskeletal conditions. The use of activator therapy could be useful in the management of patients who have contra-indications to HVLA manipulation. The indications for instrument assisted manipulation are generally similar to that of HVLA manipulation (Fuhr and Menke 2005; Spine-health 2014).

Advanced biostructural correction:

Functions on the premise of correcting certain body structures which cannot correct itself in order to maintain a properly aligned biomechanical and healthy body system (Jutkowitz 2002).

Biopuncture:

is a therapy which uses injections of biological products at specific locations of the body, depending on what the condition may be, in order to stimulate the immune system to promote natural healing. Biopuncture uses micro-doses of natural substances to achieve its therapeutic goals (Nye 2015).

Chiropractic geriatrics:

Additional course work for chiropractic care of geriatric patients in order to enhance the profession's capacity to manage the geriatric population more effectively. Clinical experience and additional course work could be necessary post graduation to increase competency of managing geriatric patients (Hawk *et al.* 2010).

Dynamic tape:

An elastic tape used for the management of musculoskeletal conditions. Dynamic tape alters the load distribution of muscles and tendons and can be used to modify movement patterns (www.dynamictape.com 2015).

Graston Technique:

A form of instrument assisted soft tissue mobilisation (IASTM). The exact use of IASTM for direct management of headache is not clear, however indirect management of soft tissue and muscular pathology could provide indirect relief of certain headaches, mostly those with an associated muscular component (Portillo-Soto *et al.* 2014).

Neuro-impulse protocol:

A specific assessment of subluxation with subsequent protocols to adjust the subluxation using an impulse style thrust applied to the overlying skin with the goal of restoring normal brain and spinal cord functioning with subsequent normalisation of any effects which might have manifested as a result of the subluxation. There is no “cracking” of joints or movement of joints in the neuro-impulse protocol (Davies 2012).

Network spinal analysis:

A form of care concerned with wellness and body awareness. It involves gentle and specific tactile stimulation to certain spinal segments which is proposed to induce wellness and normal body functioning via the central nervous system. NSA also involves assessment of the patient’s life style factors as well as advice on life style changes to improve health and wellness. The proposed mechanisms may hold beneficial outcomes for the treatment of headaches; however, high quality randomised clinical trials into the efficacy of NSA are currently lacking (WiseworldSEMINARS 2015).

Total body management:

Functions on the premise that the body's self-regulating healing capacity can be influenced by stimulating specific areas of the body via tactile inputs which subsequently affect the autonomic nervous system. There does not yet appear to be literature related to the specific efficacy of total body management on management of headaches (Millet 2015).

Philosophy of chiropractic:**Evidence based practitioners (EBP):**

Place the emphasis on critically reviewed and quality research based management approaches. EBP regards research as having an important and integral role regarding practice guidelines and the advancement of the profession. EBP show favourable demeanour towards integrative and multidisciplinary health care. An appropriate management option is selected depending on the patients' requirements and the literature to support the management options (Walker *et al.* 2014).

Straight chiropractic philosophy:

Primarily and almost exclusively focuses on the premise that a vertebral subluxation or "bone out of place" causes interference of optimal neural function, the correction of which could restore neural flow which will in turn improve or resolve symptoms of disease. The 'straight' chiropractor almost exclusively uses only SMT as a corrective measure against vertebral subluxations (Seaman and Soltys 2013).

Mixer chiropractic philosophy:

Subscribes to some of the straight philosophy and suggests that the vertebral subluxation is an important but not the only cause of disease which should be addressed. Different treatment approaches and modalities are used to address a patient's

condition. These practitioners consider manipulative therapy as an important but not the only treatment option of value to the patient.

Health care professions:

A Biokineticist:

A biokineticist is concerned with the movement patterns and functionality of a patient and use exercise based rehabilitation as treatment for musculoskeletal based injuries or conditions (BASA 2015).

Homeopathy:

A complementary alternative medicine which uses small dilutions of naturally occurring substances to treat specific conditions. The homeopathic medicine is aimed at stimulating the immune system of a patient to bring about recovery (Dixon 1995).

Massage therapy:

A form of manually applied soft tissue manipulation which is considered to be therapeutic and contributes to health and well-being (North Western Science University 2014).

Physiotherapist:

A physiotherapist assesses and treats musculoskeletal conditions and assists with the rehabilitation of physical impairments and rehabilitation of physical injuries. A physiotherapist uses physical means of treatment intervention as well as modalities depending on what each patient requires (Physiotherapy 2015).

A psychologist:

A psychologist analyses and treats disorders of the mind and behavioural patterns by identifying the reason for mental illness and provides supportive counselling to protect and promote psychological wellbeing (Psychology 2015).

A medical doctor:

Commonly referred to as a general practitioner (GP), a medical doctor is concerned with the management of all pathologies as a primary health care provider. A GP uses allopathic medicine to treat patients (Longmore *et al.* 2010).

A neurologist:

A neurologist is a specialist doctor with advanced education in the management of conditions of the nervous system (DePietro 2013).

CHAPTER 1 : INTRODUCTION

1.1 Introduction

Chapter 1 is an introduction to the research study, the objectives of the study and the problem statement with its relevance as well as the rationale of the study and the description of the format of the thesis.

1.2 Background to the study

A headache can be defined as pain experienced diffusely across various areas of the head. Headaches are a frequent medical complaint and are the most common neurological symptom worldwide (Clinch 2001; Lamont, Alias and Win 2003; Stovner *et al.* 2007). Headaches are known to have a debilitating effect on individuals and can reduce their quality of life. Headaches are amongst the most commonly diagnosed conditions responsible for absenteeism from work (Stovner *et al.* 2007). The burden of headaches on society is still greatly underestimated (Stovner *et al.* 2007). There is a worldwide need for research into headaches in order to improve and add to the current model of literature to develop more efficient management strategies for headaches (Jensen 2008).

Not all headaches can be treated by chiropractors thus the patients that present to chiropractors with such headaches should be referred to the appropriate medical personnel (Lamont, Alias and Win 2003; Kernick 2011). Nevertheless, headaches are amongst the top three reasons for a patient to visit a chiropractor in the USA (Bryans *et al.* 2011). Tension type headache (TTH), Cervicogenic headache (CEH) and Migraine headache (MEH) are amongst the most commonly diagnosed headaches worldwide, and patients with these headaches commonly present to chiropractors in practice (Sjaastad and Bakketeig 2008; Crystal and Robbins 2010; Manack, Buse and Lipton 2011). These headaches are known to cause an impact on an individual's socioeconomic functioning and decrease their quality of life (Crystal and Robbins 2010). There is evidence to suggest that chiropractors can

treat these headaches (Nilsson, Christensen and Hartvigsen 1997; Austin 2002; Haas *et al.* 2004; Harris 2005; van Duijn, van Duijn and Nitsch 2007; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Cathcart *et al.* 2012; Hubbard and Kane 2012; Bendtsen 2013).

However, to differentiate between these and other headaches generally requires good clinical judgement, a thorough evaluation of patient history, accurate interpretation of clinical presentation and physical findings along with apt knowledge about the literature surrounding headaches (Evans and Wheeler 2003; Scott 2011). To accurately diagnose headaches emphasis should be placed on patient history to retrieve the relevant information about the signs and symptoms associated with the headache and to detect any warning signs of potentially life complicating conditions also known as 'red flags' (Scott 2011). Red flags are signs and symptoms indicating the presence of currently life complicating or potentially life threatening organic pathologies (Clinch 2001). Patients with headaches of potentially fatal consequence can present to chiropractors in practice as the patients do not necessarily know if the headache they are suffering from is potentially fatal (Jensen 2003; Lamont, Alias and Win 2003; McGeeney 2009). Thus, patients presenting to chiropractors with red flags should be identified and referred to the appropriate medical personnel (Jensen 2003; Lamont, Alias and Win 2003; Menke 2003; Kernick 2011).

In addition, a specific diagnosis is important to outline what the aetiology of disease is and formulate an appropriate management strategy to best suit the needs of the patient. Different types of headaches can present similarly with discreet differences which often leads to a misdiagnosis and initiation of the incorrect management approach (Vincent and Luna 1999). Misdiagnosis can lead to incorrect treatment which could have no effect or possibly a negative effect on the patient (Evans and Wheeler 2003).

Also, following the correct diagnosis of a headache, treatment strategies and patient management should be based on clinical experience, diagnostic findings and guideline recommendations (Bryans *et al.* 2011). However these guidelines are not absolute and should not be exclusively substituted for clinical and professional expertise (Bryans *et al.* 2011). It is up to the clinician to choose from a variety of

treatment options to best suit the specific needs of the patient. Practitioners may prefer certain treatment methods based on experience and results that they achieve in practice. Currently it is, however, not known which management strategies chiropractors prefer to use in practice for TTH, CEH and MEH (Jensen 2003; Bryans *et al.* 2011).

It can therefore be seen that it is important to stay up to date with developments in practice and compare treatment tendencies (Palmer 2009). In addition, treatment tendencies can be used to support the basis of future clinical trials. Thus the purpose of this study was to determine the diagnostic accuracy of selected headaches and management strategies for TTH, CEH and MEH by chiropractors.

1.3 Research objectives

The aim of this study was to investigate the diagnosis of headaches by chiropractors in the greater Durban area and to determine how headaches commonly treated by chiropractors were managed.

Objectives of this study were:

- To determine the demographic information and professional history of chiropractors in the greater Durban area (age; gender; years in practice; philosophy of chiropractic; postgraduate courses and conferences attended; qualifications obtained, experience practicing outside of South Africa).
- To determine diagnoses and identification of 'red flags' based on case presentations.
- To determine how the sample managed CEH, TTH and MEH (spinal manipulative techniques used; modalities used; patient education and self-management; referral; treatment option for patients with contra-indications to spinal manipulation).
- To compare the above objectives for correlation of data.

1.4 Rationale

- Different interpretations of the patient history can lead to a different diagnosis with a subsequent change in the management approach (Stovner *et al.* 2007; Jensen 2008). This study set out to determine if there is a disagreement of diagnosis among the investigated sample of chiropractors. Any differences noted with regard to the diagnosis could be used to indicate an area of focus for continued professional development of chiropractors.
- The study provided information about the identification of red flags and referral patterns by participants in the sample group based on the identical case scenarios given to each participant. Patients with headaches of potentially dangerous causes could present to a chiropractor, it is therefore essential to detect the red flag signs and symptoms to manage the patient appropriately (Lamont, Alias and Win 2003; Kernick 2011).
- This study investigated any practitioner demographic differences affecting the diagnostic accuracy and management strategies used in practice. The impact of certain demographic differences on management of headaches by chiropractors is currently not clearly defined.
- This study highlighted the correlation of management options between chiropractors and could therefore highlight tendencies to use certain management approaches. Investigations into such tendencies are needed in the field of headache research in order to provide information for future development of headache management (Jensen 2008). Popular management tendencies could be used to support the basis of future clinical trials into headache management and advance the current knowledge regarding chiropractic management of headaches. Currently it is not known which management strategies chiropractors prefer to use in practice for TTH, CEH and MEH (Jensen 2003; Bryans *et al.* 2011).

1.5 Outline of chapters

The title page, acknowledgements, abstract of the study and the index precede Chapter 1.

Chapter 1 contains the introduction to the research, the objectives of the study and the problem statement with its relevance as well as the rationale of the study and the description of the format of the thesis. Chapter 2 is a review of the literature which relates to the study. Chapter 3 is a description of the research design and methodology used to conduct the research. Chapter 4 is a combination of statistical reporting and discussion of the results obtained from the research. Due to the relatively large quantity of statistical information, the results are discussed directly following the statistical reporting for purposes of convenience. Therefore this dissertation consists of five chapters as the results and discussion sections are combined into one chapter. Chapter 5 presents the conclusions drawn from the results obtained as well as the recommendations arising from it. The reference list and appendices follow Chapter 5.

CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

Chapter 2 is an overview of the literature as it pertains to the description, diagnosis and factors that may influence the treatment and management of headaches by chiropractors. Chapter 2 will predominantly focus on CEH, intracranial haemorrhage, meningitis, MEH and TTH. The focus is placed on these headaches because CEH, MEH and TTH are headaches commonly encountered and treated by chiropractors (Austin 2002; Haas *et al.* 2004; Harris 2005; van Duijn, van Duijn and Nitsch 2007; Bogduk and Govind 2009; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012; Kristoffersen *et al.* 2012; Ohlsen 2012; Bendtsen 2013). Intracranial haemorrhage and meningitis represent headaches which should be identified by the chiropractor and referred for appropriate management (McGeeney 2009; Longmore *et al.* 2010; Chew *et al.* 2014; Liebeskind 2014; Loughborough *et al.* 2014; Zueter and Zaiter 2015). For these reasons CEH, intracranial haemorrhage, meningitis, MEH and TTH were used as part of the research questionnaire. The information discussed in chapter Two is an overview of the literature currently available for headaches.

2.2 Description of headache

Headache is a frequent medical complaint and is the most common neurological symptom worldwide (Clinch, 2001; Lamont *et al.*, 2003; Jensen and Stovner, 2008). Headaches are known to have a debilitating effect on an individual and can reduce the quality of life. Headaches are amongst the most commonly diagnosed conditions responsible for absenteeism from work (Stovner *et al.* 2007). Headache is a non-specific symptom and requires a thorough understanding of anatomy and pathology to diagnose and manage appropriately (McGeeney 2009). Headaches can be classified as primary or secondary headaches depending on what the cause of the headache is.

2.2.1 Primary headache

Primary headaches are usually benign and do not pose a life threatening pathogenesis (Colledge *et al.* 2010). Primary headaches are usually referred to as a syndrome, as it may be due to an aggregation of possible physiological or structural dysfunction. Most of the specific causes for primary headaches are not known therefore primary headaches should only be diagnosed if no secondary causes for the headache are present (Gladstein 2006; McGeeney 2009; Wood 2011; Olesen *et al.* 2013). Primary headaches can often be diagnosed based on clinical features without the need for investigations to confirm a diagnosis (Olesen *et al.* 2013). Primary headaches include headaches such as CEH MEH, TTH, cluster headache and trigeminal neuralgia (Wood 2011; Olesen *et al.* 2013). Primary headaches can often present with similar symptoms which requires a thorough history to differentiate the specific type of primary headache (Sjaastad and Bakkevig 2008; Colledge *et al.* 2010). Chiropractors can treat some of the primary headaches. The headaches most commonly reported by literature to have successful treatment from chiropractors include CEH, MEH and TTH (Austin 2002; Haas *et al.* 2004; Harris 2005; van Duijn, van Duijn and Nitsch 2007; Bogduk and Govind 2009; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012; Ohlsen 2012; Bendtsen 2013). Patients with primary headaches such as CEH, MEH and TTH can present to chiropractors therefore it is important to accurately diagnose the headache to ensure appropriate management of the patient.

2.2.2 Secondary headaches

Secondary headaches have specific underlying organic causes, not necessarily confined to the parameters of the cranium or cervical region. The cause could be a potentially life threatening pathogenesis depending on the severity of the underlying organic pathology and its possible complications (Lamont, Alias and Win 2003) Secondary headaches may have an associated risk of comorbidity and possibly mortality (Crystal and Robbins 2010). Therefore it is essential to identify a secondary cause for the headache because no management or a delay in appropriate management can lead to fatal circumstances. Chiropractic management of secondary headaches involves diagnosing or identifying a secondary cause for

the headache and referring the patient for appropriate health care. Therefore the chiropractor's role in the management of secondary headaches is important to ensure that the patient receives appropriate referral. Secondary headaches may be associated with infections, trauma (in particular head trauma), raised intracranial pressure (RICP) and inflammatory disease amongst other causes. It is important to differentiate between primary and secondary causes of headache as the potential impact on the patient as well as the management of the headaches could differ substantially (Colledge *et al.* 2010).

Because chiropractors can treat certain primary headaches, patients can consult a chiropractor when they have a headache (Nilsson, Christensen and Hartvigsen 1997; Austin 2002; Haas *et al.* 2004; Harris 2005; Gallagher 2007; Bogduk and Govind 2009; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012; Ohlsen 2012; Bendtsen 2013). The patient does not necessarily know if the headache they are suffering from is a primary or secondary headache. Therefore a patient with a secondary headache can present to a chiropractor. For this reason it is important for a chiropractor to distinguish between primary and secondary headaches as the subsequent management differs substantially.

2.3 Examples of primary and secondary headaches

Table 1 shows examples of primary and secondary headaches.

Table 1: Primary and secondary headaches

Primary headaches: <ul style="list-style-type: none"> • CEH • Cluster headache • MEH • TTH • Trigeminal neuralgia 	Secondary headaches: <ul style="list-style-type: none"> • Brain abscess • Brain tumour • Cerebrovascular accident (CVA) • Encephalitis • Glaucoma • Hypertension • Influenza • Intracranial haemorrhage • Meningitis • Post-concussive syndrome • Sinusitis • Temporal cell arteritis • Temporo-mandibular joint syndrome (TMJ)
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Sources: Antonaci, Fredriksen and Sjaastad 2001; McGeeney 2009; Colledge *et al.* 2010; Wood 2011; Olesen *et al.* 2013; Zueter and Zaiter 2015

For the purpose of this study the primary headaches that are successfully treated by chiropractors (CEH, MEH and TTH) will be discussed in further detail in this chapter (Haldeman and Dagenais 2001; Nilsson, Christensen and Hartvigsen 1997; Austin 2002; Haas *et al.* 2004; Harris 2005; Gallagher 2007; Bogduk and Govind 2009; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012; Ohlsen 2012; Bendtsen 2013). Chiropractic management of secondary headache involves referring to the appropriate healthcare provider (Gladstein 2006; McGeeney 2009; Wood 2011; Zueter and Zaiter 2015). In this study two secondary headaches (intracranial haemorrhage and meningitis) were chosen to assess the chiropractor's appropriate diagnosis and management of these headaches. These two secondary headaches will be discussed further in depth.

2.3.1 Primary headache – CEH

CEH in modern literature is described as a pressure like pain experienced unilaterally and does not exhibit any throbbing or lancinating pain (Antonaci, Fredriksen and Sjaastad 2001; Bogduk 2009; Olesen *et al.* 2013). CEH is a primary headache because the headache originates from dysfunction of one or more anatomical structures associated with the cervical spine, thus no secondary causes have been identified as an aetiology of CEH (Antonaci, Fredriksen and Sjaastad 2001; Bryans *et al.* 2011; Olesen *et al.* 2013). The associated dysfunction of the related cervical spine structures include abnormal movement of the cervical spine

joints (facet, uncovertebral and intervertebral disc joints) and related posterior cervical muscles which may involve irritation of proximal nerve tissues (Haldeman and Dagenais 2001; Mariano da Silva and Bordini 2006; Bryans *et al.* 2011). Frequent and repetitive abnormal motion of the neck and its related structures can perpetuate and elicit cervical dysfunction leading to possible provocation of the headache; this is especially evident following major or even minor trauma to the neck region (Gallagher 2007). CEH like symptoms could be induced by whiplash injury which is most often close to the onset of whiplash trauma and is often short in duration (Vincent 2010).

2.3.2 Primary headache – TTH

TTH is the most common primary headache disorder globally and can occur across a wide age range from children to the elderly (Bigal and Lipton 2005; Crystal and Robbins 2010). TTH can be classified as episodic (ETTH) or chronic (CTTH) (Mathew 2006; Olesen *et al.* 2013). CTTH presents similarly to ETTH, however the headache episodes are more frequent and can be more debilitating. CTTH develops as a consequence from ETTH (Olesen *et al.* 2013). TTH usually presents with episodes of headache, typically bilateral, pressing or tightening in quality and of mild to moderate intensity, lasting minutes to days (Olesen *et al.* 2013). The pain does not worsen with routine physical activity and is not associated with nausea, but photophobia or phonophobia may be present (Bigal and Lipton 2005; Olesen *et al.* 2013). TTH is a primary headache as no secondary cause has been identified as the cause of TTH. Stress and peri-cranial muscle dysfunction has been identified as contributing factors to the development of TTH (Cathcart *et al.* 2012).

Stress has been found to contribute to the aggravation of pain in TTH. A correlation between stress levels and the intensity of TTH has been shown to exist (Cathcart *et al.* 2012). Thus TTH is activated by stress and emotional challenges. In those with genetic predisposition to TTH a reduction in pain threshold with associated pain in the pericranial muscles can aggregate into CTTH (Chen 2009). The pericranial muscles have been known to become tender in a patient with TTH (Bendtsen and Fernández-de-la-Peñas 2011).

The pain referred from active trigger points from the pericranial muscles can be partly responsible for headache and could therefore lead to typical headache episodes (Bendtsen and Fernández-de-la-Peñas 2011). In addition to stress, it is suggested that the central nervous system becomes sensitised due to consistent nociceptive stimulation from pericranial myofascial tissues thus leading to acute, and over a longer period, chronic TTH (Bendtsen 2013).

2.3.3 Primary headache – MEH

MEH is a relatively frequent headache disorder which could lead to unilateral, pulsating, and moderate to severe cranial pain attacks of four to 72 hours duration. MEH is often aggravated by routine physical activity with possible related aura symptoms (Olesen *et al.* 2013). Because the exact pathophysiology of migraine headaches is not clearly understood and no specific secondary cause for the headache has been identified it is classified as a primary headache. MEH headaches are known to be debilitating and can often lead to depression and anxiety (Samaan *et al.* 2010). MEH can possibly be associated with emotional and dietary trigger factors, hormonal changes, vasoconstriction abnormalities and muscle spasm (Finkel, Yerry and Mann 2013; Harrington *et al.* 2010; Karlı *et al.* 2012).

2.3.4 Secondary headache – intracranial haemorrhage

Intracranial haemorrhage is a secondary headache because the cause of the headache relates to bleeding within and/or around the brain and its associated structures (Cloete and Huang 2014; Liebeskind 2014). Bleeding or haematomas associated with the meninges are referred to as epidural or subdural haematomas. Bleeding into the subarachnoid space is referred to as a subarachnoid haemorrhage and bleeding into brain tissue is referred to as intra-parenchymal haemorrhage (Kumar *et al.* 2007; Colledge *et al.* 2010; Longmore *et al.* 2010; Liebeskind 2014). Intracranial haemorrhages may be secondary to hypertension or other forms of vascular injury (Cloete and Huang 2014). Subarachnoid haemorrhages are mostly associated with vascular aneurysms. Subdural and epidural haematomas are usually associated with head trauma (Kumar *et al.* 2007; Liebeskind 2014). Clinically different forms of intracranial haemorrhage may present remarkably similarly with a

headache, neurological deficit and changes in mental status (Chew *et al.* 2014; Liebeskind 2014). Trauma which can be perceived as “minor trauma” by the patient can lead to the development of intracranial haemorrhage (Liebeskind 2014). Due to the traumatic cause of the headache there might be associated trauma to the cervical spine which might cause the patient to consult a chiropractor. For this reason it is possible for a patient with intracranial haemorrhage to present to a chiropractor in practice. It is therefore essential for the chiropractor to identify a patient presenting with intracranial haemorrhage.

2.3.5 Secondary headache – meningitis

Meningitis is a secondary headache which involves inflammation (most commonly of infective origin) of the leptomeninges as well as the cerebrospinal fluid (CSF) within the sub-arachnoid space (Zueter and Zaiter 2015). Due to the close relation of the meninges to the brain tissue, spread of the infection could occur to involve the brain tissue which is known as meningoencephalitis (Colledge *et al.* 2010). The patient commonly presents with a severe headache, photophobia, altered state of consciousness, signs of meningeal irritation (neck rigidity during active and passive neck flexion) and constitutional signs of infection (fever, malaise, fatigue, increased pulse rate) (Kumar *et al.* 2007; Loughborough *et al.* 2014). A petechial rash may be present and seizures may develop (Kumar *et al.* 2007; Zueter and Zaiter 2015). Because meningitis can cause a headache, a patient with meningitis can present to a chiropractor in practice. The patients do not necessarily know if their headache has a primary or secondary cause; for this reason the chiropractor needs to accurately identify the headache to ensure that the patient will receive appropriate management.

Certain indicators of potentially serious disease (such as those which can present with secondary headaches) can be identified during the history and/or physical examination which can be used to distinguish between primary and secondary causes of headache (Clinch 2001; Lamont, Alias and Win 2003). These indicators are usually referred to as ‘red flags’ (Clinch 2001).

2.4 Red flags associated with headaches

Red flags are signs and symptoms indicating the presence of currently life complicating or potentially life threatening organic pathologies (Clinch 2001). As a health care provider it is an important task to establish whether the headache patient is presenting with is due to a potentially life threatening cause (Lamont, Alias and Win 2003). Potentially life threatening causes for headaches require quick medical response and appropriate management. Those health care professionals who deal with headache management should be able to accurately diagnose a patient's headache and determine if further investigations are necessary. This requires that red flag signs and symptoms should be detected accurately to determine the potential severity of the headache (Clinch 2001).

Examples of red flag signs and symptoms which suggest a secondary and a potentially life threatening cause of headache are shown in Table 2.

Table 2: Red flags associated with headaches

Red flag	Differential diagnosis	Investigation
Onset of a new or unknown headache to the patient after the age of 50	<ul style="list-style-type: none"> • Mass lesion within the cranium • Temporal cell arteritis 	<ul style="list-style-type: none"> • Erythrocyte sedimentation rate(ESR) • Neuroimaging (CT or MRI)
Sudden onset of a headache, especially following trauma	<ul style="list-style-type: none"> • Meningeal haemorrhage • Intracranial haemorrhage • Mass lesion formation • Vascular malformations 	<ul style="list-style-type: none"> • Neuroimaging • Lumbar puncture <p>To be used as initial investigations.</p>
Headache that increases in its intensity, frequency and severity could	<ul style="list-style-type: none"> • Aberrant medication interaction • Subdural hematoma • Mass intra cranial lesion 	<ul style="list-style-type: none"> • Drug screening (if the history suggests mal usage of medication) • Neuroimaging <p>As first line investigation</p>
Signs and symptoms of systemic disease (fever, malaise, lymphadenopathy etc.) associated with a headache	<ul style="list-style-type: none"> • Meningitis • Encephalitis • Autoimmune pathologies • Lyme disease • Variations of systemic infections 	<ul style="list-style-type: none"> • Lumbar puncture • Neuroimaging • Haematological tests
Focal neurological deficit: pupillary responses, paralysis, altered mental status, cranial nerve palsies, motor strength testing, reflex testing and	<ul style="list-style-type: none"> • Intracranial mass lesion • Cerebrovascular accident • Autoimmune pathologies • Vascular malformations 	<ul style="list-style-type: none"> • Neuroimaging • Autoimmune testing

sensation testing etc. associated with a headache		
Headache associated with papilledema	<ul style="list-style-type: none"> • Mass lesions • Meningitis • Psuedotumour cerebri 	<ul style="list-style-type: none"> • Drug screening • Lumbar puncture • Neuroimaging
Headache associated with pain which is particularly aggravated or only present at night (nocturnal pain)	<ul style="list-style-type: none"> • May suggest presence of systemic pathology such as pulmonary infection, cardiovascular disease or malignancies 	<ul style="list-style-type: none"> • Haematological tests • Chest x-ray • Neuroimaging
Headache associated with indications of a depressed immune system as associated with acquired immune deficiency syndrome (AIDS)	<ul style="list-style-type: none"> • Systemic disease 	<ul style="list-style-type: none"> • Investigations into the extent of immune suppression and possible causes of infection should be considered
Headache which becomes progressively worse	<ul style="list-style-type: none"> • Intracranial mass lesion 	<ul style="list-style-type: none"> • Neuroimaging • Haematological tests
Headache associated with signs of meningeal irritation	<ul style="list-style-type: none"> • Intracranial haemorrhage • Meningitis • Encephalitis • Brain abscess 	<ul style="list-style-type: none"> • Neuroimaging • Lumbar puncture
Sources: Clinch 2001; Lamont, Alias and Win 2003; Joubert 2005; Colledge <i>et al.</i> 2010; Longmore <i>et al.</i> 2010		

Red flags can be used to determine the most likely primary diagnosis and formulate a list of differential diagnoses. Primary headaches do not present with potentially life threatening signs and symptoms, thus the presence of red flags can be used to differentiate between primary and secondary headaches (Wood 2011). Signs and symptoms of infection such as a fever, increased pulse rate, lymphadenopathy, malaise and many more indicate that a secondary headache is far more likely than a primary headache (Clinch 2001; Lamont, Alias and Win 2003; Joubert 2005; Colledge *et al.* 2010; Longmore *et al.* 2010).

2.5 Diagnosis, differential diagnosis and investigations for headaches

For an accurate diagnosis of headaches a thorough and specific history and physical examination is essential followed by specific investigations, if necessary (Kernick 2011). When a primary headache is suspected one should first exclude all possible indications for a secondary headache (Antonaci, Fredriksen and Sjaastad 2001; Gladstein 2006; McGeeney 2009; Wood 2011). The physical examination should be thorough with emphasis on systems which are suspected to be involved in causing

the headache (Clinch 2001; McGeeney 2009; Wood 2011). Once the case history and physical examination is completed the clinician can determine the most likely diagnosis based on the clinical findings (Gladstein 2006). The clinical signs and symptoms are used to establish what the most likely primary diagnosis is and what differential diagnoses should be considered (Olesen *et al.* 2013). Based on the primary diagnosis and differential diagnoses suspected, the clinician can use certain investigations to confirm or exclude certain diagnoses.

The diagnosis selected by the clinician at the initial consultation is determined by the presenting clinical signs and symptoms of the patient (Antonaci, Fredriksen and Sjaastad 2001; McGeeney 2009; Wood 2011). Each sign and/or symptom can be indicative of a certain headache or at the very least; it can be specific of a particular category of headaches.

When performing a patient history and physical examination for a headache, there are specific questions of interest to determine the most likely diagnosis. These questions are aimed at gathering specific information regarding the combination of symptoms with which the patient presents to determine the most likely diagnosis and differential diagnoses. Information describing the location of pain, pain character, onset of symptoms, duration of symptoms, frequency of symptoms and the associated features of the headache is used to direct the clinician to an accurate diagnostic approach.

2.5.1 Location of pain

Generalised head pain is described with intracranial haemorrhage and meningitis (Cloete and Huang 2014; Liebeskind 2014; Loughborough *et al.* 2014; Zueter and Zaiter 2015). Intracranial haemorrhage can also present with different variations of head pain depending on the location of the underlying pathology (Chew *et al.* 2014; Liebeskind 2014). Other differential diagnoses to consider for generalised head pain could include headaches such as CVA, encephalitis, hypertension, intracranial haemorrhage, meningitis, and post-concussive syndrome (Lundin *et al.* 2006; Colledge *et al.* 2010; Liman, Siebert and Endres 2010; Souza 2011; Mukerji and Todd 2013; Kanika *et al.* 2015). Other differential diagnoses that can present with

variation of head pain include brain abscesses, brain tumours and intracranial haemorrhage (Greenberg *et al.* 1999; Kumar *et al.* 2007; Alvis-Miranda *et al.* 2013; Mukerji and Todd 2013; Carvalho, Nunes and Santana 2014; Liebeskind 2014).

Unilateral head pain can present with CEH and MEH. Unilateral pain ranging from the occiput to the frontal area is suggestive of CEH or MEH (Samaan *et al.* 2010; Olesen *et al.* 2013). Differential diagnoses to consider for unilateral head pain include cluster headache, TMJ syndrome, temporal cell arteritis and trigeminal neuralgia (May and Goadsby 2001; Wood 2011; Borchers and Gershwin 2012; Leclercq, Thiebaut and Héran 2013; Olesen *et al.* 2013). Unilateral pain confined to the frontal area is suggestive of cluster headache and temporal cell arteritis (Borchers and Gershwin 2012; Naegel, Holle and Obermann 2014). Unilateral pain over the jaw and cheeks is suggestive of TMJ syndrome and trigeminal neuralgia (Gonçalves *et al.* 2010; Leclercq, Thiebaut and Héran 2013; Santana-Mora *et al.* 2013).

Bilateral head pain over the temporal and frontal areas of the head can be a symptom of, MEH (in 30% of MEH patients) and TTH (Chen 2009; Lipton 2011; Chowdhury 2012; Olesen *et al.* 2013).

Post-orbital and peri-orbital pain can occasionally present in MEH. Other differential diagnoses to consider for post-orbital and peri-orbital pain include a cluster headache, temporal cell arteritis, acute glaucoma and sinusitis (Lipton 2011; Quigley 2011; Wood 2011; Borchers and Gershwin 2012; Hickner 2012; Robbins, Grosberg and Lipton 2013).

2.5.2 Pain characteristic

A deep dull aching pain is a symptom of CEH or intracranial haemorrhage, the severity of the pain experienced in an intracranial is usually severe (Antonaci, Fredriksen and Sjaastad 2001; Mariano da Silva and Bordini 2006; Olesen *et al.* 2013; Cloete and Huang 2014; Liebeskind 2014). Other differential diagnoses to consider for deep dull aching pain include CVA brain tumour, glaucoma and post-concussive syndrome (Greenberg *et al.* 1999; Antonaci, Fredriksen and Sjaastad

2001; Lundin *et al.* 2006; Mariano da Silva and Bordini 2006; Colledge *et al.* 2010; Quigley 2011; Jutel and Banister 2013; Olesen *et al.* 2013).

Throbbing and pulsatile pain is a symptom of MEH and meningitis (Colledge *et al.* 2010; Lipton 2011; Olesen *et al.* 2013; Loughborough *et al.* 2014). Other differential diagnoses to consider for throbbing and pulsatile pain include encephalitis, sinusitis, and temporal cell arteritis (Colledge *et al.* 2010; Borchers and Gershwin 2012; Hickner 2012; Olesen *et al.* 2013).

Pressure like pain is usually described by patients suffering from TTH or hypertensive headache (Bigal and Lipton 2005; Chen 2009; Colledge *et al.* 2010; Liman, Siebert and Endres 2010; Olesen *et al.* 2013).

Pain described as “sharp” or “stabbing” can be associated with trigeminal neuralgia. The diagnosis of trigeminal neuralgia is usually made based on clinical signs and symptoms (Longmore *et al.* 2010; Leclercq, Thiebaut and Héran 2013).

2.5.3 Onset of symptoms

Sudden onset of headache (within minutes) is a symptom of intracranial haemorrhage (Liebeskind 2014). Other differential diagnoses to consider for sudden onset of headache include cluster headache, CVA and trigeminal neuralgia (Wood 2011; Leclercq, Thiebaut and Héran 2013; Mukerji and Todd 2013; Olesen *et al.* 2013; Liebeskind 2014; Kanika *et al.* 2015).

Rapid onset of headache (within hours) can be associated with MEH and meningitis. Other differential diagnoses to consider for a rapid onset of headache include encephalitis, glaucoma, and temporal cell arteritis (Colledge *et al.* 2010; Lipton 2011; Quigley 2011; Borchers and Gershwin 2012; Olesen *et al.* 2013; Loughborough *et al.* 2014).

Gradual onset of headache is usually associated with CEH and TTH (Antonaci, Fredriksen and Sjaastad 2001; Gonçalves *et al.* 2010; Olesen *et al.* 2013; Santana-Mora *et al.* 2013). Other differential diagnoses to consider include TMJ syndrome,

and temporal cell arteritis (Antonaci, Fredriksen and Sjaastad 2001; Gonçalves *et al.* 2010; Longmore *et al.* 2010; Borchers and Gershwin 2012; Olesen *et al.* 2013; Santana-Mora *et al.* 2013).

Variable duration of onset is associated with a brain abscess, brain tumour and hypertensive headache (Greenberg *et al.* 1999; Colledge *et al.* 2010; Liman, Siebert and Endres 2010; Longmore *et al.* 2010; Alvis-Miranda *et al.* 2013; Jutel and Banister 2013; Carvalho, Nunes and Santana 2014). These headaches have no definitive rate of onset; they become symptomatic at different rates depending on the patient.

2.5.4 Duration of symptoms

MEH and TTH can present with a short or long duration of symptoms (Bigal and Lipton 2005; Lipton 2011; Olesen *et al.* 2013). Short duration (few minutes to a few hours) of symptoms is usually associated with cluster headaches and trigeminal neuralgia (Longmore *et al.* 2010; Wood 2011; Leclercq, Thiebaut and Hérán 2013).

Long duration of symptoms (hours to days) can be associated with CEH, MEH and TTH (Antonaci, Fredriksen and Sjaastad 2001; Bigal and Lipton 2005; Mariano da Silva and Bordini 2006; Colledge *et al.* 2010; Lipton 2011; Olesen *et al.* 2013). Sinusitis can also present with a long duration of symptoms (Antonaci, Fredriksen and Sjaastad 2001; Bigal and Lipton 2005; Mariano da Silva and Bordini 2006; Longmore *et al.* 2010; Lipton 2011; Hickner 2012; Olesen *et al.* 2013).

Variable duration of symptoms is usually associated with intracranial haemorrhage and meningitis (Colledge *et al.* 2010; Liebeskind 2014; Loughborough *et al.* 2014). Other differential diagnoses to consider include brain abscess, brain tumour, CVA, encephalitis, glaucoma, hypertensive headache, post-concussive syndrome, temporal cell arteritis and TMJ syndrome (Greenberg *et al.* 1999; Lundin *et al.* 2006; Colledge *et al.* 2010; Gonçalves *et al.* 2010; Liman, Siebert and Endres 2010; Longmore *et al.* 2010; Quigley 2011; Borchers and Gershwin 2012; Alvis-Miranda *et al.* 2013; Jutel and Banister 2013; Mukerji and Todd 2013; Liebeskind 2014; Loughborough *et al.* 2014; Kanika *et al.* 2015).

2.5.5 Frequency of the headache

Episodic headache symptoms can be associated with CEH, MEH and TTH (Antonaci, Fredriksen and Sjaastad 2001; Bigal and Lipton 2005; Mariano da Silva and Bordini 2006; Longmore *et al.* 2010; Lipton 2011; Wood 2011; Leclercq, Thiebaut and Héran 2013; Olesen *et al.* 2013). Other differential diagnoses to consider for episodic headache symptoms include cluster headache and trigeminal neuralgia (Wood 2011; Leclercq, Thiebaut and Héran 2013; Olesen *et al.* 2013). The episodic frequency refers to particular patterns of recurrence over a period of time. The differentiating factors between the episodic nature of these headaches are determined as the details of the episodes are explored. Differentiating factors include:

- CEH can occur on a daily basis depending on the provocation of cervical dysfunction (Antonaci, Fredriksen and Sjaastad 2001).
- MEH can present with headache attacks lasting 4 to 72 hours with variable frequency over a yearly basis (Lipton 2011; Olesen *et al.* 2013).
- TTH (At least 10 episodes of headache occurring on 1 to 14 days per month on average for less than 3 months) (Bigal and Lipton 2005; Olesen *et al.* 2013).
- Cluster headache occurs in episodic clusters, several daily attacks for 4-8 weeks followed by absence for 6-12 months. The cluster attacks usually occur at the exact time of the day as every other cluster attack (Olesen *et al.* 2013).
- Trigeminal neuralgia occurs in episodes or attacks triggered by chewing, ingesting cold or hot fluids, shaving the jaw or when a cold draft sensitises face (Longmore *et al.* 2010; Leclercq, Thiebaut and Héran 2013).

Non-episodic headaches refer to those headaches which present with variable frequencies of occurrence. Some of these headaches may present with a constant headache until the underlying aetiology has been managed. These headaches include intracranial haemorrhage and meningitis (Greenberg *et al.* 1999; Colledge *et al.* 2010; Longmore *et al.* 2010; Chew *et al.* 2014; Loughborough *et al.* 2014; Kanika

et al. 2015). Other differential diagnoses to consider for non-episodic headaches include brain abscess, brain tumour, CVA, encephalitis, glaucoma, hypertension, post-concussive syndrome, sinusitis, temporal cell arteritis and TMJ syndrome (Greenberg *et al.* 1999; Lundin *et al.* 2006; Colledge *et al.* 2010; Gonçalves *et al.* 2010; Liman, Siebert and Endres 2010; Longmore *et al.* 2010; Quigley 2011; Borchers and Gershwin 2012; Hickner 2012; Jutel and Banister 2013; Liebeskind 2014; Loughborough *et al.* 2014; Kanika *et al.* 2015).

2.5.6 Associated features

Headaches can present with a variety of associated signs and symptoms. Common associated symptoms include dizziness, fever, fatigue, nausea, vomiting, photophobia, phonophobia, visual changes, motor changes, neck pain and neck stiffness. Many of these symptoms can present along with many headaches. It is not the isolated associated symptom which is of importance when diagnosing a headache but rather the combination of associated symptoms which can be specific of certain headaches. Combinations of associated symptoms that could point to differential diagnoses include:

- CEH can be associated with ipsilateral arm pain, dizziness, phonophobia and photophobia and Nausea (Antonaci, Fredriksen and Sjaastad 2001; Mariano da Silva and Bordini 2006; Olesen *et al.* 2013).
- MEH can present with or without aura symptoms such as photophobia and/or phonophobia, nausea, sensory aura (numbness, tingling and visual changes) and vomiting.
- TTH can be associated with either photophobia or phonophobia and does not present with nausea or vomiting (Bigal and Lipton 2005; Chen 2009; Olesen *et al.* 2013).
- Intracranial haemorrhage can present with associated nausea, projectile vomiting, loss of consciousness and neck pain (Liebeskind 2014).
- Meningitis can present with associated neck stiffness, projectile vomiting, fever and petechial rash (Kumar *et al.* 2007; Colledge *et al.* 2010; Loughborough *et al.* 2014).

Patients presenting with other associated signs and/or symptoms could point to other differential diagnoses.

Weight loss could indicate presence of a brain tumour (Greenberg, 1999 #271). Visual changes could indicate glaucoma (Quigley 2011). Hemiparesis could indicate a CVA (Kanika *et al.* 2015). Sympathetic symptoms such as lacrimation could indicate a cluster headache (May and Goadsby 2001).

2.6 Investigations

Investigations can be utilised by the clinician to confirm the primary diagnosis or exclude certain differential diagnoses (Lamont, Alias and Win 2003; Taylor *et al.* 2012). A patient can present with few or many signs and/or symptoms of a headache; not all of the signs and/or symptoms that are associated with a headache are always present and different headaches can present with similar signs and/or symptoms (McGeeney 2009; Wood 2011; Olesen *et al.* 2013). For this reason the diagnosis of headaches is challenging. In addition to possible similarities in presentation of headaches, the symptoms described by the patient can be ambiguous or biased due to subjective description of symptoms and the interpretation of the symptoms described by the patient can be misinterpreted by the clinician. If the history does not suggest the presence of structural disease or an apparent secondary cause, and the neurological examination is normal, it is unlikely that a serious cause for the headache is present (Gladstein 2006; Wood 2011).

2.6.1 Investigations for CEH

CEH is predominantly a clinical diagnosis. Diagnostic investigations for CEH are controversial, and for the most part only exclude the possibility of the presence of other disease. In some cases cervical nerve blocks may be used to determine if the pain origin is of cervical spine origin (Vincent and Luna 1999; Mariano da Silva and Bordini 2006). Controversy exists when it comes to CEH diagnosis due to differences of professional opinions (Bogduk and Govind 2009; Chaibi and Russell 2012).

2.6.2 Investigations for MEH

MEH is a clinical diagnosis; further investigations are primarily used to exclude any other differential diagnoses or comorbidities (Olesen *et al.* 2013). For medical management of MEH investigations may be used to detect contraindications for certain treatments or to evaluate the efficacy of drugs used to treat MEH (Longmore *et al.* 2010; Lipton 2011; Olesen *et al.* 2013).

2.6.3 Investigations for TTH

Accurate diagnosis of TTH is challenging. Usually it is a diagnosis of exclusion as many of the TTH symptoms are similar to other headaches, thus investigations may be used to confirm the absence of secondary causes (Bigal and Lipton 2005; Olesen *et al.* 2013). Investigations are not usually ordered for TTH; however when the clinical presentation leaves the clinician with doubt further investigations could aid with clarification of the diagnosis. These investigations would depend on the symptoms presented by each patient and the differential diagnoses considered (Vincent 2010; Chowdhury 2012).

2.6.4 Investigations for intracranial haemorrhage

Neuroimaging such as CT and MRI are required to diagnose intracranial haemorrhage (Longmore *et al.* 2010; Chew *et al.* 2014; Liebeskind 2014). For intracranial haemorrhage CT is the examination of choice for an epidural haematoma (Chew *et al.* 2014; Liebeskind 2014). MRI may be used especially if a subdural or intra-parenchymal haemorrhage is suspected (Longmore *et al.* 2010; Chew *et al.* 2014; Liebeskind 2014). Lumbar puncture (LP) is contra indicated especially if focal neurological signs and/or symptoms are present. If a CT is performed and contraindications are excluded a LP may be useful to examine the CSF constituents for abnormalities consistent with intracranial bleeding. Coagulation profile may be used if suspicion of altered blood coagulation dynamics is suspected. Altered coagulation dynamics contra-indicates a LP due to an increased risk of persistent bleeding. Plain film skull x-ray is important for detecting skull fractures; if a skull fracture is present the possibility of a subdural haematoma is more likely, although

plain film radiography cannot confirm any intracranial haemorrhage. Plain film x-rays of the cervical spine are often required to detect concomitant cervical spine fractures or instability which could have occurred due to the initial trauma force (Ackland and Cameron 2012; Liebeskind 2014). Haematological testing such as a full blood count could be useful to determine if general indicators of infection are present and to assess the haematocrit level which could have been affected by blood loss associated with trauma or systemic disease processes (Kumar *et al.* 2007; Longmore *et al.* 2010; Chew *et al.* 2014; Liebeskind 2014).

2.6.5 Investigations for meningitis

When meningitis is suspected a LP with analysis of CSF is necessary for confirmation. If contraindications for a LP are present it is advised to perform a CT before a LP to exclude indications of mass lesions or raised intracranial pressure (RICP) (Colledge *et al.* 2010; Loughborough *et al.* 2014). If a LP is contra-indicated investigations of use for diagnosis and management of meningitis include the following:

- Haematology to assess the white blood cell count and coagulation profile to determine the extent of systemic involvement of meningitis. A blood culture may be useful to detect causative organisms involved with meningitis (Colledge *et al.* 2010; Longmore *et al.* 2010).
- Urinalysis to assess urea and electrolytes levels as these levels can become unbalanced during the infective stage (Longmore *et al.* 2010).
- LFT is used to detect if there is any damage to the liver associated with meningitis (Longmore *et al.* 2010).
- Glucose metabolism is a standard procedure to monitor the metabolic dynamics as it can become altered due to systemic involvement of meningitis (Colledge *et al.* 2010).
- Chest x-ray for signs of TB is a standard procedure when meningitis is suspected, especially in areas where TB is epidemic (Longmore *et al.* 2010).

2.6.6 Investigations for other differential diagnoses

Neuroimaging can be used to diagnose a brain abscess, brain tumour, CVA and sinusitis (Greenberg *et al.* 1999; Colledge *et al.* 2010; Chew *et al.* 2014; Colledge *et al.* 2010; Chew *et al.* 2014).

Haematological tests can be used to detect general signs of infection which can be associated with sinusitis and temporal cell arteritis (Hickner 2012). A raised ESR level associated with the signs and symptoms of temporal cell arteritis is highly indicative thereof (Longmore *et al.* 2010; Borchers and Gershwin 2012).

Tonometry can be used to measure intra-ocular pressure and determine if glaucoma is present (Longmore *et al.* 2010; Quigley 2011).

Cluster headache, TMJ syndrome and trigeminal neuralgia can be diagnosed clinically; investigations can be used to exclude any secondary causes for the headache if the clinician is in any doubt (Gonçalves *et al.* 2010; Longmore *et al.* 2010; Leclercq, Thiebaut and Hérán 2013; Naegel, Holle and Obermann 2014).

When a chiropractor has successfully diagnosed a headache they can then draw on clinical experience and knowledge to develop the most appropriate management strategy for the relevant headache.

2.7 Chiropractic role in headache treatment

Chiropractic makes use of HVLA thrusts applied to a joint or joint complex in an attempt to alter mechanical stresses thought to contribute to symptoms experienced by the patient as well as eliciting a possible neurological feedback response (Evans and Wheeler 2003). Chiropractors have a wide scope of practice to approach musculoskeletal disorders, however the main focus and primary form of intervention of a chiropractor according to the philosophy and origin of chiropractic is the use of manipulative therapy (Gallagher 2007). Over the years however, as the profession continually developed, the use of ancillary (auxiliary therapeutic modalities) procedures such as soft tissue therapy and exercise based prescriptions have

increased as adjunctive treatment options to manipulative therapy (Clijsters, Fronzoni and Jenkins 2014). Chiropractors may use these treatment options and decide which would be most applicable for certain conditions.

Treatment methods are proposed to influence the headache directly, indirectly (by addressing the related musculoskeletal dysfunction associated with the headache) or as a means of pain control (Harris 2005; Gallagher 2007; van Duijn, van Duijn and Nitsch 2007; Bogduk 2009; Bryans *et al.* 2011; Cathcart *et al.* 2012; Hubbard and Kane 2012; Ohlsen 2012; Bendtsen 2013). Not all headaches can be treated by chiropractors, however the chiropractor should be able to diagnose the headache and refer the patient as necessary (Lamont, Alias and Win 2003; Kernick 2011).

Prior to treatment the chiropractor needs to assess if any contra-indications to treatment are present. SMT may hold rare but possibly serious risks of complications which may include CVA and/or vertebrobasilar artery dissection (Plastaras *et al.* 2013). There is a lack of specific or confirmatory evidence to suggest a causal relationship between SMT and CVA. In the presence of underlying disease (such as arterial disease or connective tissue weakness) a plausible link may be established between SMT and CVA as a possible physical trigger factor (Tuchin 2013). It is therefore important to evaluate possible contra-indications to SMT prior to its application as to avoid the risk of complications. Even though it is documented to be extremely rare, the complications have serious consequences. Some indicators of possible risk factors for complications from SMT include a history of cardiovascular disease, previous CVA, blood clotting disorders, use of oral contraceptives, long term use of corticosteroids, drop attacks, dizziness or vertigo associated with head positioning or other neurological deficits which could be attributed to vascular pathology (Barker *et al.* 2001).

Referral of patients with conditions which present to a chiropractor which fall outside the scope of practice of a chiropractor or are better suited for management by another health care provider is an important part of overall patient management.

Patients have the right to choose which health care provider they would prefer to be examined and treated by. The patient has the initial responsibility to determine which

health care provider would suit them best, however it is then the responsibility of the health care provider to examine the patient and determine if they can manage them, or if the patient requires referral of the primary presenting complaint to another health care provider, or if co-management of the condition would be required for the best outcome (Holdsworth, Webster and McFadyen 2008).

Headaches with great intensity of symptoms may benefit from referral for co-management of symptoms with medication. Different health care professions each have their own area of expertise or specialist fields. Some headaches such as CEH and TTH may benefit from using exercise as an adjunctive therapy to manipulation to increase recovery outcomes, the practitioners involved with the patient care may choose to instruct the patient themselves, if it is part of their scope of practice, or they may choose to refer the patient to a health care provider which specialises in, or is perhaps more experienced in, exercise protocols (Roecker *et al.* 2013). Co-management of a CEH, TTH and MEH can include a chiropractor, physiotherapist, biokineticist, homeopath, general practitioner, psychologist, neurologist or massage therapist. It is up to the chiropractor (if seen as the initial practitioner) to decide if co-management is necessary and to which health care provider/s the patient needs to be referred to for co-management (Dixon 1995; Longmore *et al.* 2010; DePietro 2013; North Western Science University 2014; BASA 2015).

The following section describes frequently used treatment options used in practice to address musculoskeletal disorders which may be associated with headaches.

2.8 Treatment options for chiropractors to treat headaches

2.8.1 Cervical traction

Cervical traction as an adjunctive treatment to normal physical therapies has previously proved to hold potential benefits for increasing cervical spine mobility as well as reducing pain and disability perception in patients with mechanical neck pain (Bid *et al.* 2014). Certain headaches such as CEH may be associated with dysfunction of the structures related to the cervical spine (Gallagher 2007). Management of these structures may therefore provide potential benefit for patients

with certain headaches. Cervical traction may be used to increase neck stabilisation, reduce pain perception via stimulation of mechanoreceptors and decrease intervertebral disc pressure (Jellad *et al.* 2009).

2.8.2 Contrast therapy

Contrast therapy is the alternating application of cold and heat to facilitate a therapeutic process. There is evidence which suggests that contrast therapy is more effective than passive recovery in the treatment of muscular pathology (Bieuzen, Bleakley and Costello 2013). The beneficial effects are mostly related to reducing muscular pain as well as improved muscular function as a result of loss of muscle strength and power following exercise. The extent of effectiveness appears to be clinically significant however could possibly be most effective in the sports athlete. Even though some forms of contrast therapy such as contrast water immersion has been proved to be more effective than passive rest, little difference has been noticed when compared to other interventions such as cold or heat alone or compression and muscular stretching (Hing *et al.* 2008; Bieuzen, Bleakley and Costello 2013). Contrast therapy can be used as a treatment option to address muscular dysfunction or inflammation of soft tissue structures which can be associated with certain headaches such as CEH and TTH (Haas *et al.* 2004; Gallagher 2007; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012).

2.8.3 Cryotherapy

Cryotherapy involves the use of ice or frozen gel pack application or cold-water immersion, massage with the use of ice or any locally applied reduction in temperature for purposes of changing a physiological process to facilitate a therapeutic response (Bleakley *et al.* 2012).

Studies that have investigated cryotherapy state that the most significant therapeutic effect may be due to the relative suppression of the local inflammatory response which aids in reducing local metabolism as well as causing local vasoconstriction which in turn reduces the amount of exudation or transudation of plasma. Thus,

cryotherapy seems to be helpful following local inflammatory responses and for recovery from physical exercise (Hing *et al.* 2008) and can be used as a treatment option to address muscular dysfunction or inflammation of soft tissue structures if associated with certain headaches such as CEH and TTH (Haas *et al.* 2004; Gallagher 2007; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012).

2.8.4 Electromodalities

Interferential current (IFC) is a medium frequency alternating current (mostly 4000 HZ amplitude) which is modulated over low range frequencies usually between above zero and 250 Hz. IFC is applied to the body using adhesive electrode pads. The proposed advantage of using low frequencies as opposed to high frequencies springs from the ability of low frequency current to bypass the impedance offered by cutaneous tissues. The analgesic outcomes of IFC stems from theoretical mechanisms such as the physiological gate control theory as well as local circulatory stimulation and temporary neural conduction blockage (Johnson and Tabasam 2003).

The use of IFC on individuals with neck pain can decrease the resting tension in the trapezius muscle as well as during activity such as sitting and typing on a computer. The reduction in tension was noted on both the dominant and non-dominant side of the body. The relaxation gains appeared to have a greater effect accumulatively when compared to the immediate effect of IFC. A duration of 30 minutes appeared to be the required duration for therapeutic outcomes. Latent effects of IFC include increased localised circulation which could lead to a reduction in muscular lactic acid aggregation (Silva *et al.* 2011). IFC can therefore potentially be used to address trapezius muscle MFTPs associated with CEH.

IFC, which is non-invasive and relatively inexpensive, has been shown to be relatively effective in individuals with neck and facial pain with minimal side effects, (Silva *et al.* 2011; Soomro *et al.* 2012). Thus IFC may be used to address some musculoskeletal disorders which could be used to treat headaches with associated muscular tonicity such as TTH and CEH.

Trans-cutaneous electrical nervous stimulation (T.E.N.S) is a small hand held device which uses a similar mechanism of action to IFC; however, the depth of penetration into the body is more superficial than that of IFC. T.E.N.S may be effective to provide symptomatic relief of neurological and muscular pain. Some evidence also supports the use of T.E.N.S for the stimulation of acupuncture points which is used by some practitioners to treat generalised headache symptoms (Yoshimizu *et al.* 2012). T.E.N.S may also be used for muscular relaxation provided that a sufficient time of exposure is used (Monaco *et al.* 2012). The application of T.E.N.S for muscular related pain, such as those associated with CEH and TTH, may be used as a treatment for pain control.

2.8.5 Dry needling and myofascial trigger points (MFTP)s

Dry needling is primarily used as a modality to treat myofascial trigger points (MFTP)s. MFTP)s are muscular dysfunctions which can either be classified as latent or active. Latent MFTP)s can produce a loss of range of motion around a joint complex which the muscle crosses, increased muscular stiffness and pain on palpation of the involved area. Latent MFTP)s are more common than active MFTP)s. Active MFTP)s have the same effects as latent MFTP)s except that active MFTP)s may produce spontaneous pain in a pain referral pattern specific to the MFTP involved. MFTP)s can cause pain ranging from agonising and sometimes incapacitating pain (as seen in some cases of active MFTP)s) to painless restriction of motion and aberration in posture due to latent MFTP)s.

MFTP)s can be an overlooked cause of myofascial headache. MFTP)s form part of nearly everyone's life at some point and could be a large contributor to lost time and workers' compensation applications in the industrial world. Numerous ways of treating MFTP)s have been explored ranging from different types of muscle stretches, post-isometric relaxation techniques, ischaemic muscular compression, massage therapy, heat therapy, ultrasound, electro-modalities, drug therapy, injection techniques etc. (Simons *et al.* 1999). Manual type therapies such as SMT and some physiological treatment modalities have acceptable evidence to support treatment of MFTP)s (Vernon and Schneider 2009).

Dry needling involves the insertion of small solid needles into the muscle (via the overlying tissues) at the exact point where the MFTP is suspected to be present. Dry needling is considered an effective, time friendly and relatively inexpensive treatment for MFTP (Rayegani *et al.* 2014). The purpose of dry needling is to induce a localised physiological response, both vascular and neurological, with possible psychological effects, to decrease the pain associated MFTP's and resolve the MFTP (Vernon *et al.* 2009; Cagnie *et al.* 2013). Dry needling can therefore be used to treat MFTPs associated with headaches which have a muscular involvement such as CEH and TTH (Haas *et al.* 2004; Gallagher 2007; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012).

Dry needling is different to acupuncture, a misconception could occur as the instrument and application is similar however the principle or proposed mechanism of action is different. Acupuncture also utilises the insertion of a needle (similar to the needle used in dry needling) into the body via the skin, but are aimed at targeting specific points on the body which are suggested to elicit specific therapeutic effects due to the influence of change in meridian channels believed to exist within the human body.

2.8.6 Exercise

Exercise is considered to be part of a healthy lifestyle which promotes the prevention of certain diseases such as diabetes, cardiovascular disease, certain pulmonary diseases, obesity, muscular and joint diseases and some psychological conditions. Regular exercise can be seen as a therapeutic intervention (Vina *et al.* 2012). The benefits of exercise can be evident in both healthy individuals as well as those with established pathologies.

The use of exercise conditioning as an adjunctive therapy to manipulative therapy could promote and improve clinical outcomes and possibly prevent or reduce recurrence of non-specific back pain. The volume, intensity, frequency and contraindications of exercise need to be appropriately monitored (Roecker *et al.*

2013). Different types of exercise can be administered based on the lifestyle factors and/or condition the patient presents with. Exercise can be used to control comorbidities in a patient which might require a multi factorial intervention, for example resistance training could be used to control diabetes or aid immune function (Hamilton *et al.* 2008).

Postural correction, strength training and proprioceptive exercises may be effective in reducing pain, extent of disability and improve muscular strength and proprioception. Sustained or prolonged neck flexion as associated with poor postural habits and work ergonomics may cause the neck flexors to shorten and the neck extensors to lengthen causing muscular fatigue and pain. This could lead to muscular dysfunction and perpetuation of certain headaches such as CEH (Gallagher 2007; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011). By strengthening the extensor muscles in subjects with subclinical neck pain relief of the neck pain may be experienced. Addressing dysfunction associated with neck pain may impact headaches such as CEH and MEH (Anu, Aparna and Anand 2014; Harris 2005; Bryans *et al.* 2011).

A variety of exercises may benefit patients which have mechanical or non-specific neck pain. The evidence becomes stronger (although more research is still required) and more effective when exercise is combined with other therapeutic interventions such as cervical spine manipulation or mobilisation. A sustained reduction in neck disability was observed for a patient with chronic neck pain after participating in a multidisciplinary intervention that combined physical therapy and stress management approaches to facilitate muscle relaxation in the workplace (Bruflat *et al.* 2012). The effective use of exercise therapy combined with cervical spine manipulation or mobilisation for chronic neck pain could hold reason for using exercise based treatment in patients with CEH and possibly TTH if similar neck pain or dysfunction is present.

2.8.7 Instrument assisted soft tissue mobilisation

Instrument assisted soft tissue mobilisation (IASTM) is an auxiliary therapeutic technique used to alter soft tissue structures that have undergone certain

physiological changes due to the accumulation of granulation tissue and alteration of fascia orientation. The general mechanism of action mostly indicates an increase in skin temperature due to an increase in blood flow to the area, also known as active hyperaemia or erythema. The active hyperaemia increases the nutrient and oxygen delivery to the localised tissue of application (Portillo-Soto *et al.* 2014). The mechanical effect of IASTM also promotes excess granulation tissue breakdown which promotes tissue mobility and flexibility (Portillo-Soto *et al.* 2014). IASTM could be used to address muscular dysfunction associated with certain headaches such as CEH and TTH, especially if an excess of granulation tissue is associated with the associated soft tissues of the head and neck (Haas *et al.* 2004; Gallagher 2007; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012). IASTM can possibly be of particular benefit if muscular fibrosis is present (Portillo-Soto *et al.* 2014).

2.8.8 Ischaemic compression (IC)

IC is an intervention shown to be safe and can be beneficial in the treatment of MFTP. IC involves physical pressure applied to a muscle to treat MFTPs. IC is a treatment method which does not require specific equipment; the practitioner can apply pressure by the use of his/her hand (Hains 2002). IC is generally well tolerated by patients. Isolated IC to an active upper trapezius muscle trigger point proved to be beneficial in patients with non-specific neck pain (Hains 2002). Non-specific neck pain or dysfunction may be associated with some headaches such as CEH and TTH, therefore IC can be used as a treatment intervention for CEH and TTH (Haas *et al.* 2004; Gallagher 2007; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012; Olesen *et al.* 2013).

2.8.9 Kinesiotape

Kinesiotape (KT) could possibly have a beneficial effect on muscular strength, active range of motion around an injured area and force sense error. KT is proposed to have beneficial effects in the treatment of muscular imbalances and prevention of musculoskeletal pathology (Lumbroso *et al.* 2014). No substantial effects of KT are

documented in literature for the reduction of musculoskeletal related pain or muscular activity (Csapo and Alegre 2014; Parreira *et al.* 2014). The proposed use of KT for headaches would pertain to the offload of overused muscles, increase active range of motion around injured areas and correct certain postural habits associated with certain headaches which are associated with dysfunction of the cervical spine such as CEH (Gallagher 2007; Bryans *et al.*; Austin 2002; van Duijn, van Duijn and Nitsch 2007; Bogduk and Govind 2009).

2.8.10 Laser

Laser with low-intensity irradiation may have moderate benefits for musculoskeletal pain. Modest functional improvements as well as decreased subjective pain levels have been noted with the use of laser for musculoskeletal related conditions. There seems to be some credibility for the treatment of musculoskeletal pain with laser (Basford, Sheffield and Harmsen 1999).

Other evidence suggests that laser treatment for musculoskeletal conditions or laser as a form of laser acupuncture is significantly robust. Reportedly some studies which delivered negative results could have been due to limited evaluation criteria and the patient outcome wasn't followed up to a sufficient time point. For specific clinical guidelines to be developed with sufficient rigour more high quality research is necessary (Law *et al.* 2015).

Laser therapy could be used to treat musculoskeletal pain associated with headaches that have a musculoskeletal association such as CEH and TTH (Haas *et al.* 2004; Gallagher 2007; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012; Olesen *et al.* 2013).

2.8.11 Massage

Massage can increase attentiveness and improve immune function (in terms of increasing natural killer cell activity). Massage has been postulated to reduce pain in different syndromes such as fibromyalgia, rheumatoid arthritis and depression (Field 2014). Moderate pressure massage has increased weight gain in preterm infants,

and reduced pain. Massage may have a relaxation element, representations of the amygdala, hypothalamus as well as the anterior cingulate cortex (all of which are involved in stress and emotional regulation) have been shown to increase activity on functional MRI during moderate pressure massage (Field 2014). Therefore massage therapy for certain headaches (such as those associated with stress, in particular TTH) may be beneficial (Crystal and Robbins 2010; Field 2014).

2.8.12 Manipulative therapy

Studies have shown evidence of the beneficial effects of HVLA SMT for cervical spine dysfunction (Kolberg *et al.* 2010). There is evidence which suggests that HVLA is effective in reducing tenderness in the sub-occipital muscles in asymptomatic individuals (Hamilton, Boswell and Fryer 2007). This suggests that HVLA SMT may have an impact in the treatment of TTH as TTH commonly presents with sub-occipital muscle tenderness (Bigal and Lipton 2005).

Experimental research suggests that the impulse of a spinal manipulation may have an impact on proprioceptive primary afferent neurons located in the para-spinal tissue structures. Processing of pain may also be affected following SMT due to alteration in the central facilitated state of the spinal cord (Pickar 2002). This experimental research could serve to support the use of SMT for pain control and improved functional activity for headaches associated with cervical dysfunction such as CEH (Pickar 2002; Haas *et al.* 2004; Gallagher 2007; Bogduk and Govind 2009; Bryans *et al.* 2011). There is research which suggests that non-drug therapy such as SMT may be effective for the prophylactic treatment of MEH (Chaibi, Tuchin and Russell 2011).

There is a greater probability for joint gapping and/or cavitation to occur bilaterally as opposed to unilaterally during the application of a HVLA thrust in the cervical spine. The specificity or accuracy of applying SMT exclusively unilaterally might not always be possible (Dunning *et al.* 2013).

2.8.13 Mobilisation

Joint mobilisation is a process of passively moving the joint complex through its normal range of motion at low amplitudes. Cervical spine mobilisation can be used for cervical spine pain in similar scenarios to those of SMT (Gross *et al.* 2010). Mobilisation is effective in the short term treatment goals when compared to placebo and general practitioner care (Bronfort *et al.* 2001). Joint mobilisation may be used to treat decreased range of motion as associated with cervical spine dysfunction and muscular pain (Bronfort *et al.* 2001; Gross *et al.* 2010). The use of cervical spine mobilisation can therefore be used to indirectly treat associated muscular and joint components associated with CEH and TTH (Gallagher 2007; Olesen *et al.* 2013) (Haas *et al.* 2004; Crystal and Robbins 2010; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012).

2.8.14 Instrument assisted manipulation devices

Joint manipulation can be performed with mechanically assisted devices which use repetitive multiple impulse mechanical excitations via the utilisation of an impulsive adjusting instrument. This can elicit an increase in spine motion when applied to specific spinal segments. These devices can be calibrated to deliver specific forces to joint complexes (Colloca *et al.* 2000).

In addition to being applied to joint complexes for joint mobilisation, some evidence suggests that mechanically assisted manipulation devices may also provide benefits in the treatment of upper trapezius muscle MFTP in terms of reducing pain in patients with sub-acute non-specific neck pain, which may or may not be associated with headache (Simons *et al.* 1999; Dommerholt and Simons 2008). MFTPs associated with headaches such as CEH and TTH can be treated using instrument assisted manipulation devices. Cervical spine dysfunction associated with joint hypomobility can be treated with this modality so can be used as a treatment option for associated cervical spine dysfunction related to CEH (Simons *et al.* 1999; Austin 2002; Gallagher 2007; van Duijn, van Duijn and Nitsch 2007; Dommerholt and Simons 2008; Bogduk and Govind 2009).

2.8.15 Non-steroidal anti-inflammatory drugs (NSAIDS)

Both topical and oral NSAIDS are similarly effective for pain relief in subjects with musculoskeletal disorders such as osteoarthritis (OA). NSAIDS delivered a greater benefit than placebo treatment for pain relief in OA. Adverse effects of NSAIDS have been noted, particularly gastric side effects; these are mostly mild in nature but should be monitored. NSAIDS can be used for symptomatic relief of some headaches depending on the severity of the headache. Patients with CEH, TTH, MEH amongst other headaches may experience some relief (McVeigh 2013). Prescription of NSAIDS does not fall within the scope of chiropractic, although a chiropractor may advise patients to consider the use of NSAIDS provided that the patient is informed to consult a qualified physician on their use for their condition.

2.8.16 Strapping

Supportive strapping is mostly used in the context of neck pain or headache to support the upper extremities possibly to reduce tension on the upper trapezius muscle; it's an application for improving functionality rather than a direct treatment for headaches. However, research is sparse on its efficacy with only a few pilot studies or case reports so supportive strapping for headache cannot be rationalised as a direct treatment, but rather as an indirect aid related to other symptoms (Ancliffe 1992; Babu, John and Unni 2008). One case report indicated the unconventional use of strapping for temporo-mandibular joint syndrome (a possible differential diagnosis for headache) which aided with pain relief and functionality (Ancliffe 1992; Babu, John and Unni 2008).

2.8.17 Stretching

Skeletal muscle can conform to chronic mechanical stretch via the serial deposition of new contractile units known as sarcomere units, a process known as sarcomerogenesis. A computational realisation indicated that during acute stretch an increase sarcomere length of up to 14% can occur. Over a chronic duration the computational model predicts that a gradual return to original contractile length would be expected within two weeks with a model error of 2.13%. The model did not

extrapolate parameters for the best stretch increments, the duration or amplitude of the stretch. Further research is required; however the evidence is a positive prospect for tendonopathy or muscular retractions (Zöllner *et al.* 2012). These changes in the muscular system may be of benefit to address cervical dysfunction associated with certain headaches such as TTH and CEH (Bryans *et al.* 2011).

2.8.18 Ultrasound

Therapeutic ultrasound makes use of ultrasound waves ranging from low to high intensities depending on the indication for its use (ter Haar 2007). Therapeutic ultrasound has progressed since its early days of development and is now far more advanced with specifically designed transducer and computer technologies which could prove to be effective in the management of musculoskeletal and soft tissue injuries. Musculoskeletal and soft tissue injuries associated with the structures of the cervical spine could lead to the development of CEH (Haas *et al.* 2004; Gallagher 2007; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Cathcart *et al.* 2012; Olesen *et al.* 2013). Ultrasound can be used as a treatment option for musculoskeletal associations of CEH and possibly TTH (Mason 2011).

All of the above treatment options form part of a chiropractor's scope of practice either learned from the institution of chiropractic qualification or as part of additional short courses. These treatment options may be used in isolation or in combinations to treat headaches. It is up to the chiropractor to decide what he/she deems most appropriate for each individual case. Based on the treatment options available to chiropractors and the headaches most commonly treated by chiropractors, CEH and TTH can be treated by chiropractors (Mariano da Silva and Bordini 2006; Gallagher 2007; Bogduk and Govind 2009; Chaibi and Russell 2012; Bryans *et al.* 2011; Austin 2002; Haas *et al.* 2004; Chen 2009; Cathcart *et al.* 2012; Ohlsen 2012; Bendtsen 2013). There is low to moderate evidence which suggests that MEH can be treated by chiropractors (Harris 2005; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012; Sjaastad 2008; Crystal and Robbins 2010).

2.9 Chiropractic management of CEH, intracranial haemorrhage, meningitis, MEH and TTH

2.9.1 Chiropractic management of CEH

The greatest focus of care for CEH is placed on treating dysfunction of the structures associated with the cervical spine. The contribution of neck care is greater in patients who develop more frequent CEH episodes or those who are advancing in age (Gallagher 2007). SMT is supported as a treatment option for CEH (Bryans *et al.* 2011). A high quality randomised clinical trial (RCT) showed a statistically significant outcome of HVLA SMT in patients with CEH (Nilsson, Christensen and Hartvigsen 1997). The importance of cervical spine joint function becomes evident as clinical trials based on joint manipulation prove to be effective for patients with CEH (Bogduk and Govind 2009).

As more than one anatomical structure (muscle, joints and nerves) can contribute to the symptoms experienced in a CEH a multimodal management approach would be deemed relevant. A combination of HVLA thrust joint manipulation, joint mobilisations, soft tissue manipulation, stretching of cervical spine musculature, exercise conditioning of the cervical spine as well as patient education on how to maintain progress and prevent aggravation of the headache can produce beneficial management outcomes (van Duijn, van Duijn and Nitsch 2007; Bryans *et al.* 2011). Patient education can focus on a form of exercise conditioning (resisted isometric muscle contractions of the cervical spine musculature and analysis of prolonged cervical spine postures which are considered to be abnormal) (Austin 2002). The exact period of care required for the treatment of CEH is dependent on the severity of the condition; however a large clinical trial suggested that nine to 12 visits over a three week duration may be required for maximal relief and sustained outcome effects following manual care for CEH and associated neck pain (Haas *et al.* 2004). Other literature suggests two visits per week over three weeks (Bryans *et al.* 2011).

2.9.2 Chiropractic management of MEH

The exact pathogenesis of MEH is not reliably established, therefore exact strategies for management are difficult. The exact mechanism of action for the effect of SMT on MEH is not fully understood and requires more research, although some evidence as mentioned above as well as some case reports (Harris 2005; Hubbard and Kane 2012) have suggested that MEH symptoms may be lessened from chiropractic treatment. There is research which suggests that non-drug therapy such as SMT, physiotherapy and massage therapy may be equally as effective as some drugs such as topiramate and propranolol for the prophylactic treatment of MEH (Chaibi, Tuchin and Russell 2011). Case reports have suggested that combining chiropractic and rehabilitative management for MEH can improve symptoms more so than in isolation (Harris 2005). Some evidence suggests that upper cervical chiropractic treatment improves MEH symptoms (Hubbard and Kane 2012). Multimodal and/or multidisciplinary approaches may benefit patients with MEH (Bryans *et al.* 2011). Guidelines from research are important to incorporate into practice however it is not necessarily a substitute for a clinicians' experience and expertise (Bryans *et al.* 2011). Once the cause of MEH is fully understood an appropriate treatment protocol would be easier to establish with reproducible efficacy.

2.9.3 Chiropractic management of TTH

The aim of management of TTH should be directed at controlling patients' perceived stress as well as treating the pain sensitised structures involved (such as associated muscular tenderness of the sub-occipital and adjacent muscles) (Chen 2009; Bendtsen and Fernández-de-la-Peñas 2011). Thus, affecting the relationship between stress and the sensitivity to pain could be a beneficial focus of treatment for TTH (Cathcart *et al.* 2012).

The pericranial muscles may become tender in a patient with TTH and have been found to be associated with myofascial trigger points (MFTPs). Thus treatments aimed at resolving MFTPs could be of benefit for a patient with TTH (Bendtsen and Fernández-de-la-Peñas 2011). Some evidence suggest that the combination of SMT and acupuncture could be beneficial for a patient with TTH (Ohlsen 2012).

According to a systematic review by Bryans *et al.* (2011) there is insufficient evidence to recommend for or against the use of SMT, manual traction, connective tissue manipulation or physical training for patients with TTH. The use of certain exercises such as resistive exercises or thera-band exercises is recommended for the long term management of TTH. As TTH is frequently associated with pericranial muscular tenderness, non-drug therapy is often directed at soft tissue manipulation of the involved musculature. Treatment of MFTPs in muscles which reproduce the pain experienced in TTH can be of benefit to the patient (Bendtsen 2013).

Low-load craniocervical mobilisation can be recommended for patients with TTH. Some examples of low-load mobilisation include the use of resistive exercise routines and thera-band exercises (Bryans *et al.* 2011).

2.9.4 Chiropractic management of meningitis

A patient with suspected meningitis presenting to a chiropractor should ideally be referred for medical attention. Meningitis falls outside of the scope of practice of a chiropractor. The patient should be referred to a hospital or general practitioner immediately (Colledge *et al.* 2010).

2.9.5 Chiropractic management of intracranial haemorrhage

Intracranial haemorrhage falls outside of the scope of practice of a chiropractor. The chiropractor can identify signs and symptoms of intracranial haemorrhage and should refer the patient immediately. Prompt neurosurgical referral is essential for the management of a patient with any form of suspected intracranial bleeding. Depending on the location, referral to a hospital is usually the most appropriate and fastest option as emergency surgery may be necessary (Longmore *et al.* 2010).

CHAPTER 3 : RESEARCH METHODOLOGY

3.1 Introduction

Chapter 3 is a description of the research methodology used to develop and execute this research study. This chapter will explain the procedure of how the research was conducted in a sequential manner. The ethical considerations will be discussed at the end of the chapter.

3.2 Research design

This study was a quantitative descriptive questionnaire based study. Quantitative statistical information was generated from a validated research questionnaire.

3.3 Population

The population comprised all 88 Chiropractors practicing in the greater Durban area registered with the Allied Health Professions Council (AHPCSA) during the time of data collection. Any chiropractors who were not practicing anymore or those who were untraceable during the time of data collection were not included in the population parameter.

3.4 Sample size

Seven chiropractors participated in the expert group and pilot study so these individuals were excluded from the final study sample. A response rate of 70% was required for statistical significance, thus a minimum of 62 (70% of the 88 chiropractors in the greater Durban area) questionnaires had to be returned for statistical significance (Esterhuizen 2015, pers. comm.12 April). Any chiropractors who did not meet the inclusion and exclusion criteria were not included in the sample. A final response rate of 72% was obtained as 63 questionnaires were

returned, coded onto a spread sheet and statistically analysed. This study therefore surpassed the minimum requirements for statistical significance.

3.5 Sample recruitment

Non-probability total sampling was used. Advertising was not necessary as all individuals that were included in the sample group were contacted and invited to participate in the study.

Permission from the Chiropractic Association of South Africa (CASA) was granted to conduct research on their members (Appendix H). The CASA was contacted by the researcher to get permission to conduct research on their members and to obtain the contact details of the registered chiropractors in the Greater Durban Area (Appendix I). It was not mandatory for all chiropractors to be registered with CASA; however it is mandatory for all chiropractors to register with the AHPCSA. Contact details of the chiropractors who were not registered with CASA were retrieved from AHPCSA. As the AHPCSA is a statutory council it was not necessary to ask for permission to conduct research on their members.

The researcher then contacted the prospective participants by scheduling an appointment via their secretary either by visiting their practice or by using telephonic communication, to ask them if they would like to participate in the research study. The questionnaire was delivered by hand or emailed to the participant depending on which method of delivery the participant agreed to when contacted.

3.6 Inclusion and exclusion criteria

Each participant had to meet the following inclusion and exclusion criteria to participate in the research study.

Inclusion criteria:

- Each participant had to be registered with the Allied Health Professions Council of South-Africa.

- Each participant had to sign an informed consent form to participate in the study (Appendix A).
- Each participant had to be practicing in the greater Durban metropolitan area (031 dialing code).

Exclusion criteria:

- Each participant who failed to return the questionnaire within the data collection period.
- Each participant that participated in the expert group or pilot study.
- Each participant who did not wish to participate in the research study.

3.7 Measurement tools

This study utilised a questionnaire as the data collection tool. As no questionnaire specific to the research problem existed at the time for the target population a questionnaire was developed by the researcher (Pre-expert group questionnaire).

3.7.1 Pre-expert group questionnaire

The pre-expert group questionnaire (Appendix N) was validated by an expert group and pilot study. The purpose of the expert group was for industry and research experts to scrutinise and ratify the questionnaire. This would help develop context and face validity for the questionnaire (Brink *et al.*, 2012). It also helped to reduce ambiguity in the questionnaire format and sentence structure.

The pre-expert group questionnaire (Appendix N) was constructed in English as English is the medium of education for chiropractic in South Africa and as such all chiropractors would understand the English terminology used in the questionnaire. The questionnaire consisted of three main sections constituting a demographic section, diagnostic section and a management section.

The demographic section retrieved information about the participant's age, gender, qualifications obtained, years of practical experience, short courses and conferences attended specific to chiropractic and philosophy of chiropractic. The demographic information requested was based specifically on the premise that the demographics as mentioned above could possibly affect the way practitioners diagnose and/or manage headaches in practice. This applies more specifically to demographics such as age, qualifications obtained, years of practical experience, short courses and conferences attended and philosophy of chiropractic (Forand *et al.* 2004; Harvey *et al.* 2011).

The diagnostic section provided five case scenarios, each describing a different headache, three of which are supported by the literature review to be manageable by chiropractors (CEH, TTH and MEH) and two of which are 'red flag' headaches (meningitis and intracranial haemorrhage) which should ideally be referred for emergency care. The case scenarios were adapted from case studies and theoretical frame works, and the diagnosis of each individual case was previously investigated and confirmed to be a specific headache. These case scenarios along with the rest of the questionnaire were subjected to an expert group panel for scrutiny and validity.

The management section determined the management options each participant used for CEH, TTH and MEH as well as the two 'red flag' headaches. The post-expert group questionnaire format changed as the management section was changed to only collect management information about CEH, TTH and MEH as this is what the literature review supports and the extra management blocks in the pre-expert group questionnaire increased the length of the questionnaire considerably which could have been avoided. This will be discussed further in the sections to come.

3.7.2 Expert group

The expert group was attended by:

- One qualified chiropractor practicing in the Greater Durban area (which represented the target population).

- One chiropractic student conducting questionnaire based research at DUT and who had previously hosted an expert group meeting and had previously validated a research questionnaire.
- One chiropractic student currently in the research process to develop a questionnaire based study.
- One chiropractic student currently in the research process who operated the video recorder.
- One DUT research supervisor who is knowledgeable on research protocol and DUT research procedures and has previously published research articles in accredited research journals.
- One DUT co-supervisor who is knowledgeable on research protocol and DUT research procedures.
- The research supervisor.
- The researcher.

All members of the expert group had to sign a code of conduct and confidentiality statement (Appendix C), were given a letter of information and consent (Appendix B) regarding the study, all of which had to be read, understood and signed. Each member of the expert group meeting was given a pre-expert group questionnaire (Appendix N). The researcher was present to answer any questions regarding the study, explain the format and purpose of the expert group, and conduct the meeting. The expert group panel was given time to read through the questionnaire after which the entire questionnaire was discussed in a sequential manner starting at the title page and progressing through each question up to the end of the questionnaire. All individuals of the expert group were given opportunities to voice their expert opinions. These opinions were then debated amongst the expert group until a verdict was reached as to what the final recommendation was for the point raised. Changes were made to the questionnaire (Appendix H), which led to the development of the post-expert group questionnaire (Appendix F). The meeting was video recorded by the researcher so that the researcher could reflect on all comments and recommendations made. The video was stored on a DVD which is only accessible to the researcher and was used for the researcher to reflect on recommendations made and for examination purposes only.

As a result of the recommendations by the expert group the management information for the “red flag” headaches was confined to the diagnostic information and the management section then focussed on the management of CEH, TTH and MEH as these headaches are supported by the literature review to be managed by chiropractors. This reduced the overall length of the questionnaire as the pre-expert group questionnaire was impractically extensive and would have potentially discouraged potential research participants from participating thus reducing the validity of the results obtained. For a more detailed list of all the recommendations and changes from the expert group meeting please see (Appendix H).

The post-expert group questionnaire (Appendix F) was presented to the departmental research council along with the research proposal. Following approval of the research proposal by the departmental research council the research proposal was directed to, and approved by, the Faculty of Health Sciences Research Council followed by the Institutional Research Ethics Council (IREC) (Appendix K).

3.7.3 Pilot study

The post expert group questionnaire (Appendix F) was tested for validity via a pilot study. The pilot study commenced once ethical clearance was granted (Appendix K). The post-expert group questionnaire was distributed to three members of the sample group. The participants who formed part of the pilot study had to comply with the inclusion and exclusion criteria. Each member of the pilot study received a letter of information and informed consent (Appendix E); a code of conduct and confidentiality statement (Appendix D); a letter of information and informed consent for the questionnaire (Appendix A); a post expert group questionnaire (Appendix F); as well as a pilot study evaluation form (Appendix G). Those who took part in the pilot study were excluded from the study sample and the data obtained from the pilot study was not included in the research study (Brink *et al.* 2012). The purpose of the pilot study was to determine the feasibility of the proposed study and identify any flaws or shortcomings of the method of data collection (Brink *et al.* 2012). All comments made by the expert group and pilot study were used to improve and develop the questionnaire.

A summary of the changes made to the questionnaire as suggested by the pilot study members includes minor changes to the format of the questionnaire and instructions so as to make the questionnaire as easy as possible to answer. Some of the pilot group members felt that the questionnaire was too long and that it should be shortened. However to maintain validity and accuracy no questions were removed. For a detailed list of recommendations and changes made to the questionnaire following the pilot study please see Appendix J. From the pilot study correction the final research study questionnaire (Appendix F) was developed for data collection.

After the changes were made to the questionnaire following the pilot study the list of recommendations, changes and rationale for the changes were presented to the final IREC for approval before continuing with data collection (Appendix K). Once IREC approval was granted the questionnaires as well as the information and consent letters were printed prior to commencement of the data collection period.

3.8 Data collection procedure

All questionnaires that were distributed to the research participants were identical.

- A. Each participant within the study population was contacted and invited to participate in the research. Participants were either contacted telephonically or personally visited in their practice to schedule a time via the receptionist to communicate with the practitioner.
- B. If the participant complied with the inclusion and exclusion criteria they were invited to participate in the research study.
- C. Although participants were offered the option of hand delivery and collection or email delivery and collection, in this study all questionnaires as well as the accompanying letters of information and consent (Appendix A) and questionnaires (Appendix F) were hand delivered and collected personally. This was done to establish a higher response rate as it was considered to be

the most convenient method for the research participants. For the purposes of recording the methodology, the following methods of return were offered to participants.

Hand delivery/return of questionnaires

The letter of information and consent (Appendix A) as well as the questionnaires were collected by the researcher from the practice of the participant and placed into sealed boxes. The letter of information and consent was placed into a labelled box (labelled box B) and the questionnaire was placed into a sealed box (labelled box A). This was done to maintain confidentiality of the participant so that no association between the letter of information and consent could be made with the questionnaire.

Email and fax

The questionnaire and letter of information and consent (Appendix A) could be sent via email to each research participant who chose that option. The letter of information and consent (Appendix A) could be printed, signed and faxed by the research participant to the research assistant who then forwarded it to the researcher via email. Alternatively those who knew how to sign documents electronically could do so and email it to the researcher directly. The questionnaire could then be completed on the participant's computer and emailed to the research assistant upon completion. The research assistant printed the questionnaires and the researcher placed these questionnaires in a sealed and labelled box (labelled box A).

For the use of the above mentioned fax line permission was asked from the research assistant for the use of the fax line and email communication (Appendix L). The research assistant signed a code of conduct and confidentiality statement (Appendix M) prior to the data collection process.

D. The participants were given two weeks to complete and return the questionnaire. However, it was apparent that participants were very busy during the data collection period so an additional period of two weeks was granted to the participants in order to achieve a statistically significant feedback

to ensure validity of the research study. If a 70% response had not been achieved by the closing stage of data collection participants would have been contacted on a weekly basis in an attempt to increase the response rate.

- E. After the data collection period the data was entered into a spread sheet and sent to the statistician for data analysis. The questionnaires were coded, the codes were used to correlate the codes to an excel spread sheet in the event that any data coding errors were suspected.
- F. All of the ethical considerations were adhered to at all times during the research process, please see ethical considerations as described below.
- G. Note that all the data obtained will be safely stored and shredded/deleted after a 15 year period.

3.9 Statistical analysis

SPSS version 22 was used to analyse the data. Descriptive statistics were reported in frequency tables for categorical variables, and summary statistics such as mean, standard deviation and range for continuous variables. Continuous variables were compared between independent categories using one way ANOVA tests. Chi square were used tests to compare categorical variables however these tests were found to be invalid as there were too many categories with low frequencies in each case, thus the trends shown in the cross tabulations were interpreted descriptively (Esterhuizen 2015, pers. comm.12 April).

3.10 Ethical considerations

All questionnaires were identical. The questionnaire was only used after it had been validated and tested by the expert group and pilot study. The participants remained anonymous and at no point were any of the participants' personal details such as name or address etc. recorded on the questionnaires.

The questionnaires were inserted into an envelope and sealed before being returned to the researcher. All participants signed the letter of information and consent (Appendix A) before completing the questionnaire. No names or reference to personal detail that could compromise the identity of the participants were used in the publication of the results. The results of this study are shown in aggregate thus there is no reference to results obtained from specific participants. Those who did not want to take part in the research study were excluded from the study; no one was forced in any way to take part in the study. The participants could withdraw from the study at any point up until the questionnaire was submitted in a sealed envelope. Once the questionnaire in the envelope was inserted into the sealed box they were not allowed to withdraw in order to prevent tampering with the questionnaires once submitted and to maintain confidentiality of the other research participants. The participants were given three weeks to complete the questionnaire and should not have been completed during their consultation hours in order to prevent any loss of time which should have been spent with their patients. The participants were informed via the letter of information and consent that the results of the study will be available at the DUT library at the Steve Biko campus and online via the DUT Institutional Repository once the research has been completed and examined.

3.11 Limitations of the research study

The study sample was limited to the number of chiropractors registered with the AHPCSA in the greater Durban area and to the number of these chiropractors who complied with the inclusion and exclusion criteria.

If any errors were made during the completion of the questionnaire by the research participant, such errors were included in the results (e.g. if the wrong option was ticked on the questionnaire).

Even though all research participants were required to respond honestly it is not possible to determine if the participant did in fact respond honestly; thus, any responses which may not reflect true honesty were included in the results of the study.

The case scenarios given to the participants provided pre-determined information about the patients' case history and physical findings, thus the actual patient interaction with the participant did not occur and the information provided to the participant might not have been asked for by the participant in practice or the participant might have asked for more information. Thus the diagnoses are based on the participants' interpretation of the information given which might not have been the same as if the participant attended to the patient in practice. Thus, this study provides an insight into the diagnosis and management of selected headaches in practice but does not necessarily reflect the exact outcome of the doctor patient relationship in a clinical setting.

CHAPTER 4 : RESULTS AND DISCUSSION

4.1 Introduction

Chapter 4 includes a statistical description of the results obtained and the discussion of these results. Due to the large amount of statistical information generated by this study the discussion of the results immediately follows the reporting of the results for each question. This was done so that the reader does not have to frequently alternate between pages when reading the research.

The results are reported in a descriptive manner in paragraphs, tables or figures where appropriate. Results described in sentences are expressed as percentages followed by the numerical value in brackets signifying the actual number of participants e.g. 10% (6).

4.2 Demographic information

4.2.1 Age of the participants

4.2.1.1 Results for the age of the participants

There were 63 participants. Mean age of the participants was 36.8 years with a standard deviation of nine years and a range from 25 to 71 years of age (Table 3).

Table 3: Age distribution of the participants

A) Age (years)	
N	63
Mean	36.79
Std. Deviation	8.99
Minimum	25
Maximum	71

4.2.1.2 Discussion of age of the participants

The age of the participants was reasonably close to a study performed on the same population in 2009, in which the average age was between 30 and 34 years old, with a range from 25 to 74 years of age (Palmer 2009). The average age of the chiropractors practicing in the greater Durban area appears to be relatively young. This could be due to a relatively recent increase in the amount of graduating chiropractors in South Africa which would result in the mean age favouring a lower number.

4.2.2 Gender profile of the participants

4.2.2.1 Results for the gender profile of the participants

The participants were 50.8% (32) female (Table 4).

Table 4: Gender distribution of the participants

B) Gender	N	Column N %
Male	31	49.2%
Female	32	50.8%
Total	63	100.0%

4.2.2.2 Discussion of the gender profile of the participants

SMT requires a refined motor execution, the application of which is seen as a skill which requires practice. Differences between genders may possibly exist when learning a specific SMT due to gender related learning patterns (Harvey *et al.* 2011).

However physical application of a treatment such as SMT showed similar mechanics of application for male chiropractors when compared to female chiropractors and it was concluded that male chiropractors produce similar manual treatments as their female colleagues, at least from a biomechanical point of view (Forand *et al.* 2004).

The gender distribution of the participants was nearly equal. It would appear that there is not a predisposition for a specific gender to follow a career in chiropractic, at least not in the greater Durban area. The sample size is too small to extrapolate this observation to all of chiropractic.

4.2.3 Institution of qualification

4.2.3.1 Results for “From which institution did you receive your qualification?”

Most had qualified from Durban University of Technology (DUT) representing 92% (58) of the participants. University of Johannesburg (UJ) graduates represented 3.2% (2) of the participants. 1.6% (1) of the participants represented each of the following institutions: National Chiropractic College, United Kingdom (UK institution not specified) and Palmer College (Table 5).

Table 5: Institution of qualification for the chiropractic degree

C) “From which institution did you receive your qualification?”	N	Column N %
Durban University of Technology	58	92.1%
University of Johannesburg	2	3.2%
National Chiropractic College	1	1.6%
United Kingdom (institution not specified)	1	1.6%
Palmer Chiropractic College	1	1.6%
Total	63	100.0%

4.2.3.2 Discussion of “From which institution did you receive your qualification?”

In South Africa the chiropractic course is offered at two institutions, University of Johannesburg (UJ) and Durban University of Technology (DUT). Although the course outline and practice of chiropractic at both institutions must adhere to the

AHPCSA requirements. Thus, the content offered by the two institutions is similar with regard to the theoretical education, however the lecturing staff and practical learning experience may be different (CASA 2015). In some countries numerous chiropractic colleges exist with different philosophical origins which inevitably influences the education standards or beliefs of their alumni, thus the clinical results with regard to the practice acumen may be different (Wickes 2002).

The majority of the chiropractors being from DUT can be expected as DUT falls within the geographical parameters of the population of this study. The chiropractic degree offered by DUT involves six years of studying, thus the students could possibly grow accustomed to the area and could prefer not to move away from the area where they have been staying. UJ is located in the city of Johannesburg which is approximately 600km from Durban, thus the low count of UJ graduates in the participants which had been investigated could be due to the geographical location of the participants.

4.2.4 Duration of practice

4.2.4.1 Results for “How long have you been practicing chiropractic?”

The highest number of the participants reported a duration of practice between six to nine years. A shortest duration of one month was recorded and a longest duration of 47 years in practice was recorded (Table 6).

Table 6: Duration of practice

D) “How long have you been practicing chiropractic?”	N	Column N %
< 1 year	2	3.2%
1-3 years	11	17.5%
3-6 years	10	15.9%
6-9 years	13	20.6%
9-12 years	5	7.9%
12-15 years	8	12.7%
15-18 years	7	11.1%
18-21 years	4	6.3%
> 21 years	3	4.8%
Total	63	100.0%

4.2.4.2 Discussion of “How long have you been practicing chiropractic?”

The majority of the participants had been in practice between six to nine years which coincides with the average age assuming that the average age at which the participants qualified was in their mid to late twenties. The participants represented a wide range of years of practice experience.

4.2.5 Practice hours

4.2.5.1 Results for “Are you currently practicing chiropractic part time or full time?”

The majority (82.5% (52)) of the participants practiced full time while 17.5% (11) practiced part time (Table 7).

Table 7: Practice hours

E) “Are you currently practicing chiropractic part time or full time?”	N	Column N %
Full time	52	82.5%
Part time	11	17.5%
Total	63	100.0%

4.2.5.2 Discussion of “Are you currently practicing chiropractic part time or full time?”

Experience can influence the way a health care provider practices (Harvey *et al.* 2011). Some practitioners choose to practice part time which allows them to pursue other professional or personal activities. Those who practice full time would be exposed to more chances for the development of clinical skills. As the majority practice full time, it could indicate that the majority of the participants are exposed to more development of practical skills and clinical acumen which could positively affect the clinical outcome of management of patients (Harvey *et al.* 2011).

4.2.6 Additional tertiary qualifications

4.2.6.1 Results for “Do you have any other tertiary qualifications other than a degree in chiropractic?”

17.5% (11) of the participants had additional qualifications with the most common being Master’s degree of medical science (4.8% (3)), and the second most common being an international certified chiropractic sports practitioner certification (3.2% (2)). Five other qualifications (as listed in Table 6) were equally common (1.6% (1)). One unspecified qualification was listed. Some of the qualifications listed by the participants did not meet the criteria for a tertiary qualification; however they were included in the analysis (Table 8).

Table 8: Additional tertiary qualifications

F) “Do you have any other tertiary qualifications other than a degree in chiropractic?”	N	Column N %
None	52	82.5%
Masters of Medical Science (Sports Medicine)	3	4.8%
Bachelors of Science	1	1.6%
Internationally Certified Chiropractic Sports Practitioner (ICCS/CCSP/ICSSD)	2	3.2%
Diploma in Therapeutic Aromatherapy	1	1.6%
Bachelors of Medical Science	1	1.6%
Diploma of Chiropractic Radiography (U.S.A)	1	1.6%
Massage Diploma	1	1.6%
Not specified	1	1.6%
Total	63	100.0%

4.2.6.2 Discussion of “Do you have any other tertiary qualifications other than a degree in chiropractic?”

The majority of the additional qualifications which were listed are related to the health care professions. This indicates a consistency among the participants of having a professional interest in health care.

Those that obtained a Master’s degree of medical science (sports medicine) or bachelor’s degree in medical science may indicate that they have a specific interest

in sports related conditions; the additional degree could also have increased their knowledge related to that of sports dynamics. No tertiary qualifications were listed which would specifically influence the diagnosis and management of headaches.

ICCSP, diploma of chiropractic radiography, massage diploma, and a diploma in therapeutic aromatherapy were listed by the participants as additional tertiary qualifications however these diplomas or certifications do not fulfil the requirements to be classified as an additional tertiary qualification. None of the course content of these courses would directly pertain to or affect the diagnosis and management of headaches.

4.2.7 Short courses attended

4.2.7.1 Results for “Please indicate if you have attended any of the following health related short courses since you qualified”

A total of 18 different short courses were attended by 79.4% (50) of the participants. 15 courses influenced management of headaches in practice. The most popular short course attended was a paediatric short course and a KT course. 20.6% (13) of the participants indicated that a paediatric course did influence the way they manage headaches in practice and 17.5% (11) of the participants indicated that a KT course did influence the way they manage headaches in practice. 20.6% (13) of the participants did not attend any short courses (Table 9).

Table 9: Additional short courses attended and their influence on practice

Course attended	N	Percentage	Percentage of sample	Influenced management of headache (N)	Percentage of sample	No influence on headache management (N)	Percentage of sample
Paediatric	22	23.4%	34.9%	13	20.6%	9	14.2%
Geriatric	3	3.2%	4.8%	1	1.6%	2	3.2%
Kinesiotaping	33	35.1%	52.4%	11	17.5%	22	34.9%
Graston technique	4	4.3%	6.3%	1	1.6%	3	4.8%
Neuro impulse protocol	2	2.1%	3.2%	2	3.2%	0	0.0%
Animal chiropractic	2	2.1%	3.2%	0	0.0%	2	3.2%
Extremity adjusting	1	1.1%	1.6%	0	0.0%	1	1.6%
Total body modification	1	1.1%	1.6%	1	1.6%	0	0.0%
Acupuncture	2	2.1%	3.2%	2	3.2%	0	0.0%
Advanced biostructural technique	1	1.1%	1.6%	1	1.6%	0	0.0%
Dynamic taping	2	2.1%	3.2%	1	1.6%	1	1.6%
Biopuncture	1	1.1%	1.6%	1	1.6%	0	0.0%
Ultrasonography	1	1.1%	1.6%	0	0.0%	1	1.6%
Principles of pain management	1	1.1%	1.6%	1	1.6%	0	0.0%
Activator therapy	1	1.1%	1.6%	1	1.6%	0	0.0%
Lower extremity	1	1.1%	1.6%	1	1.6%	0	0.0%
Laser therapy	2	2.1%	3.2%	1	1.6%	1	1.6%
Network spinal analysis	1	1.1%	1.6%	1	1.6%	0	0.0%
No courses attended	13	13.8%	20.6%	0	0.0%	0	0.0%
Total	94	100.0%	100.0%	39	100.0%	42	100.0%

4.2.7.2 Discussion of “Please indicate if you have attended any of the following health related short courses since you qualified”

The most popular short course to have reportedly influenced the management of headaches in practice appears to be a paediatric short course. The assessment of a paediatric patient is different from that of older patients due to anatomical and physiological changes. The mention of a paediatric course which affected the way

some of the participants managed headaches in practice should mainly pertain to that of the paediatric patient.

There does not appear to be specific research to support the use of KT for specific headaches or as adjunctive therapy for headache treatment. The use of KT however may be used to treat musculoskeletal related dysfunction or aberrant movement and postural problems which could possibly be used indirectly to aid other treatment options that may be used for headaches (Williams *et al.* 2012; Csapo and Alegre 2014; Parreira *et al.* 2014). This might be why some of those who attended the KT course indicated that it did influence management of headaches.

Graston course is a form of IASTM. Treatment of soft tissue and muscular pathology could provide indirect relief of certain headaches, mostly those with an associated muscular component such as CEH and TTH (Portillo-Soto *et al.* 2014).

A geriatrics course may provide useful and additional course work for chiropractic care of the geriatric patients. Such training is important in order to enhance the profession's capacity to manage the geriatric population more effectively. Clinical experience and additional course work could be necessary post-graduation in order to increase competency of managing geriatric patients (Hawk *et al.* 2010). A geriatric specific course may therefore be useful to assess and manage headaches in the geriatric population.

Numerous short courses were attended each of which had specific focii regarding the management of patients. All of these courses could potentially influence management options used in practice. The majority of the participants appear to attend short courses which are an appropriate method of learning or advancing certain clinical skills and/or knowledge. Thus it appears as if the participants maintain a relatively updated knowledge base as far as advancement of knowledge and skills via short courses is concerned. This advancement of knowledge is important for the continual professional development (CPD) of chiropractic. It is the CPD which aids and allows the profession to be critical, self-directed as well as reliable. The goal of CPD is ultimately to improve patient care in practice.

4.2.8 Journals and their influence on practice

4.2.8.1 Results for “Do you read any chiropractic specific journals?”

The majority of the participants 65.1% (41) indicated utilisation of chiropractic specific journals. This study found that 38.1% (24) of the participants used journals specific to chiropractic which DID provide literature on headaches and it DID influence management of headaches. 17.5% (11) of the participants did previously use chiropractic specific journals which did provide literature on headaches which did NOT influence the management of headaches. 9.5% (6) of the participants DID previously use chiropractic specific journals which DID NOT provide literature on headaches and therefore it DID NOT influence the management of headaches (Table 10).

Table 10: Usage of chiropractic specific journals and its influence on practice

H) “Do you read any chiropractic specific journals?”	N	Column N %
Yes, however it did not provide literature regarding headaches nor did it influence the management of headaches.	6	9.5%
Yes, it did provide literature regarding headaches however it did not influence the management of headaches.	11	17.5%
Yes, it did provide literature regarding headaches and it did influence the management of headaches.	24	38.1%
No	22	34.9%
Total	63	100.0%

4.2.8.2 Discussion of “Do you read any chiropractic specific journals?”

Journals offer critical evaluation of research being conducted (Bolton and Humphreys 1998). It is a positive outcome that the majority of the participants utilises journals to stay up to date with the developments in research. Considering the diagnostic challenge which headaches can present, it is of benefit to provide chiropractors with the latest information regarding headache. The utilisation of journals may prove an effective tool to disseminate this information (Jensen 2008). The provision of headache literature is dependent on the specific type of journal the practitioner subscribes to. A relatively large portion of the participants mentioned that they did not use any chiropractic specific journals. This could be because some

of the participants utilise other methods of staying up to date with developments in research such as short courses and health related conferences.

4.2.9 Health related conferences

4.2.9.1 Results for “Do you attend any health related conferences on a regular basis (annually, biannually or more often)?”

Health related conferences were attended on a regular basis (annually, biannually or more often) by 77.8% (49) of the participants. 38.1% (24) of the participants indicated that these conferences DID provide information on headaches and DID influence the way they manage headaches in practice. 20.6% (13) of the participants indicated that these conferences did provide information on headaches however this DID NOT influence the way they manage headaches in practice. 19% (12) of the participants indicated that these conferences DID NOT provide information on headaches and DID NOT influence management of headaches in practice (Table 11).

Table 11: Health related conferences attended on a regular basis (annually, biannually or more often) and its influence on practice

I) “Do you attend any health related conferences on a regular basis (annually, biannually or more often)?”	N	Column N %
Yes, however it did not provide literature regarding headaches nor did it influence the management of headaches.	12	19.0%
Yes, it did provide literature regarding headaches however it did not influence the management of headaches.	13	20.6%
Yes, it did provide literature regarding headaches and it did influence the management of headaches.	24	38.1%
No	14	22.2%
Total	63	100.0%

4.2.9.2 Discussion of “Do you attend any health related conferences on a regular basis (annually, biannually or more often)?”

Health related conferences are another means of staying up to date with advancements in health care (Bolton and Humphreys 1998). Some health related conferences provide practical skill demonstration and training. The majority of the

participants attended health related conferences on a regular basis which is a positive indication for the advancement of the knowledge within the sample. Not all conferences would necessarily present new information on headaches specifically as this is dependent on the timing of the course relative to the release of new literature as well as the relevance thereof, which could possibly explain the different responses regarding the effect these conferences have on the management of headaches. Thus those that indicated that the conferences did not provide any information regarding headaches could possibly have been due to a lack of new research at the time the conference was presented.

4.2.10 International practice

4.2.10.1 Results for “have you ever practiced outside of South Africa?”

A total of 17.5% (11) of the participants practiced outside of South Africa at some point during their professional career. The longest duration of practice outside of South Africa was 12 years and the shortest was one month. The most popular destination was found to be Ireland with 36.4% (4). Other countries include Malaysia, United Kingdom, Namibia and Italy. One respondent did not specify a country (Table 12).

Table 12: International practice information.

J) “have you ever practiced outside of South Africa?”		N	Column N %
J) Practiced outside of South-Africa	no	52	82.5%
	yes	11	17.5%
	Total	63	100.0%
J) Specified duration of practice outside of South-Africa	Less than one year	2	18.2.%
	one to two years	2	18.2.%
	Two to three years	1	9.1%
	Three to four years	2	18.2.%
	Four to five years	1	9.1%
	More than five years	1	9.1%
	Not specified	2	18.2.%
	Total	11	100.0%
J) Specified area outside of South-Africa	Ireland	4	36.4%
	Malaysia	2	18.2.%
	Namibia	1	9.1%

United Kingdom	2	18.2.%
Italy	1	9.1%
Not specified	1	9.1%
Total	11	100.0%

4.2.10.2 Discussion of “have you ever practiced outside of South Africa?”

International regulations and standards of chiropractic may vary according to the laws and regulations of the statutory regulators place on the profession (Wickes 2002). Chiropractic has varying degrees of public and professional acceptance around the world and the establishment of chiropractic also differs across the globe. The experience of a chiropractic consult may therefore be different depending on the country. Practicing outside of South Africa could influence the participant and expose them to different learning experiences and/or skills which may influence the management of headaches (Wickes 2002). Relatively few participants practiced outside of South Africa during their professional career.

4.2.11 Philosophy of chiropractic

4.2.11.1 Results for “Which philosophy of chiropractic do you subscribe to (more than one option may be selected)?”

The majority of the participants considered themselves a combination of mixer and evidence based practitioners (47.6% (30)), followed by mixer philosophy 28.6% (18), evidence based philosophy 17.5% (11), a combination of mixer and straight philosophy 4.8% (3) and only 1.6% (1) a combination of straight and evidence based philosophy. No participants selected an exclusively straight philosophy (Figure 1).

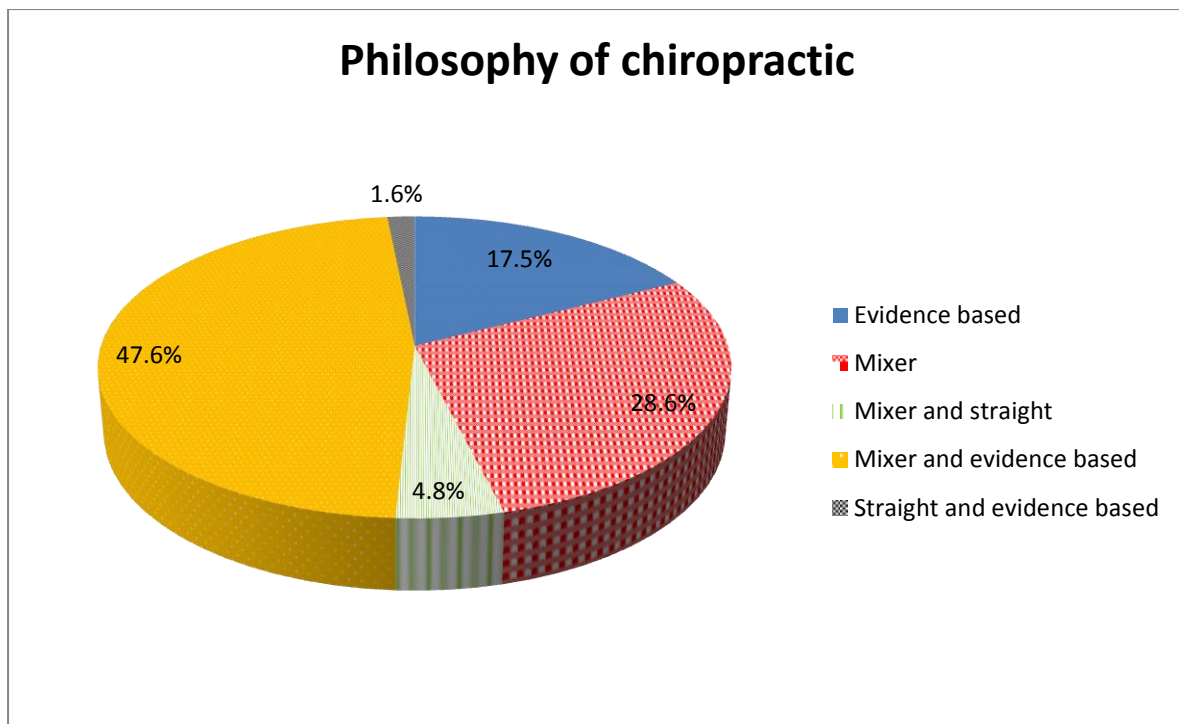


Figure 1: Philosophy of chiropractic

4.2.11.2 Discussion of “Which philosophy of chiropractic do you subscribe to (more than one option may be selected)?”

Mixer and evidence based philosophy was selected most commonly which indicates that the majority of the participants do not necessarily regard manipulative therapy as the only treatment option for the patient. The majority of the participants would likely suggest or apply more than one treatment option to the patients (depending on the condition). This could reflect positively on this sample’s approach to treating headaches as literature suggests that a multimodal approach can be of benefit for the management of certain headaches (Bryans *et al.* 2011).

Mixer was selected second most commonly indicating that these participants subscribe to some of the straight philosophy and different treatment approaches and modalities are used by them to address a patient’s condition.

Health care professions over the years have shown an increased following of EBP (Walker *et al.* 2014). Only 17.5% (11) of the participants considered themselves as exclusively EBP. A total of 66.7% (42) considered evidence based practice as part

of their philosophy (thus those who indicated a philosophy which was combined with that of EBP) which would indicate that the majority of the participants incorporate EBP in their philosophy of practice.

The combined selection of mixer and straight philosophies are confusing as a mixer philosophy essentially indicates that some of the straight chiropractic principles are considered as part of the way they practice but additional treatment approaches are used in conjunction to that of the straight philosophy, thus stating that one is a mixer implies a modified persona from that of a straight. The combined selection of a mixer and a straight is therefore indicating that one is essentially a mixer. Recent research suggest that a minority of the chiropractic profession still hold to and practice according to a straight philosophy which is generally in conflict with the orthodox medicine perspective (McGregor *et al.* 2014). The results from this study show that the straight chiropractic philosophy was selected by the minority of the sample. The application of straight philosophy chiropractic to the management of headaches by the participants is relatively small.

Only 1.6% (1) of the participants indicated a combined philosophy of a straight and EBP. This could perhaps indicate that only treatment protocols which are considered as part of a straight chiropractic philosophy which have been clinically proven are used in practice for this practitioner.

Ultimately the clinical management of a condition could be impacted by the philosophical background or belief of the chiropractor. The wide range of philosophical preference could impact the management seen in practice.

4.3 Diagnostic information

4.3.1 Results and discussion of question 1 (case 1 – meningitis)

4.3.1.1 Primary diagnosis for case 1

4.3.1.1.1 Results of “What is your primary diagnosis (select only one)”

The primary diagnosis for case 1 was diagnosed as meningitis by 79.4% (50) of the participants with 19% (13) choosing encephalitis and 1.6% (1) selected CEH (Figure 2).

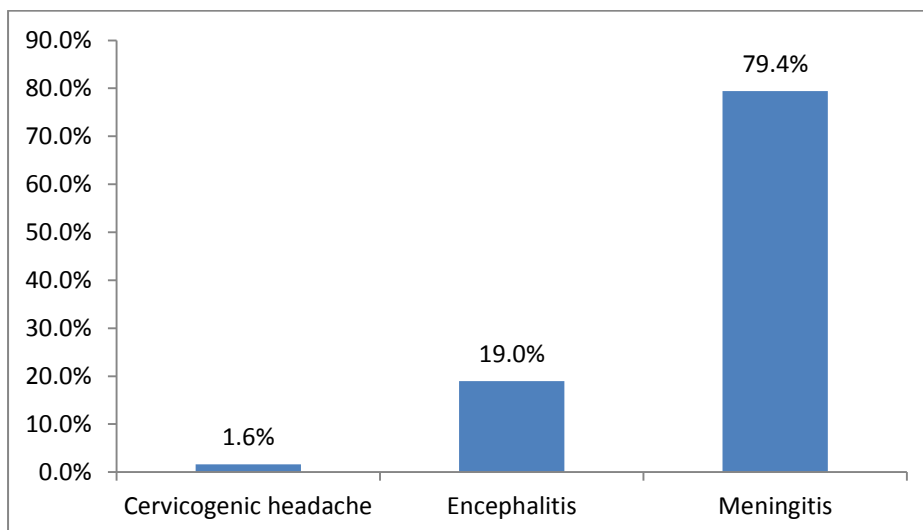


Figure 2: Primary diagnosis for case 1

4.3.1.1.2 Discussion of the primary diagnosis for case 1 “What is your primary diagnosis (select only one)”

The correct diagnosis for case 1 is meningitis. Considering the fact that in a clinical setting meningitis and encephalitis may present remarkably similarly the diagnosis of encephalitis should be considered as being clinically sufficient as both conditions have an infective origin and involve the cerebrospinal system (Colledge *et al.* 2010; Zueter and Zaiter 2015). Combining encephalitis and meningitis responses, 98.4% (62) of the participants gave a sufficient primary diagnosis for case 1. The general outcome for the diagnosis of case 1 reflects favourably for the participants. The

diagnosis of CEH as a primary diagnosis is not accurate. Considering the red flags mentioned in case 1: “confusion and headache; CD4 count of 22 cells/mm³; HIV RNA of 210,000; fever, and slight confusion; neck stiffness during active and passive neck flexion; a GCS of 14 and decreased performance on her mini-mental status examination” the primary diagnosis is clearly that of a potentially life complicating or life threatening condition (Zueter and Zaiter 2015).

4.3.1.2 Differential diagnoses for case 1

4.3.1.2.1 Results of “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”

A total of 16 different diagnoses were selected by the participants for case 1. The top three differential diagnoses given by the participants for case 1 were encephalitis (71.4% (45)), cerebrovascular accident (19% (12)) and meningitis (19% (12)) (Table 13).

Table 13: Differential diagnoses for case 1

Q1.2) “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”	Responses		Percentage of sample
	N	Percentage	
Brain tumour	10	8.1%	15.9%
Cervicogenic headache	11	8.9%	17.5%
Cluster headache	1	0.8%	1.6%
Cerebrovascular accident	12	9.7%	19.0%
Encephalitis	45	36.3%	71.4%
Glaucoma	2	1.6%	3.2%
Hypertensive headache	3	2.4%	4.8%
Intracranial heamorrhage	10	8.1%	15.9%
Meningitis	12	9.7%	19.0%
Migriane	7	5.6%	11.1%
Post-concussive syndrome	2	1.6%	3.2%
Sinusitis	3	2.4%	4.8%
Temporal cell arteritis	2	1.6%	3.2%
Tension type headache	2	1.6%	3.2%
HIV encephalopathy	1	0.8%	1.6%
Tuberculosis	1	0.8%	1.6%
Total	124	100.0%	196.8%

4.3.1.2.2 Discussion of “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”

Due to the clinical similarity of encephalitis to meningitis it is expected that the majority selected encephalitis as a differential diagnosis for case 1 as the majority selected meningitis as their primary diagnosis (Longmore *et al.* 2010; Loughborough *et al.* 2014; Zueter and Zaiter 2015). The selection of CVA as a differential diagnosis for meningitis should be considered as a less likely diagnosis given that the case history suggest that an infective cause due to a depressed immune system and an associated fever. CVA is however supported by the presentation of headache, confusion, decreased performance on the patients’ mini-mental status examination and a GCS of 14, thus CVA cannot be excluded as a differential diagnosis (Colledge *et al.* 2010; Kanika *et al.* 2015).

CEH is a weak differential diagnosis for case 1; the red flag features are suggestive of a secondary cause for the headache (Clinch 2001).

Intracranial haemorrhage (subarachnoid haemorrhage) is a strong differential diagnosis for case 1 as it may present similar to meningitis (Liebeskind 2014). The information as described in case 1 makes it less likely due to the strong suspicion that an infective cause should be the culprit due to the indicators of a depressed immune system and a fever, however one must consider the possibility of intracranial haemorrhage until investigations prove otherwise (Colledge *et al.* 2010; Liebeskind 2014).

Brain tumour is a weak differential diagnosis for a patient presenting with meningitis as described in case 1, the progression and onset of symptoms is less aggressive than that of meningitis which is why a brain tumour should be considered as a differential diagnosis at this stage and not the primary diagnosis (Greenberg *et al.* 1999; Loughborough *et al.* 2014).

MEH is a weak differential diagnosis to consider based on the information given in case 1 (Wood 2011; Olesen *et al.* 2013; Loughborough *et al.* 2014). In a severe and acute onset of migraine headache it is possible for MEH to be considered or

differentiated from meningitis, it is usually relatively easy to exclude MEH as a primary diagnosis based on the signs of meningeal irritation amongst signs and symptoms of infection and mental changes (Colledge *et al.* 2010).

The differential diagnosis of hypertensive headache is not sufficiently supported by the history given in case 1 (Liman, Siebert and Endres 2010). The blood pressure is slightly elevated however it is still within normal ranges, even though symptoms of hypertensive headache are not always proportional to the extent of elevation in blood pressure. The history does not indicate adequate ground for the diagnosis of hypertensive headache (Colledge *et al.* 2010).

Sinusitis is a weak differential diagnosis for case 1. Sinusitis may present with signs and symptoms of infection which are associated with a headache. The presence of meningeal irritation and changes in mental status renders the diagnosis of sinusitis less likely (Hickner 2012). Sinusitis may be associated with meningitis but in case 1 there is no mention of signs or symptoms of involvement of the para-nasal sinuses (Longmore *et al.* 2010).

Glaucoma is weak differential diagnosis, based on the information given in case 1, which would be more suggestive of systemic causes for the headache. Little information was supplied relating to ocular signs and symptoms of glaucoma (Longmore *et al.* 2010; Quigley 2011).

Post-concussive syndrome is a weak differential diagnosis for case 1. Patients with post-concussive syndrome may present with some confusion and altered mental status examination as well as some neck stiffness as described in case 1 (Lundin *et al.* 2006). However post-concussive syndrome should be excluded as a differential diagnosis for case 1 as there was no mention of any history of acute trauma or any indication of previous traumatic brain injury. Patients with post-concussive syndrome are not likely to present with a fever (Lundin *et al.* 2006; Bigler 2008).

The consideration of temporal cell arteritis based on the information given in case 1 is not appropriate (Borchers and Gershwin 2012). Even though the rare manifestation of temporal cell arteritis may present with symptoms of transient

ischaemic attacks which may present with neurological symptoms, the distinct characteristics given in case 1 (fever, mental changes, signs of meningeal irritation) should suggest differential diagnoses more along the lines of infectious or haemorrhagic causes (Colledge *et al.* 2010; Borchers and Gershwin 2012).

TTH is a weak differential diagnosis for meningitis as described in case 1. TTH does not present with a fever or mental changes (Olesen *et al.* 2013). TTH is a primary headache disorder which should be diagnosed by exclusion; if any features of systemic diseases are present the possibility of TTH becomes unlikely (Olesen *et al.* 2013).

Cluster headache is a weak differential diagnosis as the history given in case 1 does not support the characteristic episodic and cluster attacks of cluster headache (Wood 2011).

HIV encephalopathy is a weak differential diagnosis. Even though the onset of meningoencephalitis due to seroconversion of the HIV is rare it may be considered as a differential diagnosis. However the information in case 1 states “advanced HIV disease diagnosed 3 years ago” which would mean that seroconversion has passed which make it less likely, the consideration of encephalopathy would more likely be due to other systemic causes (Longmore *et al.* 2010).

TB can spread and cause tuberculous meningitis (Loughborough *et al.* 2014; Zueter and Zaiter 2015). Tuberculous meningitis is a strong differential diagnosis.

The majority of the participants selected appropriate differential diagnoses for case 1 which show an accurate understanding of the presentation of meningitis as described in case 1. The wide variety of differential diagnoses given is concerning as more than half of the differential diagnoses are considered as weak. The selection frequencies for those differential diagnoses are relatively low which indicates that most of the weak differential diagnoses were selected by the minority of the participants.

4.3.1.3 Consideration of further investigations for case 1

4.3.1.3.1 Results for “Would you consider further investigations for this patient?”

The majority of the participants (85.7% (54)) indicated that they would consider further investigations necessary for the patient described in case 1 (Table 14).

Table 14: summary of consideration of further investigations for case 1

Q1.3) “Would you consider further investigations for this patient?”	Answer	N	Column N %
	No	9	14.3%
	Yes	54	85.7%

4.3.1.3.2 Discussion of “Would you consider further investigations for this patient?”

The presence of red flag signs and symptoms in case 1 justifies the need for further investigations to confirm the diagnosis and manage the condition appropriately (McGeeney 2009; Loughborough *et al.* 2014). Meningitis should not be treated by a chiropractor. Investigations can be used to confirm that there is a serious cause of headache and that referral is required. The presence of red flag signs and symptoms in case 1 could have made some participants refer the patient directly to the appropriate medical practitioner. Therefore some of the participants might not have considered investigations necessary and this could account for why some participants chose not to do further investigations for this case.

4.3.1.3.3 Investigations specified for case 1

4.3.1.3.4 Results for “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

A total of 11 different investigations were selected by those who indicated that they would consider further investigations. Of those who did indicate (85.7% (54)) that

they would consider further investigations, the majority (74.1% (40)), indicated that they would send the patient described in case 1 for haematological testing (e.g. FBC, ESR etc.). Referral for MRI was the second most commonly chosen investigation with a selection frequency of 37% (20) and referral for CT selected by 20.4% (11) of those who considered further investigations necessary (Table 15).

Table 15: further investigations considered for case 1

Q1.3) "Would you consider further investigations for this patient?"	Responses		Percentage of sample
	N	Percentage	
Autoimmune tests	3	2.5%	5.6%
Coagulation profile	6	5.0%	11.1%
Refer for CT	11	9.1%	20.4%
Glucose metabolism	1	0.8%	1.9%
Haematology (e.g. FBC, ESR etc.)	40	33.1%	74.1%
Liver function test	8	6.6%	14.8%
Refer for MRI	20	16.5%	37.0%
Tumour markers	7	5.8%	13.0%
Urinalysis	10	8.3%	18.5%
X-ray	7	5.8%	13.0%
Refer for lumbar puncture	8	6.6%	14.8%
Total	121	100.0%	224.1%

4.3.1.3.5 Discussion of "Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)"

To confirm meningitis a LP is required. Even though it is more common for an individual infected with HIV and advanced immune suppression to contract cryptococcal meningitis one must confirm these suspicions with appropriate investigations (Longmore *et al.* 2010; Loughborough *et al.* 2014). Very few of the participants who considered further investigations selected a LP. If meningitis is suspected based on clinical findings, the patient should be referred for a LP along with appropriate medical management as soon as possible.

Haematological testing may be of use to indicate potential findings of systemic pathology; it has good sensitivity however it is not specific enough to isolate one particular condition, especially not in the context of case 1. The use of

haematological testing is therefore a reasonable test to consider as it would aid in establishing if any other possible differential diagnoses or risk factors should be considered or excluded which could aid to direct further investigations if necessary (Longmore *et al.* 2010).

Neuroimaging may be used to detect any neurological lesions factor when neuroimaging won't confirm meningitis. However, if focal neurological signs and/or symptoms are present neuroimaging is required to determine where the deficit is originating from. Neuroimaging may be used to exclude differential diagnoses such as brain tumours, CVA and intracranial haemorrhage. If raised intracranial pressure is suspected, neuroimaging is required to determine if a LP is contra-indicated (Clinch 2001; Chew *et al.* 2014; Liebeskind 2014).

Coagulation profile is not of any use to diagnose meningitis. If septicaemia is associated with the meningitis the coagulation profile may be useful to determine if the patient has a risk of haemorrhage. The coagulation profile can indicate if the lumbar puncture is contra-indicated (Colledge *et al.* 2010)

Plain film X-ray would be of minimal use in context of the patient described in case 1, unless involvement of the sinuses or physical deformities are suspected, which the information in case 1 does not stipulate. It would not be of any benefit considering that there are more pressing investigations required (Kumar *et al.* 2007; Ackland and Cameron 2012).

On the basis that a brain tumour is a less likely diagnosis in case 1, the use of tumour markers are also less relevant however they may be of more relevance if other investigations are negative (Greenberg *et al.* 1999; Longmore *et al.* 2010).

With the history as described in case 1 it is not clear why autoimmune testing would be considered as an investigation. None of the diagnoses or differential diagnoses listed by the participants indicate the suspicion of autoimmune conditions which would suggest that it is not an adequate investigation in this context.

The use of glucose metabolism tests in meningitis is not of specific diagnostic value however the clinician can use glucose metabolism investigations to monitor co-morbidities and the impact they might have on the management of meningitis (Longmore *et al.* 2010).

LFT is an appropriate investigation if meningitis is present to determine the effect of systemic involvement; however a LFT is not diagnostic of meningitis (Colledge *et al.* 2010; Longmore *et al.* 2010; Loughborough *et al.* 2014).

The use of urinalysis in meningitis is not of specific diagnostic value in the setting as described in case 1; however it is used to determine the impact of meningitis on the physiological balance of the patient. For these purposes urea and electrolyte levels are more useful means of assessment (Longmore *et al.* 2010).

The majority of the participants selected investigations which would indicate the presence of systemic pathology with good sensitivity however low specificity. These tests can therefore confirm that the condition investigated probably falls outside of the scope of practice of a chiropractor and requires referral. The sensitive but non-specific investigations can then be used by the appropriate health care provider to determine which specific investigations would be most valuable and continue management.

4.3.1.4 Treatment of patient in case 1 as a chiropractor

4.3.1.4.1 Results for “Would you treat this patient as a chiropractor at this stage”?

The majority of the participants (95.2% (60)) indicated that they would not treat the patient described in case 1 as a chiropractor (Figure 3).

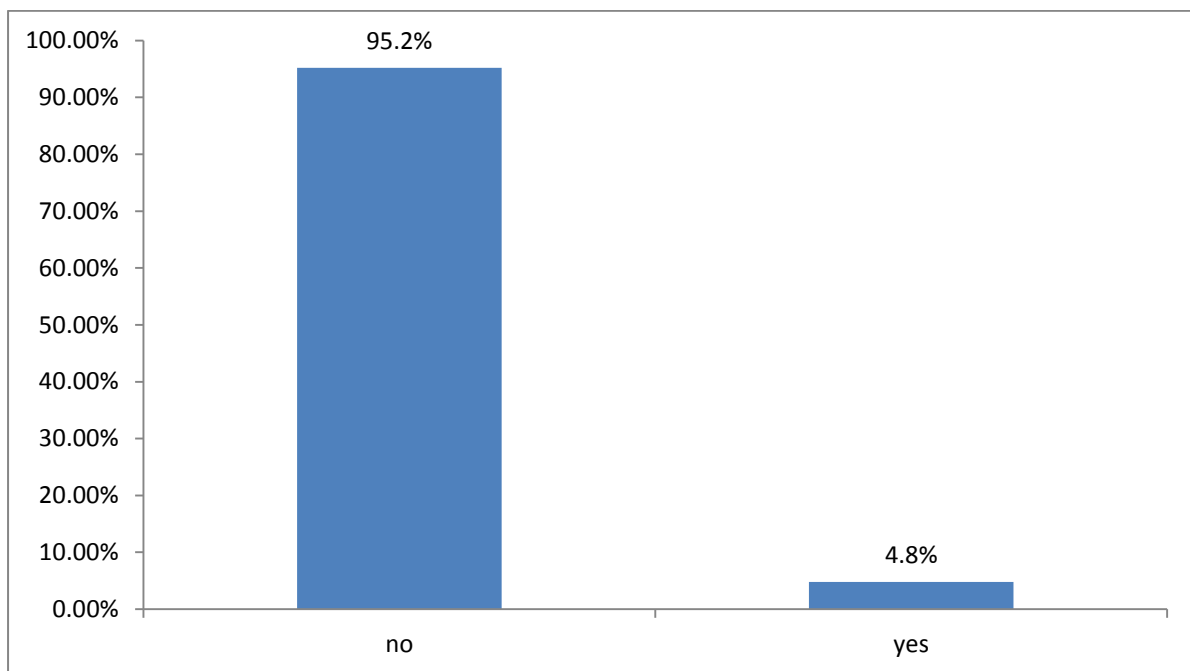


Figure 3: Treatment of patient described in case 1 as a chiropractor

4.3.1.4.2 Discussion of “Would you treat this patient as a chiropractor at this stage?”

The patient described in case 1 should be referred for urgent medical management, the primary presenting complaint (meningitis) is not a condition which chiropractors can treat. The fact that some participants indicated that they would treat the patient raises some concern as this could delay treatment of the primary presenting complaint.

4.3.1.5 Red flags detected in case 1

4.3.1.5.1 Results for “What sign and/or symptom in case 1 deters you from treating this patient?”

Four different signs and symptoms were listed as red flags by those who did not opt to treat the patient described in case 1. Fever was most frequently listed 76.7% (46), followed by the presence of neck stiffness (58.3% (35)) and symptoms of confusion or changes in mental status (45% (27)). The presence of HIV and/or a combination of a cd4 count of 22 cells/mm³ was regarded as a red flag by 6.7% (4) (Table 16).

Table 16: Red flags indicated for case 1

Q1.4.2) “What sign and/or symptom in case 1 deter you from treating this patient?”	Responses		Percentage of sample
	N	Percentage	
Fever	46	41.1%	76.7%
Confusion/ changes in mental status	27	24.1%	45.0%
Neck stiffness	35	31.3%	58.3%
HIV/cd4 count	4	3.6%	6.7%
Total	112	100.0%	186.7%

4.3.1.5.2 Discussion of “What sign and/or symptom in case 1 deter you from treating this patient?”

The signs and/or symptoms which deterred the participants from treating the patient described in case 1 were the following:

- Fever was the most commonly indicated red flag which is an appropriate response as a fever could indicate systemic infection (Loughborough *et al.* 2014).
- Confusion/changes in mental status indicates possible neurological involvement which requires further investigation as the causes thereof could be potentially life complicating or threatening (Clinch 2001).
- Neck stiffness as described in case 1 “neck stiffness during active and passive neck flexion” may very well be regarded as a benign musculoskeletal complaint however in context of the other information given it should be seen

as a red flag and indicate possible meningeal irritation (Clinch 2001; Lamont, Alias and Win 2003).

- HIV/cd4 count which is below the normal value should increase the suspicion that systemic infections are more likely to be present and further examination is required (Longmore *et al.* 2010).

The red flags which were identified by the participants were accurate and are established signs and/or symptoms of concern (Clinch 2001; Lamont, Alias and Win 2003; Colledge *et al.* 2010; Longmore *et al.* 2010). The majority of the participants were capable of detecting red flags accurately.

4.3.1.6 Referral of the primary presenting complaint for case 1

4.3.1.6.1 Results for “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?” “If you answered no to question 1.4.1 please continue to answer question 1.5.1”

A total of 95.2% (60) of the participants referred the patient in case 1 for the primary presenting complaint of which 50% (30) opted to refer the patient to a general practitioner, 41.7% (25) to a neurologist and 8.3% (5) chose to refer the patient to a hospital for admission (Table 17).

Table 17: Referral for primary presenting complaint for case 1

		N	Column N%
Q1.5.1) “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”	General practitioner	30	50.0%
	Neurologist	25	41.7%
	Hospital for admission	5	8.3%
Total		60	95.2%

4.3.1.6.2 Discussion of “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

The referral of the patient to a general practitioner, neurologist or to the hospital would all be appropriate for continuing management of the patient as the

management of meningitis falls within their scope of practice. This indicates that the majority of the participants used appropriate sources for referral of the patient described in case 1.

4.3.1.7 Referral for co-management for case 1

4.3.1.7.1 Results for one “Would you refer this patient for co-management?” “If you answered yes to question 1.4.1 please continue to answer question 1.5.2”

More than one option could have been selected by each participant for this question. Three complied with this option. The options chosen for co-management were equally distributed with referrals to a general practitioner, a homeopath and a neurologist.

Two of the participants who indicated that they referred the patient for the primary presenting complaint also selected options in the co-management section. Thus the total amount of participants who responded for question 1.5.2 was five participants, which selected a total of six options. Thus the percentage of sample in Table 16 is based on five participants (Table 18).

Table 18: Referral for co-management for case 1

Q1.5.2) “Would you refer this patient for co-management?”	Responses		Percentage of sample
	N	Percentage	
General practitioner	2	33.3%	40.0%
Homeopath	2	33.3%	40.0%
Neurologist	2	33.3%	40.0%
Total	6	100.0%	120.0%

4.3.1.7.2 Discussion of “Would you refer this patient for co-management?”

The selected health care providers for co-management were GP, neurologist and homeopath. A GP and neurologist would be sufficient to continue management of the patient. In the acute setting the evidence for management of meningitis by a

homeopath is not currently recommended (Loughborough *et al.* 2014; Zueter and Zaiter 2015).

The selection of co-management by a chiropractor is not appropriate during the acute stage of meningitis as described in case 1 (Kumar *et al.* 2007; Colledge *et al.* 2010; Longmore *et al.* 2010; Loughborough *et al.* 2014; Zueter and Zaiter 2015). In context of case 1, co-management in terms of treatment the chiropractor can offer the patient is limited.

4.3.2 Results and discussion of question 2 (case 2 – TTH)

4.3.2.1 Primary diagnosis for case 2

4.3.2.1.1 Results for “What is your primary diagnosis (select only one)”

Case 2 was diagnosed as a CEH by 49.2% (31) of the participants and 38.1% (24) diagnosed case 2 as a TTH with 6.3% (4) for each of MEH and cluster headache (Figure 4).

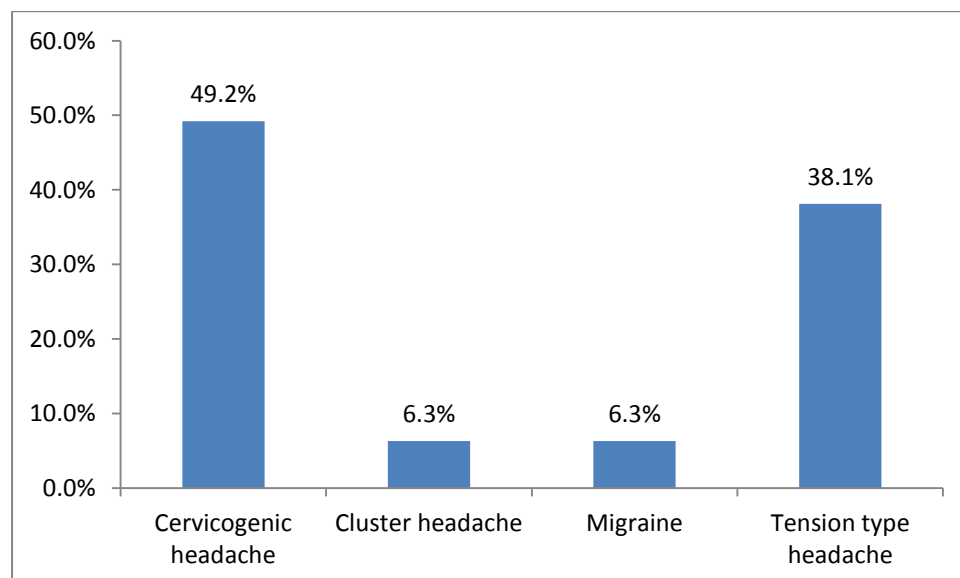


Figure 4: Primary diagnosis for case 2

4.3.2.1.2 Discussion of “What is your primary diagnosis (select only one)”

Case two described a TTH. The majority of the participants incorrectly diagnosed case 2 as a CEH. TTH and CEH may present similarly in a clinical setting (Vincent 2010). MEH could also present similarly to TTH (Bigal and Lipton 2005; Vincent 2010). The primary diagnoses given for case 2 support the controversies in the literature with regard to the clinical diagnosis of primary headache disorders such as TTH (Vincent 2010). Primary headache disorders often present similarly; these headaches are considered when secondary causes are absent and investigations are mostly used to exclude any secondary causes. Thus to distinguish between the primary headaches the clinician relies mostly on clinical findings which can often present with minor differences (Bigal and Lipton 2005; Crystal and Robbins 2010; Vincent 2010).

All of the headaches chosen for the primary diagnosis of case 2 are classified as primary headaches (Wood 2011; Olesen *et al.* 2013). The diagnoses are adequate in the sense that no one suspected a secondary cause for the headache. The participants did show a lack of consensus terms of diagnosing the primary headache disorder specifically.

The following signs and symptoms from case 1 formed part of the diagnostic criteria for TTH (Olesen *et al.* 2013):

- “headache episodes lasting for 12 to 48 hours”
- “pain had a constrictive character and frontal bilateral localization”
- “The frequency of these episodes was between two and four per month”
- “mentioned no accompanying symptoms such as photophobia, vertigo or nausea”

4.3.2.2 Differential diagnoses of TTH

4.3.2.2.1 Results for “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”

A total of nine different types of headaches were selected by the participants as differential diagnoses for case 2. The top three differential diagnoses selected by the participants were TTH (54% (34)), CEH (41.3% (26)) and MEH (22.2% (14)) (Table 19).

Table 19: Differential diagnoses for case 2

Q2.1) “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”	Responses		Percentage of sample
	N	Percentage	
Cervicogenic headache	26	24.8%	41.3%
Cluster headache	11	10.5%	17.5%
Glaucoma	1	1.0%	1.6%
Hypertensive headache	4	3.8%	6.3%
Migraine	14	13.3%	22.2%
Sinusitis	8	7.6%	12.7%
Temporal cell arteritis	1	1.0%	1.6%
Temporo-mandibular joint syndrome	6	5.7%	9.5%
Tension type headache	34	32.4%	54.0%
Total	105	100.0%	166.7%

4.3.2.2.2 Discussion of “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”

TTH was the most selected differential diagnosis followed by CEH, which indicates the similarity in the clinical presentation of these two headaches. TTH is consistent with the primary diagnosis for case 2 and CEH is an appropriate differential diagnosis to consider for TTH (Bigal and Lipton 2005; Crystal and Robbins 2010; Vincent 2010). Thus the majority of the participants selected appropriate differential diagnoses for case 2. MEH is an acceptable differential diagnosis when taken into context of the information given in case 2: “12 to 48 hours which could start at any time of the day; the intensity of pain was moderate to severe; The frequency of these episodes was between two and four per month”

Cluster headache is a weak differential diagnosis as the characteristic chronological pattern of cluster headaches or cluster attacks are not mentioned in the case history given for case 2 (Wood 2011).

Sinusitis should not be considered as one of the top three differential diagnoses as the evidence to support sinusitis as a differential diagnosis for case 2 is sparse (Hickner 2012). Case two did not mention any symptom present as being dull aching pain distributed over the frontal and/or maxillary sinus with associated tenderness of the overlying skin; post nasal drip or nasal discharge as associated with sinusitis (Longmore *et al.* 2010).

TMJ syndrome is a weak differential diagnosis to consider, the information in case 2 did not mention any signs or symptoms suggestive of dysfunction in the articular and supporting structures of the TMJ which would be characteristic of TMJ syndrome (Tsai and Heffer 2015).

Hypertensive headache is not supported by the information given in case 2, the blood pressure in case 2 is not classified as hypertension (Longmore *et al.* 2010). Glaucoma is a weak differential diagnosis based on the information given in case 2 as no signs and/or symptoms of ocular dysfunction were mentioned (Colledge *et al.* 2010; Quigley 2011). Temporal cell arteritis is as a differential diagnosis based on the information given in case 2 does not mention any signs or symptoms of visual changes, headache which is mostly localised to the ipsilateral temporal and occipital regions or the rare manifestation of hemiparesis (Borchers and Gershwin 2012). Therefore temporal cell arteritis is a weak differential diagnosis for case 2.

4.3.2.3 Consideration of further investigations for case 2

4.3.2.3.1 Results for “Would you consider further investigations for this patient?”

For this question one participant did not answer the question, thus the sample size for this question was 62. 76.2% (47) indicated that they would not consider further investigations as being necessary (Figure 5).

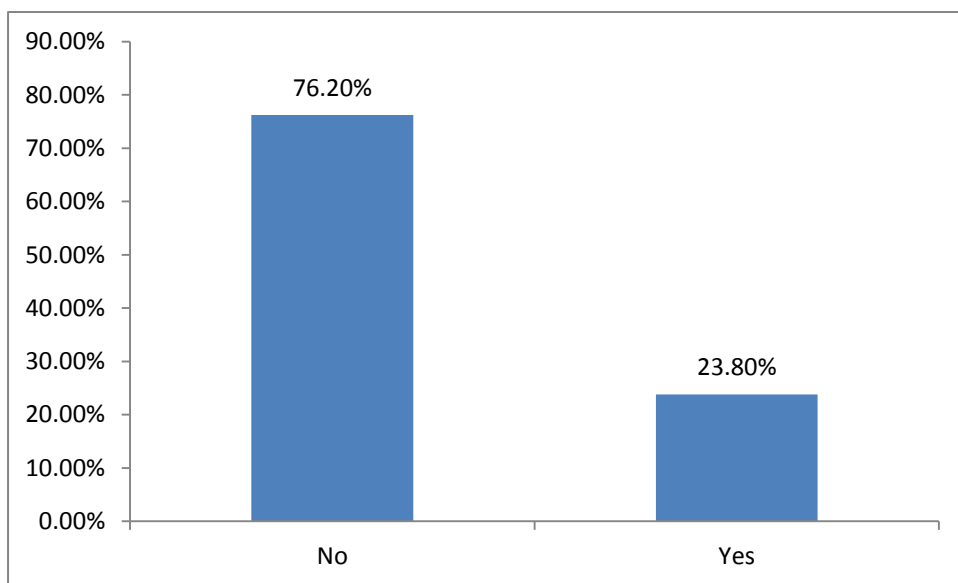


Figure 5: Consideration of further investigations for case 2

4.3.2.3.2 Discussion of two “Would you consider further investigations for this patient?”

No red flags were present to suggest that further investigations needed to be conducted. However, for purposes of excluding other conditions and to investigate for any structural causes for the symptoms, investigations may be of benefit to definitively exclude secondary causes for the headache.

4.3.2.3.3 Results for “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

A total of 14 participants opted to send for further investigations. A total of four different investigations were selected by the participants. The majority of those who considered further investigations necessary with 85.7% (12) selecting x-ray imaging, followed by haematology (14.3% (2)), allergy testing (7.1% (1)) and referral for MRI (7.1% (1)) (Table 20).

Table 20: Further investigations considered for case 2

Q 2.3) “Would you consider further investigations for this patient?”	Responses		Percentage of sample
	N	Percentage	
Allergy testing	1	6.3%	7.1%
Haematology (e.g. FBC, ESR etc.)	2	12.5%	14.3%
Refer for MRI	1	6.3%	7.1%
X-ray	12	75.0%	85.7%
Total	16	100.0%	114.3%

4.3.2.3.4 Discussion of “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

X-ray was the most commonly selected investigation; however, the use of x-ray has no specific diagnostic value for a TTH. It can only be used to exclude the possibility of a secondary cause for the headache or it can be used to identify a possible contra-indication to certain treatment options (Longmore *et al.* 2010; Ackland and Cameron 2012).

Haematology would mostly be of benefit for the patient described in case 2 to determine if any comorbid conditions may be present. It is not of specific diagnostic value, as primary headaches are diagnosed only when no secondary causes are suspected. If positive findings or abnormalities are detected it would warrant further investigation and could possibly suggest a cause for the headache other than TTH (Longmore *et al.* 2010).

No specific signs or symptoms were described in case 2 which would suggest that hypersensitivity reactions could be of significance in this case (Colledge *et al.* 2010). Any positive findings during testing for allergens may be considered an incidental finding. Referral for MRI based on the clinical presentation of the patient in case 2 is not warranted at this stage (Chew *et al.* 2014).

Case 2 can be diagnosed as a TTH based on clinical signs and/or symptoms of “headache episodes lasting for 12 to 48 hours; the pain had a constrictive character and frontal bilateral localization; the patient also reported concomitant pain in the cervical region; the intensity of pain was moderate to severe; the frequency of these episodes was between two and four per month; past medical history reveals no significant findings; the patient denies any previous trauma, and; during the physical examination the patient experienced moderate pain during forward neck flexion and tenderness to palpation of the sub-occipital muscles”

The vital signs in case 2 are within the normal parameters. Investigations are not necessary as the clinical presentation is consistent with the diagnostic criteria of a TTH (Olesen *et al.* 2013). When the clinical presentation leaves the clinician with doubt further investigations could aid with clarification of the diagnosis (Vincent 2010; Chowdhury 2012). This could indicate that the majority of the participants were cautious to diagnose case 2 only based on the clinical presentation and requested further investigations to exclude a secondary cause for the headache.

4.3.2.4 Treatment of patient described in case 2 as a chiropractor

4.3.2.4.1 Results for “Would you treat this patient as a chiropractor at this stage?”

The majority of the participants (98.4% (62)) indicated that they would treat the patient described in case 2 as a chiropractor (Figure 6).

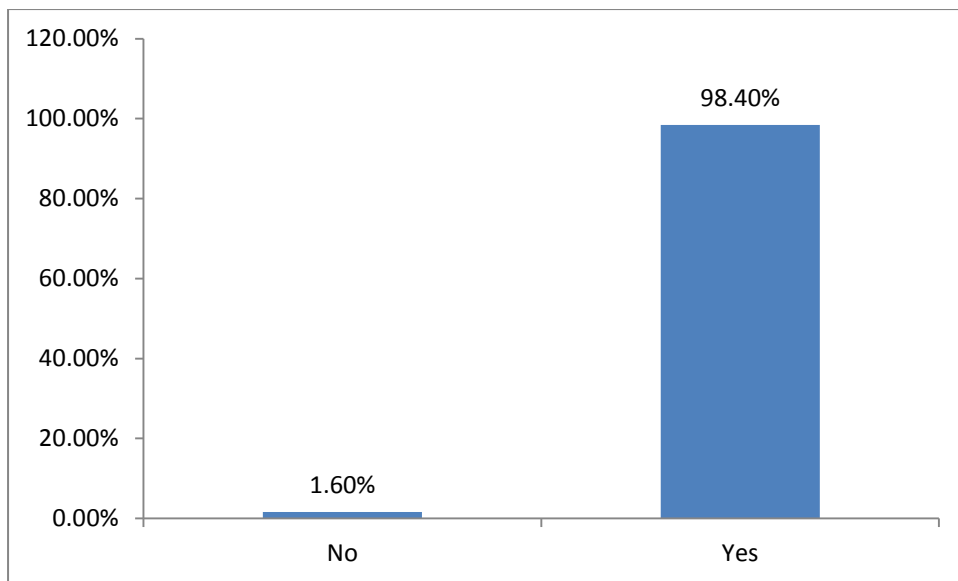


Figure 6: Treatment of patient described in case 2 as a chiropractor

4.3.2.4.2 Discussion of “Would you treat this patient as a chiropractor at this stage?”

TTH is a condition which has some evidence to suggest that treatment according to the scope of chiropractic could be of benefit (Bigal and Lipton 2005; Chen 2009; Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011; Ohlsen 2012). The majority of the participants indicated that they would treat the patient as a chiropractor even though a large portion of the participants misdiagnosed case 2. This can be explained by most of the sample misdiagnosing case 2 as a CEH which can be treated by chiropractors (Austin 2002; Gallagher 2007; van Duijn, van Duijn and Nitsch 2007; Bogduk and Govind 2009; Bryans *et al.* 2011) followed by MEH which can be treated by chiropractors (Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012). 6.3% (4) of the participants misdiagnosed case 2 as a cluster headache which has limited evidence of positive treatment outcomes from chiropractic, however only 1.6% (1) of the participants indicated that he/she would not treat the patient described in case 2. This could indicate that some of the participants expect positive results for the treatment of a cluster headache.

4.3.2.5 Red flags and referral for primary presenting complaint in case 2

4.3.2.5.1 Results for “What sign and/or symptom in case 2 deters you from treating this patient?” And “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

1.6% (1) of the participants decided not to treat the patient described in case 2. The symptom which deterred the participant from not treating was not specified. A neurologist was the preferred choice of referral. The participant who did not opt to treat the patient did not specify which signs and/or symptoms deterred him/her (Table 21).

Table 21: Red flags indicated and referral pattern of primary presenting complaint for case 1

		N	Percentage
Q2.4.2) “What sign and/or symptom in case 2 deters you from treating this patient?”	Not specified	1	100.0%
Q2.5.1) “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”	Neurologist	1	100.0%

4.3.2.5.2 Discussion of “What sign and/or symptom in case 2 deters you from treating this patient?” And “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

A neurologist was the health care provider of choice to refer the patient to, which could possibly indicate that the participant had concerns of neurological significance to be addressed or he/she felt that the condition is best managed by a neurologist rather than a chiropractor.

4.3.2.6 Co-management of case 2

4.3.2.6.1 Results of “Would you refer this patient for co-management?”

98.4% (62) of the participants completed the co-management section for case 2. The majority (72.6% (45)) decided not to refer the patient described in case 2 for co-management. Second most selected was referral to a massage therapist (12.9%

(8)) and third most selected was referral to a homeopath (11.3% (7)). A total of six different health care professions were selected (Table 22).

Table 22: Referral for co-management for case 2

Q2.5.2) "Would you refer this patient for co-management?"	Responses		Percentage of sample
	N	Percentage	
No	45	67.2%	72.6%
Biokineticist	3	4.5%	4.8%
General practitioner	2	3.0%	3.2%
Homeopath	7	10.4%	11.3%
Massage therapist	8	11.9%	12.9%
Physiotherapist	1	1.5%	1.6%
Psychologist	1	1.5%	1.6%
Total	67	100.0%	108.1%

4.3.2.6.2 Discussion of "Would you refer this patient for co-management?"

The majority selected not to refer the patient for co-management which indicates that they feel the patient would receive adequate management from a chiropractor. A chiropractor can treat a TTH (Chen 2009; Bendtsen and Fernández-de-la-Peñas 2011; Cathcart *et al.* 2012; Ohlsen 2012; Bendtsen 2013).

All of the selected health care providers could potentially benefit the patient described in case 2. A massage therapist could aid with the muscular component of a TTH and relieve stress which is associated with a TTH (Bigal and Lipton 2005). A homeopath may offer alternative medication and therapy for a patient with TTH; homeopaths are known for taking an in depth personal and medical history which could aid in identifying the triggers for stress in a patient with TTH (Chen 2009). A biokineticist could offer apt rehabilitation protocols for cervical musculature as well as general exercise therapy. This could aid with increasing dynamic and static stability of the cervical spine as well as combating stress for the patient described in case 2 (Bigal and Lipton 2005; Chen 2009; Cathcart *et al.* 2012).

A GP is an appropriate health care provider to co-manage the patient described in case 2 as the combination of medication for pain relief or stress management combined with musculoskeletal management may benefit the patient (Bendtsen

2009). A physiotherapist may be used to concentrate on both the rehabilitation as well as the soft tissue therapy for a patient with TTH which is appropriate (Bigal and Lipton 2005; Chen 2009; Cathcart *et al.* 2012). A psychologist is an appropriate option for co-management as a psychologist could aid with the identification and management of emotional stress which could be associated with TTH (Chen 2009).

The use of co-management depends on which treatment interventions participants believe is necessary for the patient described in case 2 and which treatment interventions the participants would apply in their practice. Some might use a wide variety of manipulative and auxiliary therapies. Some might only use manipulative therapies and therefore refer the patient to other health care providers to receive treatments which some of the other participants might have done themselves. This could be because some of the participants prefer to only use one treatment intervention in their practice or because they might believe that other health care providers could be more effective at utilising certain treatment modalities.

4.3.3 Results and discussion of question 3 (case 3 – MEH)

4.3.3.1 Primary diagnosis of case 3

4.3.3.1.1 Results for “What is your primary diagnosis (select only one)”

The primary diagnosis for case 3 was diagnosed as a MEH by 77.8% (49) of the participants, 9.5% (6) diagnosed a cluster headache followed by 7.9% (5) diagnosing a CEH. TTH was regarded as the primary diagnosis for case 3 by 3.2% (2) of the participants and 1.6% (1) diagnosed temporal cell arteritis (Figure 7).

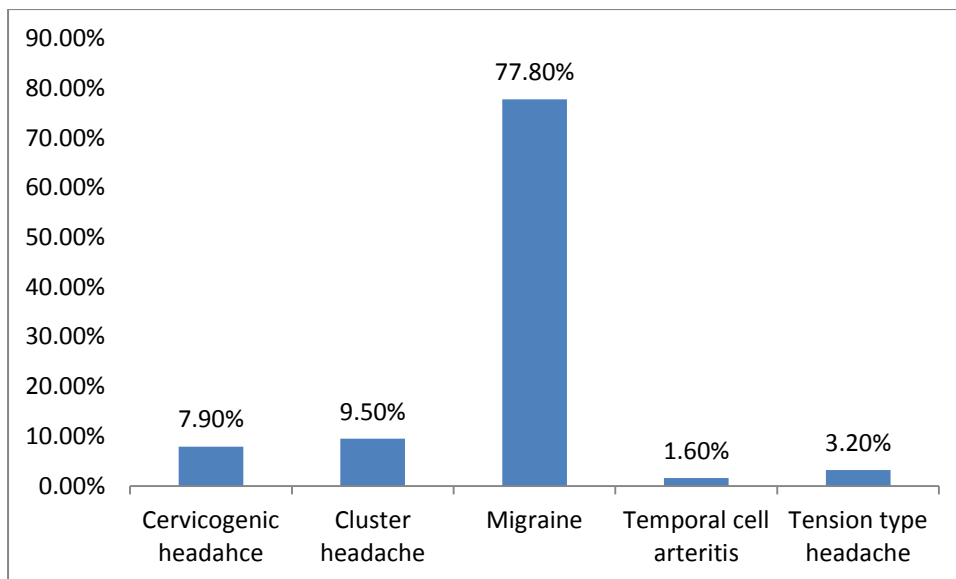


Figure 7: Primary diagnosis of case 3

4.3.3.1.2 Discussion of “What is your primary diagnosis (select only one)”

The majority of the participants diagnosed case 3 correctly as MEH. Symptoms of MEH described in case 3 such as: “unilateral pain in the right neck that spread to the postorbital region on the same side, the attacks occur six to 12 times per year and lasting as long as 24 hours; The pain can start at any time during the day” And “At maximum the pain was pulsatile and accompanied by photophobia, phonophobia and occasional nausea” are consistent with the diagnostic criteria for a MEH (Lipton 2011; Olesen *et al.* 2013). The other primary diagnoses that were given (Cluster, CEH and TTH) by the minority of the participants are headaches which should be differentiated from MEH (Wood 2011; Olesen *et al.* 2013). Temporal cell arteritis was selected by 1.6% (1) which is not an accurate primary diagnosis as no mention of jaw pain particularly when chewing; visual changes or rare manifestations of transient ischaemic attacks, brainstem infarcts and hemiparesis (Colledge *et al.* 2010; Borchers and Gershwin 2012).

4.3.3.2 Differential diagnosis of case 3

4.3.3.2.1 Results for “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”

A total of 10 different differential diagnoses were selected by the participants for case 3. The majority of the participants selected CEH as a differential diagnosis followed by 34.9% (22) with cluster headache and 33.3% (21) selecting TTH (Table 23).

Table 23: Differential diagnoses for case 3

Q3.2) “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”	Responses		Percentage of sample
	N	Percentage	
Brain tumour	4	3.3%	6.3%
Cervicogenic headache	41	34.2%	65.1%
Cluster headache	22	18.3%	34.9%
Hypertensive headache	2	1.7%	3.2%
Migraine headache	10	8.3%	15.9%
Post-concussive syndrome	1	0.8%	1.6%
Temporal cell arteritis	8	6.7%	12.7%
Temporo-mandibular joint syndrome	5	4.2%	7.9%
Tension type headache	21	17.5%	33.3%
Trigeminal neuralgia	6	5.0%	9.5%
Total	120	100.0%	190.5%

4.3.3.2.2 Discussion of “Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)”

CEH was the most commonly selected differential diagnosis, CEH may occasionally have a similar presentation as MEH (Vincent 2010; Olesen *et al.* 2013). Features of “photophobia, phonophobia and occasional nausea” are more often associated with a diagnosis of MEH than CEH (Olesen *et al.* 2013).

Cluster headache usually presents with a very specific and time consistent pattern (May and Goadsby 2001; Haas *et al.* 2004). The information in case 3 adheres to some of the characteristics of a cluster headache such as the post-orbital pain and

episodic occurrence throughout the year; however these are symptoms which could present in most primary headaches. The characteristic chronological pattern and cluster attacks of a cluster headache were not described making a diagnosis of cluster headache less likely. Cluster headache is a differential to consider for a MEH and should be differentiated from other primary headaches (May and Goadsby 2001; Colledge *et al.* 2010; Longmore *et al.* 2010; Wood 2011).

TTH is an appropriate differential diagnosis to consider for MEH. However, the patient described in case 3 presents with aura features (Olesen *et al.* 2013). According to the diagnostic criteria of TTH, either photophobia or phonophobia could be present but not both and TTH does not present with nausea which should exclude the TTH as a differential diagnosis (Olesen *et al.* 2013).

MEH is consistent with the primary diagnosis for case 3; it is a good indication that MEH was at least considered in the list of differential diagnoses by those who did not list it as their primary diagnosis.

Temporal cell arteritis based on the information given in case 3 is a weak differential diagnosis as no jaw pain, visual changes or rare manifestations of hemiparesis were described in case 3 (Colledge *et al.* 2010; Borchers and Gershwin 2012). Trigeminal neuralgia is a weak differential diagnosis based on the information given in case 3 as no trigger factors, facial spasm or sharp “stabbing” unilateral pain was mentioned (Longmore *et al.* 2010; Leclercq, Thiebaut and Héran 2013).

TMJ syndrome is a possible differential diagnosis to consider for primary headache disorders however the aura symptoms described in case 3 would exclude or at least make TMJ syndrome a weak differential diagnosis (Tsai and Heffer 2015).

A brain tumour should not be discarded as a differential diagnosis altogether but is not a likely diagnosis for the patient described in case 3 (Greenberg *et al.* 1999; Kumar *et al.* 2007; Colledge *et al.* 2010). No signs and/or symptoms of a progressing headache, focal neurological deficit, personality changes or meningeal irritation are described in case 3 which are some of the symptoms characteristic of a brain tumour (Greenberg *et al.* 1999; Colledge *et al.* 2010; Longmore *et al.* 2010).

Hypertensive headache is not supported as a differential diagnosis based on the information provided in case 3. The blood pressure in case 3 is not classified as hypertension (Colledge *et al.* 2010; Liman, Siebert and Endres 2010).

Post-concussive syndrome is highly unlikely due to the chronicity of the headache described in case 3 accompanied by no history of previous concussion or trauma, and is therefore not an appropriate differential diagnosis (Lundin *et al.* 2006; Bigler 2008).

The majority of the participants selected appropriate differential diagnoses (CEH and TTH) for case 3.

4.3.3.3 Consideration of further investigations for case 3

4.3.3.3.1 Results for “Would you consider further investigations for this patient?”

For case 3 61.9% (39) did not consider further investigations to be necessary (Table 24).

Table 24: Consideration of further investigations for case 3

		N	Percentage
Q3.3) “Would you consider further investigations for this patient?”	No	39	61.9%
	Yes	24	38.1%

4.3.3.3.2 Discussion of “Would you consider further investigations for this patient?”

MEH is a clinical diagnosis which does not require investigations (Longmore *et al.* 2010; Olesen *et al.* 2013). Investigations may be used to detect comorbidities or exclude other causes for the headache. No definitive indications were described in case 3 which would make investigations essential. There is limited evidence in case 3 to suggest that a co-morbid condition is present. Investigations for a MEH are not

of specific diagnostic value for a MEH. Therefore the majority of the sample responded appropriately.

4.3.3.4 Investigations considered for case 3

4.3.3.4.1 Results for “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

38.1% (24) considered further investigations necessary, a total of seven different investigations were chosen for case 3. Of those 24 respondents the most commonly selected investigations were x-ray imaging (54.2% (13)), followed by referral for a MRI 37.5% (9) and allergy testing 20.8% (5) (Table 25).

Table 25: further investigations considered for case 3

Q3.3) “Would you consider further investigations for this patient?”	Responses		Percentage of sample
	N	Percentage	
Allergy testing	5	13.9%	20.8%
Autoimmune tests	1	2.8%	4.2%
Refer for CT	4	11.1%	16.7%
Diagnostic ultrasound	2	5.6%	8.3%
Haematology (e.g. FBC, ESR etc.)	2	5.6%	8.3%
Refer for MRI	9	25.0%	37.5%
X-ray	13	36.1%	54.2%
Total	36	100.0%	150.0%

4.3.3.4.2 Discussion of “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

Plain film radiography (x-ray) would mainly be used to exclude a secondary cause for the headache (Ackland and Cameron 2012). From a perspective of a clinician who uses manual therapies as a potential treatment approach, the use of x-ray could be of importance to exclude possible contra-indications to SMT, especially when applied to the cervical spine.

As MEH is a clinical diagnosis the use of MRI and CT is not necessarily required and may incur unnecessary expenses for the patient. If other investigations show non-specific abnormalities these neuroimaging tools may be useful to perform more specific investigations (Longmore *et al.* 2010; Olesen *et al.* 2013; Chew *et al.* 2014).

Based on the information provided in case 3 it is not clear why allergy testing was considered as specific indicators of hypersensitivity reactions were not mentioned. Diagnostic ultrasound would be of minimal diagnostic value in the patient described in case 3. Duplex ultrasonography may however be used to ascertain if any vascular compromise is present, of particular interest would be the carotid arteries or vertebral arteries, to assess for contra-indications to SMT or a possible secondary cause for the headache. However no diagnoses or differential diagnoses were listed by the participants which would involve the carotid or vertebral arteries, thus it is unlikely that diagnostic ultrasound was selected for purposes of excluding secondary causes for the headache (Longmore *et al.* 2010).

Haematology may be useful to detect if any comorbid or systemic pathologies are present. It is not confirmatory of MEH but may be used to exclude secondary causes for the headache. Based on the information given in case 3 it is not clear why autoimmune tests are of relevance, no diagnoses or differential diagnoses were listed by the participants for which autoimmune tests may have been useful (Longmore *et al.* 2010).

4.3.3.5 Treatment of patient in case 3 as a chiropractor, and red flags And referral for the primary presenting complaint

4.3.3.5.1 Results for “Would you treat this patient as a chiropractor at this stage?”, “What sign and/or symptom in case 3 deters you from treating this patient?” and “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

For case 3 95.2% (59) indicated that they would treat the patient described in case 3. 4.8% (3) of the participants indicated that they would not treat the patient. The reasons for not treating the patient were: post-orbital pain, low body mass index and

one unspecified reason. All of the 4.8% (3) who chose not to treat the patient indicated that they would refer the patient to a neurologist (Table 26).

Table 26: Treatment of patient as a chiropractor, red flag symptoms, and referral of patient for primary presenting complaint for case 3

	Answer	N	Percentage
Q3.4.1) "Would you treat this patient as a chiropractor at this stage?";	No	3	4.8%
	Yes	59	95.2%
Q3.4.2) "What sign and/or symptom in case 3 deters you from treating this patient?"	Post-orbital pain	1	33.3%
	Low body mass index	1	33.3%
	Not specified	1	33.3%
Q3.5.1) "Would you refer this patient to another health care professional for the patient's primary presenting complaint?"	Neurologist	3	100.0%

4.3.3.5.2 Discussion of "Would you treat this patient as a chiropractor at this stage?"

The current research suggests that in some cases chiropractic treatment may be useful for MEH however further high quality research is required (Harris 2005; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012).

As the exact pathogenesis of MEH has not yet been established specific treatment is difficult. The majority of the participants would treat the patient described in case 3 for the primary presenting complaint. Thus during the time of data collection for this study the participants potentially would expect improvement for the patient in case 3, more research into the efficacy of chiropractic management of MEH would be useful as it is currently being used to treat patients with MEH (as described in case 3) in the sample which was investigated.

4.3.3.5.3 Discussion of "What sign and/or symptom in case 3 deters you from treating this patient?"

The patient described in case 3 has a body mass index (BMI) of 24 Kg/m² which is considered a normal BMI and is not a red flag symptom (Longmore *et al.* 2010).

Post orbital pain in the context of case 3 is not considered a red flag as it can be part of the symptoms perceived with a MEH pain distribution or aura symptoms (Olesen *et al.* 2013).

4.3.3.5.4 Discussion of “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

All three of those who chose not to treat the patient as a chiropractor indicated that they would refer the patient to a neurologist for the primary diagnosis. A neurologist is an appropriate health care provider for the treatment of MEH.

4.3.3.6 Referral of the patient described in case 3 for co-management

4.3.3.6.1 Results for “Would you refer this patient for co-management?”

50% (30) indicated that they would not refer the patient for co-management. A total of five different health care providers were chosen to co-manage the patient described in case 3. The most common health care provider chosen for co-management was a homeopath (26.7% (16)) followed by a general practitioner (20% (12)) and a neurologist (13.3% (8)) (Table 27).

Table 27: Referral for co-management for case 3

Q3.5.2) “Would you refer this patient for co-management?”	Responses		Percentage of sample
	N	Percentage	
No	30	43.5%	50.0%
General practitioner	12	17.4%	20.0%
Homeopath	16	23.2%	26.7%
Massage therapist	2	2.9%	3.3%
Neurologist	8	11.6%	13.3%
Physiotherapist	1	1.4%	1.7%
Total	69	100.0%	115.0%

4.3.3.6.2 Discussion of “Would you refer this patient for co-management?”

Half of the participants indicated that they do not consider co-management of the patient necessary. Evidence is suggestive that there might be effective outcomes of

chiropractic management of MEH (Harris 2005; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011; Hubbard and Kane 2012). Chiropractic care is considered a generally safe and conservative treatment option with rare complications, thus it may be beneficial to the patient to attempt chiropractic management provided that the patient is educated on the prognosis expected and possible rare complications of treatment.

A homeopath may provide an alternative approach to treatment of a patient with a MEH, homeopaths are known to thoroughly investigate life style factors. Some evidence suggests that patients with a MEH may benefit from homeopathic treatment (Witt, Lüdtkke and Willich 2010).

A general practitioner could be useful in the management of MEH, allopathic treatment has varying results in the treatment of MEH, the combination of chiropractic and allopathic treatment of a patient with MEH may be favourable (Longmore *et al.* 2010).

A neurologist is a specialist of neurological conditions which frequently deals with patients suffering from MEH. The combined treatment of neurologists and chiropractors could possibly in theory be of benefit to the patient with MEH (DePietro 2013).

A massage therapist could be of use for a patient with MEH, frequent massage therapy of 45 minutes duration on a weekly basis has been shown to be of benefit (Bryans *et al.* 2011).

A physiotherapist could provide effective soft tissue treatment to the patient, depending on which treatment modalities the chiropractor (as the referring health care provider) intends to use in practice, the use of physiotherapy could be of benefit for the patient.

The participants showed a wide range of referral to other health care providers for co-management, each of which could possibly benefit a patient with MEH. No inappropriate referrals were listed.

4.3.4 Results and discussion of question 4 (case 44 – CEH)

4.3.4.1 Primary diagnosis for case 4

4.3.4.1.1 Results for “What is your primary diagnosis (select only one)”

CEH was selected as the primary diagnosis for case 4 by 85.7% (54) of the participants, followed by 7.9% (5) for TTH and 1.6% (1) for each of cluster headache, intracranial haemorrhage, post-concussive syndrome and TMJ syndrome (Figure 8).

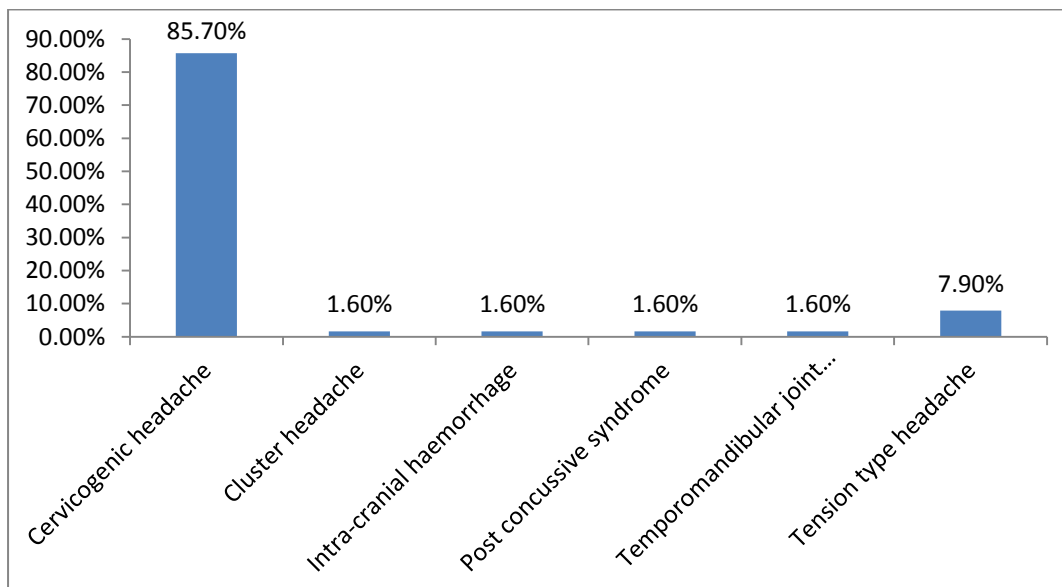


Figure 8: Primary diagnosis for case 4

4.3.4.1.2 Discussion of “What is your primary diagnosis (select only one)”

The majority of the participants diagnosed case 4 correctly as a CEH. TTH was the second most commonly selected primary diagnosis which indicates the similar clinical presentation between CEH and TTH (Vincent 2010). However in contrast to case 2, where the primary diagnosis was TTH, in case 4 there appears to be less discrepancy with regard to the primary diagnosis as 85.7% (54) selected CEH with only 7.9% (5) selecting TTH. This could be due to the information given in case 4 describing a CEH more definitively.

Cluster headache and TMJ syndrome could present similarly to CEH. Cluster headache is however a weak primary diagnosis because of the lack of characteristic symptoms of cluster headache such as the consistent onset of the symptoms in a repetitive cycle, occurring at the same time of the day on the same day of the week on a regular basis (May and Goadsby 2001). There was no mention of swelling and erythema around the face on the ipsilateral side to the pain or associated rhinorrhoea (Longmore *et al.* 2010).

Intracranial haemorrhage is not considered an accurate diagnosis based on the information given in case 4 as no acute history of trauma, signs of meningeal irritation or neurological deficit was mentioned (Colledge *et al.* 2010; Liebeskind 2014). Post-concussive syndrome is a highly unlikely diagnosis considering the chronicity of the complaint described in case 4 (Lundin *et al.* 2006; Bigler 2008).

4.3.4.2 Differential diagnosis of case 4

4.3.4.2.1 Results for “Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)”

A total of 10 different differential diagnoses were selected by the participants, the top three most selected differential diagnoses being post-concussive syndrome (19% (12)) followed by hypertensive headache (15.9% (10)) and CEH (11.1% (7)). All other differential diagnoses had selection frequencies below 10% (Table 28).

Table 28: Differential diagnoses for case 4

Q4.2) “Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)”	Responses		Percentage of sample
	N	Percentage	
Brain tumour	2	2.1%	3.2%
Cervicogenic headache	7	7.3%	11.1%
Cluster headache	3	3.1%	4.8%
Cerebro vascular accident	1	1.0%	1.6%
Hypertensive headache	10	10.4%	15.9%
Intra cranial haemorrhage	2	2.1%	3.2%
Meningitis	1	1.0%	1.6%
Migraine	4	4.2%	6.3%
Post-concussive syndrome	12	12.5%	19.0%

Temporal cell arteritis	1	1.0%	1.6%
Temporo-mandibular joint syndrome	6	6.3%	9.5%
Tension type headache	45	46.9%	71.4%
Trigeminal neuralgia	1	1.0%	1.6%
Whiplash	1	1.0%	1.6%
Total	96	100.0%	152.4%

4.3.4.2.2 Discussion of “Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)”

TTH is an appropriate differential diagnosis to consider for a CEH, the patient described in case 4 could have symptoms which are similar with symptoms experienced in TTH such as “neck pain and headache”; “mild to moderate severity”; “Relieving factors included resting”; “Palpation revealed increased muscle tone and tenderness of the sub occipital muscles” and “Neurovascular assessment was unremarkable” (Antonaci, Fredriksen and Sjaastad 2001; Bryans *et al.* 2011; Olesen *et al.* 2013).

Post-concussive syndrome is a weak differential diagnosis due to the chronicity of the presenting complaint, no history of acute head injury, mental confusion or focal neurological deficit was mentioned in case 4 (Lundin *et al.* 2006; Kumar *et al.* 2007; Colledge *et al.* 2010).

Hypertensive headache is not supported by the information in case 4, the blood pressure is close to that of stage one hypertension and symptoms experienced in hypertensive headaches are not necessarily proportional to the level of the blood pressure. However only based on the blood pressure (which is pre-hypertensive) the differential diagnosis of hypertensive headache is not likely (Kumar *et al.* 2007; Colledge *et al.* 2010; Liman, Siebert and Endres 2010).

The selection of CEH is consistent with that of the primary diagnosis. TMJ syndrome is an often overlooked cause of headache and an appropriate differential diagnosis to consider when a patient presents with a primary headache such as CEH (Tsai and Heffer 2015).

MEH may present similarly to that of CEH so should be a strong differential diagnosis to consider when assessing patients with primary headache disorders. Based on the chronicity and frequency of the symptoms described in case 4, MEH is an appropriate differential diagnosis (Antonaci, Fredriksen and Sjaastad 2001; Olesen *et al.* 2013).

Cluster headache could be considered as a weak differential diagnosis. Characteristic symptoms of cluster headache are absent such as the consistent onset of the symptoms in a repetitive cycle, occurring at the same time of the day on the same day of the week on a regular basis. For the patient described in case 4, cluster headache should be differentiated from other primary headache disorders (May and Goadsby 2001; Longmore *et al.* 2010; Wood 2011).

Brain tumour could be a possibility in the patient described in case 4. The chronic and persistent nature of the headache could increase this suspicion, although it is less likely due to the lack of neurological involvement as well as no constitutional symptoms of systemic disease being present. However, considering the importance of detecting a brain tumour, it should not be excluded until confirmatory investigations have been conducted to prove otherwise (Greenberg *et al.* 1999; Kumar *et al.* 2007; Colledge *et al.* 2010).

Trigeminal neuralgia is a weak differential diagnosis to consider as trigeminal neuralgia has very characteristic symptoms and triggers, none of which are described in case 4 (Leclercq, Thiebaut and Héran 2013).

Whiplash is usually a diagnosis based on acute injury which is not consistent with the information given in case 4. The trauma mentioned in case 4 “neck pain and headache which started three years before after falling down a flight of stairs” occurred a long time ago which would make whiplash a weak differential diagnosis. The whiplash injury could have induced the CEH which would classify whiplash as a cause rather than a diagnosis in this case (Vincent 2010). CVA based on the information given in case 4 is a weak differential diagnosis as the information in case 4 does not suggest that a CVA had occurred.

4.3.4.3 Consideration of further investigations for case 4

4.3.4.3.1 Results for “Would you consider further investigations for this patient?”

73% (46) of the participants indicated that they would consider further investigations necessary (Table 29).

Table 29: Consideration of further investigations

	Answer	N	Percentage
Q4.3) “Would you consider further investigations for this patient?”	No	17	27.0%
	Yes	46	73.0%

4.3.4.3.2 Discussion of “Would you consider further investigations for this patient?”

Further investigations used for the diagnosis of CEH are mostly used for the exclusion of other pathology. Investigations may be of benefit to investigate the chronicity of the condition and to determine if any chronic secondary causes may be associated with the condition.

4.3.4.4 Investigations considered for case 4

4.3.4.4.1 Results for “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

A total of six different investigations were selected by those who considered further investigations necessary 73% (46). 97.8% (45) of those who considered further investigations necessary selected x-ray imaging. The five other investigations selected recorded relatively low selection frequencies (Figure 9).

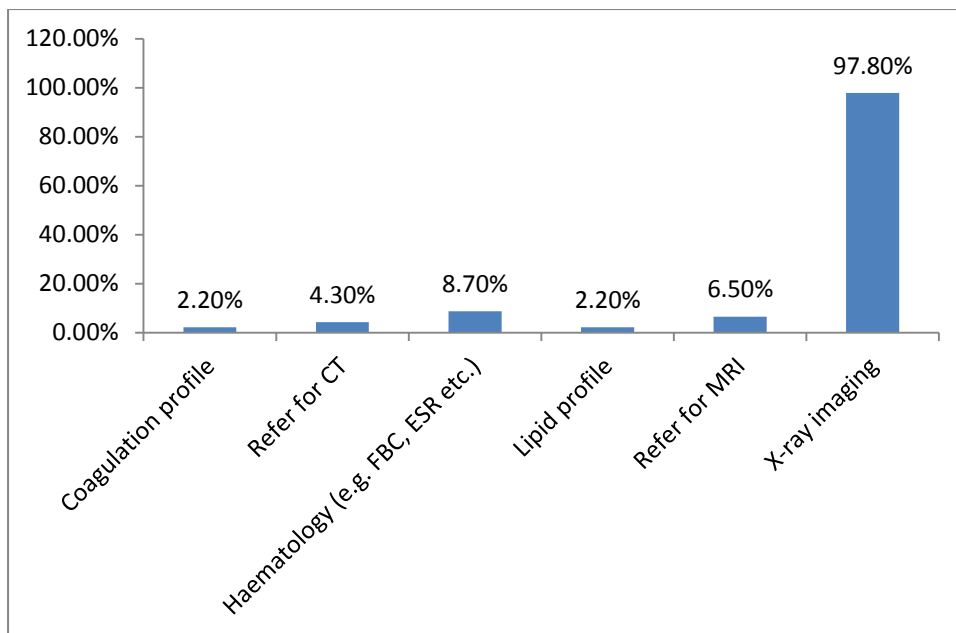


Figure 9: investigations considered for case 4

4.3.4.4.2 Discussion of “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

Considering the chronicity of the complaint it may be necessary to request further investigations. Plain film radiography would be considered an appropriate investigation based on the information given in case 4 especially taking into account the history of trauma and the chronicity of the complaint. Some chronic changes may be revealed on x-ray such as cervical spine instability, degenerative joint disease or other structural abnormalities (Colledge *et al.* 2010). X-rays can also be used to assess for contra-indications to certain treatments such as SMT. Due to the chronicity of the complaint the investigation for chronic abnormalities and contra-indications is appropriate (Barker *et al.* 2001; Haldeman, Kohlbeck and McGregor 2002; Tuchin 2013).

Haematology could be used in the context of case 4 to exclude any general signs of systemic causes for the presenting complaint such as abnormal leucocyte counts, raised ESR and many more indicators (Longmore *et al.* 2010). MRI and CT may be used to investigate the aetiological factor involved for exclusion of any other possible diagnoses (Kumar *et al.* 2007; Colledge *et al.* 2010; Longmore *et al.* 2010).

No specific indicators were mentioned in case 4 which would suggest that a lipid profile would contribute specific diagnostic monitoring or value to the patient. Those who considered a lipid profile necessary may use it as a general tool for lifestyle management in their practice thus possibly incorporating a more holistic approach. Based on the information given in case 4 it is not clear why a coagulation profile would be of specific diagnostic value or of importance for management of co-morbid or lifestyle factors.

4.3.4.5 Treatment of the patient described in case 4 as a chiropractor

4.3.4.5.1 Results for “Would you treat this patient as a chiropractor at this stage?”

The majority of the participants (96.8% (61)) indicated that they would treat the patient described in case 4 as a chiropractor (Table 30).

Table 30: Treatment of patient as a chiropractor

	Answer	N	Percentage
Q4.4.1) “Would you treat this patient as a chiropractor at this stage?”	No	2	3.2%
	Yes	61	96.8%

4.3.4.5.2 Discussion of “Would you treat this patient as a chiropractor at this stage?”

The literature does suggest beneficial outcomes for the chiropractic management of CEH, the majority of the participants would treat the patient described in case 4 and potentially expects improvement of symptoms for a CEH.

4.3.4.6 Red flags for case 4

4.3.4.6.1 Results for “What sign and/or symptom in case 4 deters you from treating this patient?”

The 3.2% (2) of participants who decided not to treat the patient in case 4 indicated that the symptom which deterred them from treating the patient was nocturnal pain. One unspecified response was recorded (Table 31).

Table 31: symptoms which deter practitioner from treating patient

	Answer	N	Percentage
4.4.2) “What sign and/or symptom in case 4 deters you from treating this patient?”	Nocturnal pain	1	50%
	Unspecified	1	50%

4.3.4.6.2 Discussion of “What sign and/or symptom in case 4 deters you from treating this patient?”

Nocturnal pain may be an indicator of potentially dangerous disease however it is a symptom which must be taken into context of the other presenting signs and symptoms (Colledge *et al.* 2010). In context of case 4 nocturnal pain could be attributed to that of CEH or non-specific musculoskeletal related pain, therefore nocturnal pain in this context is not considered a red flag. The other participant did not specify a sign or symptom which deterred him/her from treating the patient.

4.3.4.7 Referral for primary presenting complaint for the patient in case 4

4.3.4.7.1 Results for “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

No referrals were selected even though some participants indicated that they would not treat the patient described in case 4 as a chiropractor. All of the participants continued to complete the selection for co-management. This could be due to random error or a misunderstanding when the participants answered the questionnaire.

4.3.4.7.2 Discussion of “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?”

The patient described in case 4 does not require referral for management of the primary presenting complaint, a CEH is a condition which chiropractors have reasonable success treating (Nilsson, Christensen and Hartvigsen 1997; Austin 2002; Gallagher 2007; van Duijn, van Duijn and Nitsch 2007; Bogduk 2009; Bryans *et al.* 2011). If the treatment outcomes are not achieved referral of the patient should be considered.

4.3.4.8 Referral for co-management for the patient in case 4

4.3.4.8.1 Results for referral for co-management “Would you refer this patient for co-management?”

A total of seven different health care providers were selected for co-management of the patient by those who decided to treat the patient in case 4. 61.9% (39) of the participants indicated that they would not refer the patient for co-management, 17.5% (11) indicated that they would refer to a biokineticist, 15.9% (10) selected referral to a massage therapist. The remaining four health care professionals which were selected were a homeopath (4.8% (3)), a neurologist (4.8% (3)), a physiotherapist 1.6% (1) and an exercise conditioner (1.6% (1)) (Table 32).

Table 32: Referral for co-management for case 4

Q4.5.2) “Would you refer this patient for co-management?”	Responses		Percentage of sample
	N	Percentage	
No	39	55.7%	61.9%
Biokineticist	11	15.7%	17.5%
General practitioner	2	2.9%	3.2%
Homeopath	3	4.3%	4.8%
Massage therapist	10	14.3%	15.9%
Neurologist	3	4.3%	4.8%
Physiotherapist	1	1.4%	1.6%
Exercise conditioning (Pilates, yoga etc.)	1	1.4%	1.6%
Total	70	100.0%	111.1%

4.3.4.8.2 Discussion of “Would you refer this patient for co-management?”

A chiropractor has a wide scope of practice, depending on the chiropractor's opinions and style of practice referral may not be necessary. If the chiropractor can apply rehabilitation and/or massage in his/her practice, outside referral for such treatments may not be required. The majority opted not to refer the patient for co-management of the condition described in case 4 which would indicate that the majority of the participants feel that chiropractic treatment would be sufficient.

A biokineticist could be a valuable source to refer the patient to for active rehabilitation of the cervical spine. A massage therapist could be useful for soft tissue therapy. A homeopath could be of benefit for the patient, especially if life style changes are required. A neurologist could provide allopathic medication for relief of pain for a patient with CEH. A GP may be a useful health care provider to manage the patient in the case that allopathic intervention may aid with the management of CEH. A physiotherapist could be useful to co-manage the patient.

Exercise conditioning (Pilates, yoga etc.) could be beneficial for the wellbeing and general conditioning of the patient. Exercise conditioning is an appropriate suggestion.

All of the sources of referral which were selected are considered appropriate as it depends on what the chiropractor regards as his/her role in the management of the patient.

4.3.5 Results and discussion of question 5 (Case 55 – intracranial haemorrhage)

4.3.5.1 Primary diagnosis of case 5

4.3.5.1.1 Results for the primary diagnosis of case 5 “What is your primary diagnosis (select only one)”

For case 5, 68.3% (43) of the participants selected post-concussive syndrome as their primary diagnosis. 27.0% (17) of the participants selected intracranial haemorrhage. CEH headache, CVA and encephalitis were each represented by 1.6% (1) of the participants (Figure 10).

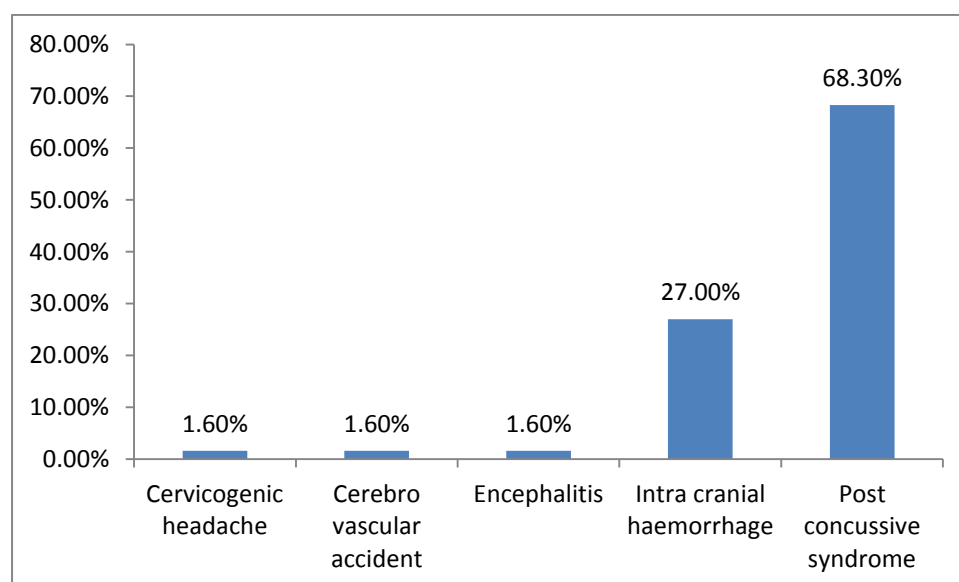


Figure 10: Primary diagnosis for case 5

4.3.5.1.2 Discussion of “What is your primary diagnosis (select only one)”

The correct primary diagnosis for case 5 is an intracranial haemorrhage (specifically an epidural haematoma). The majority of the participants misdiagnosed the primary diagnosis as post-concussive syndrome which may present clinically similarly to intracranial haemorrhage (Lundin *et al.* 2006; Liebeskind 2014).

The history of trauma could have led the participants to think that a concussion occurred. Furthermore information stating that neuroimaging was negative during the initial hospital visit could also have misled the participant to misdiagnose case 5 as an intracranial haemorrhage would generally be visualised with neuroimaging. However characteristic signs of intracranial haemorrhage (specifically epidural haematoma) were mentioned in case 5 which would make the diagnosis of intracranial haemorrhage clear (Chew *et al.* 2014; Liebeskind 2014). The description of a lucid interval was mentioned in the case: “The patient experienced transient loss of consciousness immediately after the injury” and “His headache has continued over the past few days. He now presents to you with the headache which has worsened and is associated with vomiting.” Neuroimaging can be negative within a short duration following head trauma, the lucid interval suggests that a progressive intra cranial bleed can be present (Kumar *et al.* 2007; Liebeskind 2014). Furthermore the presence of focal neurological deficit was mentioned: “sluggish response of the pupils to follow your finger during the H-test with slight horizontal nystagmus bilaterally; the right pupil is slightly more dilated in comparison to the left”. The presence of possible meningeal irritation was described: “The patient shows resistance to neck flexion and mentions that his neck has been stiff since his gymnastic accident”. The combination of all these symptoms is indicative of raised intracranial pressure which is suggestive of a potentially life complicating or life threatening condition which requires urgent medical attention (Kumar *et al.* 2007; Liebeskind 2014).

The diagnosis of CVA is not entirely accurate however the subsequent management would follow relatively similar referral patterns which would see the patient receiving urgent medical attention (Kanika *et al.* 2015). Encephalitis is not a likely diagnosis as the information in case 5 does not support infective causes (Loughborough *et al.* 2014). CEH is not an appropriate primary diagnosis for case 5 as CEH does not present with focal neurological deficit (Olesen *et al.* 2013).

4.3.5.2 Differential diagnosis of case 5

4.3.5.2.1 Results for “Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)”

A total of 10 different differential diagnoses were selected for case 5. The top three differential diagnoses according to frequencies of selection were intracranial haemorrhage (61.9% (39)), CVA (30.2% (19)) and post-concussive syndrome (28.6% (18)) (Table 33).

Table 33: Differential diagnoses for case 5

Q5.2) "Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)"	Responses		Percentage of sample
	N	Percentage	
Brain tumour	1	1.0%	1.6%
Cervicogenic headache	15	14.4%	23.8%
Cerebro-vascular accident	19	18.3%	30.2%
Encephalitis	2	1.9%	3.2%
Hypertensive headache	2	1.9%	3.2%
Intra cranial haemorrhage	39	37.5%	61.9%
Meningitis	2	1.9%	3.2%
Migraine	5	4.8%	7.9%
Post-concussive syndrome	18	17.3%	28.6%
Trigeminal neuralgia	1	1.0%	1.6%
Total	104	100.0%	165.1%

4.3.5.2.2 Discussion of "Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)"

Intracranial haemorrhage was the most commonly selected differential diagnosis which is consistent with what the primary diagnosis should be. However due to the potentially fatal nature of intracranial haemorrhage, if the primary diagnosis was incorrect and was diagnosed as a pathology which would not see the patient receive urgent medical attention, the inclusion of intracranial haemorrhage in the differential diagnoses is perhaps still insufficient. The majority of the participants at least considered the possibility of intracranial haemorrhage being present (Colledge *et al.* 2010; Liebeskind 2014).

CVA is an appropriate differential diagnosis to consider, even though the history would dictate that it is less likely than cranial bleeding, the clinical presentations of CVA may be similar (Colledge *et al.* 2010).

Post-concussive syndrome is an appropriate differential diagnosis provided that the primary diagnosis was that of a potentially life threatening neurological condition, thus if test results indicate the absence of any such potentially life threatening conditions (after excluding the presence of a lucid interval) post-concussive syndrome would be a strong differential diagnosis to consider (Lundin *et al.* 2006; Bigler 2008).

CEH is a weak differential diagnosis to consider at this stage due to the presence of focal neurological deficit, and therefore the presence of serious conditions has to be excluded (Antonaci, Fredriksen and Sjaastad 2001). Migraine is not an accurate differential diagnosis for case 5, the information given is not consistent with that of MEH (Bigler 2008; Colledge *et al.* 2010; Olesen *et al.* 2013).

Encephalitis and meningitis have some similar symptoms in common with those described in case 5, the history of trauma and absence of a fever is a strong indicator that encephalitis or meningitis would be less likely and atypical, however it should not be excluded all together as some symptoms are similar (Colledge *et al.*; Loughborough *et al.* 2014). Hypertensive headache is a weak differential diagnosis to consider based on the information given in case 5 (Liman, Siebert and Endres 2010).

Brain tumour could possibly present with similar symptoms as those described in case 5, the progression of the symptoms however might be considered too fast for that of a brain tumour however that would largely depend on the type of tumour involved. A brain tumour would be an appropriate, although relatively atypical differential diagnosis to consider based on the information given in case 5 (Liebeskind, 2014; Colledge *et al.* 2010). The information given in case 5 is not consistent with that of trigeminal neuralgia (Longmore *et al.* 2010).

4.3.5.3 Consideration of further investigation for case 5

4.3.5.3.1 Results for “Would you consider further investigations for this patient?”

85.7% (54) of the participants indicated that they would consider further investigations for the patient described in case 5 (Table 34).

Table 34: Consideration of further investigations for case 5

	Answer	N	Percentage
Q5.3) "Would you consider further investigations for this patient?"	No	9	14.3%
	Yes	54	85.7%

4.3.5.3.2 Discussion of "Would you consider further investigations for this patient?"

The majority of the participants were correct to indicate that they would consider further investigations necessary for the patient described in case 5.

4.3.5.4 Investigations considered for case 5

4.3.5.4.1 Results of "Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)"

A total of eight different investigations were selected by those who considered further investigations necessary (85.7% (54)). Of those who considered further investigation necessary 74.1% (40) selected referral for MRI followed by X-ray imaging (38.9% (21)) and 27.8% (15) selected haematology (e.g. FBC, ESR etc.) (Table 35).

Table 35: Investigations considered for case 5

Q5.3) "Would you consider further investigations for this patient?"	Responses		Percentage of sample
	N	Percentage	
Autoimmune tests	1	1.0%	1.9%
Coagulation profile	14	13.9%	25.9%
Refer for CT	8	7.9%	14.8%
Diagnostic ultrasound	1	1.0%	1.9%
Haematology (e.g. FBC, ESR etc.)	15	14.9%	27.8%

Refer for MRI	40	39.6%	74.1%
Thyroid screen	1	1.0%	1.9%
X-ray	21	20.8%	38.9%
Total	101	100.0%	187.0%

4.3.5.4.2 Discussion of “Would you consider further investigations for this patient? (if yes please tick all the investigations you would send this patient for)”

MRI was the most selected investigation, MRI is an appropriate investigation however the investigation usually considered as the first line of investigation for a suspected epidural bleed is CT (Colledge *et al.* 2010; Chew *et al.* 2014; Liebeskind 2014).

X-ray may only be useful to detect possible skull or cervical spine fractures which could provide important information regarding patient management, especially if cervical spine fractures are present as this would require urgent attention and stabilisation of the fractured regions (Ackland and Cameron 2012). Plain film radiography won't be sufficient to investigate intracranial bleeding (Kumar *et al.* 2007; Longmore *et al.* 2010; Ackland and Cameron 2012).

Haematology may be used to determine the haematocrit level which could indicate the severity of blood loss, generalised indicators of infection or inflammation would also be useful to determine if systemic pathology is present (Longmore *et al.* 2010).

Coagulation profile is a useful test to determine if the patient is at risk of persistent bleeding and if a LP may be contra-indicated (Longmore *et al.* 2010). If the blood coagulation dynamics are poor the risk of persistent progression of the bleed is higher. CT is an appropriate investigation for intracranial bleeding and is in most cases regarded as the investigation of first choice (Liebeskind, 2014).

Autoimmune testing is not of specific diagnostic value based on the information provided in case 5; however it may be used to determine if there is an acute recurrence of the ITP (Longmore *et al.* 2010).

Diagnostic ultrasound would be of limited significance and it is not clear why it was considered for the patient described in case 5. The consideration of a thyroid screen for the patient described in case 5 is not appropriate when taking into consideration the information and context of the case. The combination of autoimmune testing as well as diagnostic ultrasound and a thyroid screen could be used in conjunction to diagnose and assess autoimmune thyroid pathology. However no diagnoses or differential diagnoses were listed by the participants which is suggestive of thyroid pathology (Longmore *et al.* 2010).

4.3.5.5 Treatment of the patient described in case 5 as a chiropractor

4.3.5.5.1 Results for “Would you treat this patient as a chiropractor at this stage?”

90.4% (57) of the participants indicated that they would not treat the patient described in case 5 as a chiropractor (Table 36).

Table 36: treatment of patient described in case 5 as a chiropractor

	Answer	N	Percentage
Q5.4.1) “Would you treat this patient as a chiropractor at this stage?”	No	57	90.4%
	Yes	6	9.5%

4.3.5.5.2 Discussion of “Would you treat this patient as a chiropractor at this stage?”

The majority of the participants indicated that they would not treat the patient described in case 5 as a chiropractor for the primary presenting complaint, which is an appropriate response. Less than one tenth of the participants indicated that they would however treat the patient which is concerning due to the potential implications of intracranial bleeding. Even though 73% (46) of the participants misdiagnosed case 5, only 9.5% (6) indicated that they would still treat the patient in case 5 as a chiropractor. Thus some participants who misdiagnosed the primary diagnosis still

opted not to treat the patient which is a good sign as manual therapy could complicate the intracranial bleed.

4.3.5.6 Red flags detected for case 5

4.3.5.6.1 Results for “What sign and/or symptom in case 5 deters you from treating this patient?”

A total of 10 different symptoms were indicated as red flags for the patient described in case 5. Dilated pupil 50.9% (28), sluggish pupillary response 47.3% (26) and nystagmus 38.2% (21) were the most commonly selected red flags. Note that 90.4% (57) of the participants indicated that they would not treat the patient as a chiropractor, however two of those participants did not continue to answer question 5.4.2 of the questionnaire as was required. Thus the percentages of cases are based on a response count of 55 (Table 37).

Table 37: Red flags detected for case 5

Q5.4.2) “What sign and/or symptom in case 5 deters you from treating this patient?”	Responses		Percentage of sample
	N	Percentage	
Confusion/ changes in mental status	5	4.3%	9.1%
Nystagmus	21	17.9%	38.2%
Sluggish pupillary response	26	22.2%	47.3%
Dilated pupil	28	23.9%	50.9%
Neck stiffness	5	4.3%	9.1%
History of idiopathic thrombocytopenic purpura	5	4.3%	9.1%
Vomiting	12	10.3%	21.8%
Progressing headache	8	6.8%	14.5%
History of trauma	2	1.7%	3.6%
High blood pressure	3	2.6%	5.5%
Not specified	2	1.7%	3.6%
Total	117	100.0%	212.7%

4.3.5.6.2 Discussion of “What sign and/or symptom in case 5 deters you from treating this patient?”

Dilated pupil and sluggish pupillary responses are appropriate and definite indications of focal neurological deficit as well as raised intracranial pressure and should warrant further investigations. In the context of the information given in case 5, vomiting is an appropriate red flag, especially when present along with a progressing headache and neck rigidity. Progressing headache is an appropriate concern especially when taken into context of the case presented in case 5 as it could indicate the presence of a lucid interval (Kumar *et al.* 2007; Colledge *et al.* 2010).

Neck stiffness or rigidity may indicate meningeal irritation and is an appropriate red flag (Lamont, Alias and Win 2003). History of ITP could be a danger to the patient if it is not in remission, a history of ITP associated with the history of recent head trauma is not strictly classified as a red flag symptom but rather a risk factor for potential persistent bleeding (Longmore *et al.* 2010). Confusion and/or changes in mental status are one of the most reliable indicators suggesting that further neuroimaging should be performed (Lamont, Alias and Win 2003). High blood pressure in context of the information given in case 5 is not a clear red flag considering that the blood pressure is not classified as “high” (Kumar *et al.* 2007; Liman, Siebert and Endres 2010). History of trauma, especially head trauma, is an important red flag to take into consideration when associated with the headache (Ackland and Cameron 2012).

4.3.5.7 Referral of patient described in case 5 for primary presenting complaint and co-management

4.3.5.7.1 Results for “Would you refer this patient to another health care professional for the patient’s primary presenting complaint?” And “Would you refer this patient for co-management?”

Even though six participants opted to treat the patient described in case 5 as a chiropractor only five selected the co-management options, thus one of those participants did indicate that they would refer the patient for the primary presenting complaint. Of those who decided not to treat the patient described in case 5 (including the one participant who answered question 5.5.1 instead of 5.5.2), 86.2%

(50) indicated that they would refer the patient to a neurologist, 5.2% (3) selected a general practitioner, 5.2% (3) selected referral to a hospital for admission and 3.4% (3) selected an orthopaedic surgeon (Table 38).

Table 38: referral of patient for primary presenting complaint for the patient described in case 5

	Answer	N	Percentage
Q5.5.1) "Would you refer this patient to another health care professional for the patient's primary presenting complaint?"	General practitioner	3	5.2%
	Neurologist	50	86.2%
	Orthopaedic surgeon	2	3.4%
	Hospital admission for	3	5.2%
Q5.5.2) Would you refer this patient for co-management?"	None	1	20.0%
	Neurologist	4	80.0%

4.3.5.7.2 Discussion of "Would you refer this patient to another health care professional for the patient's primary presenting complaint?"

A neurologist would be an appropriate health care provider to manage the condition. The remainder of the participants selected to refer the patient to a GP, hospital for admission and an orthopaedic surgeon all of which would be capable of detecting the intracranial bleed however the neurologist would be the most appropriate health care provider to treat the condition. Referral to the hospital for admission could potentially be the fastest method of obtaining treatment depending on the socioeconomic circumstances.

4.3.5.7.3 Discussion of "Would you refer this patient for co-management?"

The majority of those who selected to co-manage the patient selected a neurologist as a health care provider to co-manage the patient. Co-management of the patient is not the ideal option as it would indicate that the participant opted to treat the primary presenting complaint which does not fall under the scope of chiropractic in South-Africa. One participant did not deem co-management necessary which is concerning considering the fatal potential of intracranial haemorrhage.

4.3.6 Results for the diagnostic outcome of cases presented to the research

As a generalised synopsis of the diagnostic outcome for cases 1 to 5 as presented to the research participants in the questionnaire, the combination of the primary diagnoses and differential diagnoses were categorised into three categories. These categories were accurate diagnosis, adequate diagnosis and inadequate diagnosis. For an accurate diagnosis the primary diagnosis must be correct or sufficiently close enough to the correct diagnosis so that the subsequent management of the condition is appropriate (e.g. meningitis and encephalitis was considered accurate for case 1 and CVA was included as an accurate diagnosis for case 5). For an adequate diagnosis the primary diagnosis was not correct however the primary diagnosis was considered in the list of differential diagnoses given by the participant, thus the participant did consider the correct diagnoses as part of their thought process. An inaccurate diagnosis was scored if the correct diagnosis was not part of the primary diagnosis or the differential diagnoses. In Figure 11 the results for the above mentioned scoring system is shown (Figure 11).

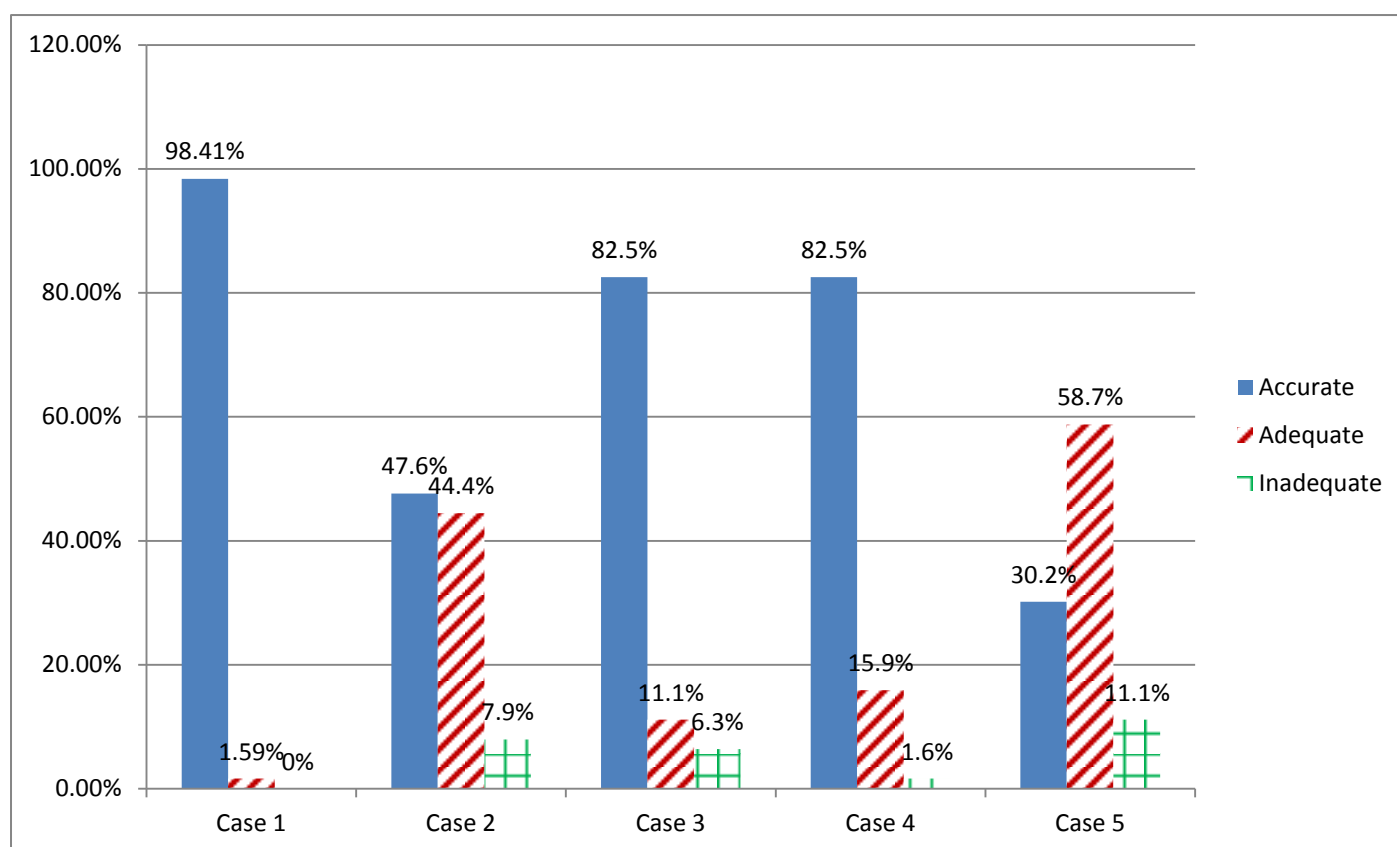


Figure 11: Diagnostic outcome for case 1 to case 5

4.3.6.1 Discussion of diagnostic outcome of cases presented to the research participants

For case 1 (meningitis) it is a positive outcome that the vast majority of the participants selected an accurate response. Case 1 is a red flag headache which could be potentially fatal which requires prompt referral to the appropriate medical personnel. Only 1.6% (1) of the participants did not respond accurately, however at the very least this participant responded adequately, thus considering the correct diagnosis as a differential diagnosis. The primary diagnosis of encephalitis was accepted as an accurate primary diagnosis for case 1 based on the information provided in case 1 and due to the remarkably similar clinical presentation of encephalitis and meningitis.

Case 2 (TTH) indicated consistency with the literature with regard to the possible confusion in the clinical diagnosis of TTH and CEH. The majority of the participants diagnosed case 2 accurately, nearly as many participants adequately diagnosed case 2 which would indicate that 92% (58) of the participants had the correct diagnosis either as their primary diagnosis or as part of a differential diagnosis. Even though the minority responded inadequately, it is concerning as the chiropractic profession suggests that they can provide benefits to a patient with TTH. If the diagnosis is not inaccurate the subsequent management may be incorrect.

The general response for case 3 (MEH) appears to be predominantly accurate; this is a good sign as the chiropractic profession suggests that MEH patients could benefit from chiropractic care. When those who responded accurately are added with those who responded adequately, 93.6% (59) of the participants at least considered the correct diagnosis, either as part of the primary diagnosis or differential diagnoses.

Case 4 (CEH) was diagnosed accurately by the majority of the participants, this is a good outcome as the chiropractic profession suggests that CEH can be managed beneficially with chiropractic care. When the accurate and adequate responses are

combined, 98.4% (62) of the participants considered the correct diagnosis, either as part of the primary diagnosis or differential diagnoses.

Case 5 (intracranial haemorrhage) delivers concerning results. Intracranial haemorrhage (more specifically epidural haematoma), is a potentially life threatening condition which requires emergency care as soon as possible. Only 30.2% (19) of the participants accurately diagnosed case 5. When combined with those who adequately responded to case 5 88.9% (56) of the participants correctly diagnosed case 5 or at least considered the correct diagnosis as part of their differential diagnoses. It would seem less concerning as 58.7% (37) at least adequately responded to case 5, however considering the potentially fatal nature of intracranial haemorrhage, an accurate diagnosis is essential so as not to postpone appropriate management. Of greater concern is that 11.1% (7) of the participants responded inaccurately which means that they did not even consider intracranial haemorrhage as a differential diagnosis.

A limitation of this study is that the responses are based on case scenarios and not real time clinical presentations, thus there is no doctor-patient interaction and the information provided to the research participant is fixed. Any conclusions made from this study should be made while taking this into consideration.

4.4 Management information

4.4.1 Results and discussion for question 6 (CEH)

4.4.1.1 Adjustment of a patient presenting with a CEH

4.4.1.1.1 Results for “Would you adjust a patient with this condition if no red flags are present?”

All of the participants agreed that they would adjust a patient with a CEH provided that there are no red flags present which would deter them from adjusting the patient (Table 39).

Table 39: Adjustment of a patient with a cervicogenic headache if no red flags are present

Q6.1.1) "Would you adjust a patient with this condition if no red flags are present?"	N	Column N %
no	0	0.0%
yes	63	100.0%

4.4.1.1.2 Discussion of "Would you adjust a patient with this condition if no red flags are present?"

All of the participants indicated that they would use manipulative therapy for a patient presenting with a CEH if no red flags are present. The literature does suggest that a patient with a CEH may benefit from SMT. The use of SMT, if no red flags are present to contra-indicate SMT, is therefore deemed appropriate provided that the diagnosis is accurate and cervical dysfunction can be elicited (Nilsson, Christensen and Hartvigsen 1997; Gallagher 2007; Bogduk and Govind 2009).

4.4.1.2 Adjustments used in practice if no red flags are present for a CEH

4.4.1.2.1 Results of "Which of the following adjustments would you use in practice for this condition if no red flags are present?"

84.1% (53) of the participants agreed to adjust only those segments which are suspected to be fixated, 77.8% (49) agreed to adjust fixated segments throughout the cervical- and thoracic spine and 71.4% (45) disagreed that multiple segments throughout the thoracic should be adjusted including those which are not fixated. 74.6% (47) disagreed that only thoracic spine fixations should be adjusted. 69.8% (44) disagreed that multiple segments which are not fixated should be adjusted throughout the cervical and thoracic spine (Table 40).

Table 40: Adjustments used in practice if no red flags are present for a cervicogenic headache

Q6.1.2) "Which of the following adjustments would you use in practice for this condition if no red flags are present?"	Answer	N	Column N %
Q6.1.2 A) Attempt to adjust specific segments only (only those which are suspected to be fixated).	Agree	53	84.1%
	Neutral	6	9.5%

Q6.1.2 B) Adjust the fixated segment on both sides	Disagree	4	6.3%
	Agree	25	39.7%
	Neutral	26	41.3%
	Disagree	12	19.0%
Q6.1.3 C) Adjust multiple segments throughout the cervical spine including those which are not fixated.	Agree	3	4.8%
	Neutral	16	25.4%
	Disagree	44	69.8%
Q6.1.2 D) Adjust multiple fixated segments throughout the cervical and thoracic spine	Agree	49	77.8%
	Neutral	8	12.7%
	Disagree	6	9.5%
Q6.1.2 E) Adjust the thoracic spine fixations only	Agree	0	0.0%
	Neutral	16	25.4%
	Disagree	47	74.6%
Q6.1.2 F) Adjust multiple segments throughout the thoracic spine including those which are not fixated	Agree	5	7.9%
	Neutral	13	20.6%
	Disagree	45	71.4%

4.4.1.2.2 Discussion of “Which of the following adjustments would you use in practice for this condition if no red flags are present?”

The general consensus gathered suggests that the majority of participants were mainly in favour of adjusting specific fixated segments only, the majority of the participants then disagreed to adjust multiple non-fixated segments. This would indicate that the majority of the participants attempt to be specific or goal orientated when considering adjustments on a patient and do not necessarily just adjust the patient regardless of examination findings (in terms of which levels are suspected to be fixated).

The only statement for which the majority of the participants were neutral was for adjusting a fixated segment bilaterally. The literature suggests that with a unilateral adjustment the facet joints may undergo joint gapping bilaterally along with bilateral cavitation; however this does not occur exclusively on every SMT procedure (Cramer *et al.* 2011). The majority of the participants may therefore be neutral possibly because they agree with the literature that the facet joints have gapped bilaterally or they've had mixed results based on experience.

4.4.1.3 The primary focus of treatment for a CEH

4.4.1.3.1 Results for “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

Approximately one tenth of the participants (9.5% (6)) did not regard spinal manipulation as the primary focus of treatment for a CEH (Table 41).

Table 41: Spinal manipulative therapy as primary focus of treatment for a cervicogenic headache

	Answer	N	Column N %
Q6.1.3) “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”	No	6	9.5%
	Yes	57	90.5%

4.4.1.3.2 Discussion of “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

The literature does suggest potential benefits of SMT for CEH however it does not necessarily dictate that SMT should be applied exclusively and as the primary treatment procedure for CEH. In this study it was revealed that the majority of the participants did regard SMT as the primary focus of treatment for CEH (Austin 2002; Gallagher 2007; van Duijn, van Duijn and Nitsch 2007; Bogduk 2009; Bryans *et al.* 2011).

4.4.1.4 Reason/s for not regarding SMT as the primary focus of treatment for CEH

4.4.1.4.1 Results for “Would you regard spinal manipulation as your primary focus of your treatment of this condition? (No, if no please indicate why)”

The majority of those who did not regard SMT as their primary focus of treatment indicated that soft tissue therapy is the primary of focus when treating CEH (47.5% (3) (Table 42).

Table 42: Reason for not regarding spinal manipulation as the primary focus of treatment

Q6.1.3) "Would you regard spinal manipulation as your primary focus of your treatment of this condition?"	N	Column N %
Due to personal interpretation of current literature	1	12.5%
Because soft tissue therapy is the primary focus of your treatment for this condition	3	47.5%
Multifactorial aetiology requiring a multidisciplinary management approach	1	12.5%
Manipulative therapy and soft tissue regarded as equally important	1	12.5%
Focus depends on each individual case	1	12.5%
Patient education considered the primary focus	1	12.5%
Total	8	100.0%

4.4.1.4.2 Discussion of "Would you regard spinal manipulation as your primary focus of your treatment of this condition? (No, if no please indicate why)"

Treatment of CEH usually involves the management of cervical spine dysfunction, thus attention to all of the associated structures should be addressed depending on the extent of their involvement (Gallagher 2007). Considering SMT more important than soft tissue therapy or vice versa is therefore a matter of what was found during examination of the patient followed by the practitioners' interpretation thereof. One participant considered a multidisciplinary management approach as the primary focus of treatment, considering that cervical dysfunction and CEH could have more than one component involved in clinical manifestation of the disorder. Multidisciplinary management could be appropriate to include more than one health care provider, each of which could attribute in their own way. Multi-disciplinary management could also depend on the health care needs demonstrated by each individual patient. Thus each individual case may be interpreted or managed differently; one participant indicated this as a reason for not considering SMT as the primary focus of treatment.

One participant indicated that due to his/her personal interpretation of the current literature SMT is not regarded as the primary focus of treatment. The literature does suggest that possible benefits from SMT for a patient with CEH exist however in most cases it stipulates that more research is required to confirm such suggestions (Bogduk 2009). This participant could therefore interpret such conclusions to indicate that SMT should not be the primary focus of treatment for a CEH.

The educational component as the primary focus of treatment is a plausible suggestion as patient education is an important factor to consider as causative activities, perpetuating factors and rehabilitative strategies is an very important component of preventing progression, avoiding recurrence and resolving the CEH (Gallagher 2007).

4.4.1.5 Modalities used in conjunction with SMT for a CEH

4.4.1.5.1 Results of “Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)”

The majority of the participants (81% (51)) selected stretching exercises followed by 74.6% (47) of the participants selecting massage therapy. Cryotherapy, electro-modalities, KT, cervical traction and dry needling were selected with frequencies between 22.2% (14) and 28.6% (18). Slightly more than one tenth of the participants selected activator gun / impulse adjuster as an adjunctive therapy to SMT. Ultrasound was selected with a low frequency 4.8% (3). A low count of 3.2% (2) of participants indicated that they would not use any modalities in conjunction with SMT. 3.2% (2) of the participants indicated the use of IASTM in conjunction with SMT (Figure 12).

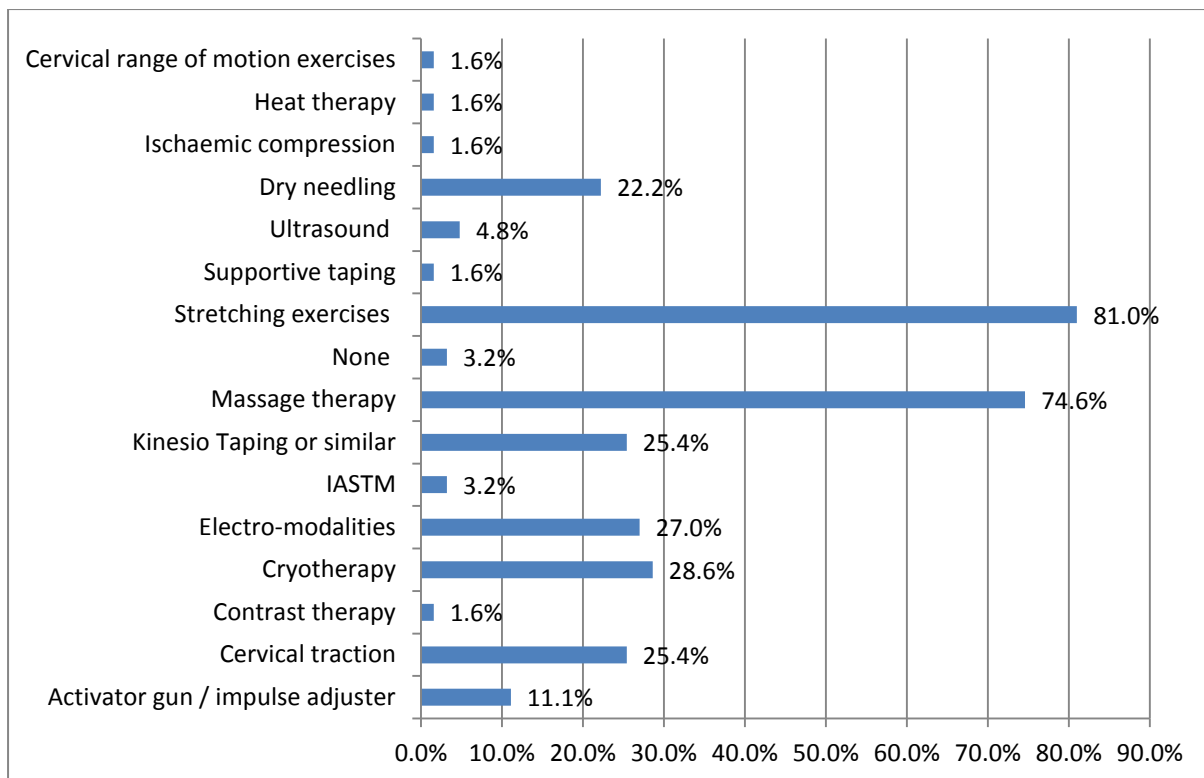


Figure 12: modalities used in conjunction with spinal manipulation for a cervicogenic headache

4.4.1.5.2 Discussion of “Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)”

Stretching may prove useful in a CEH if a strong muscular component is suspected to be associated with the CEH thus the selection of stretching is appropriate. Massage therapy would be appropriate if a strong muscular and possibly even stress related association exists with the CEH. The two most commonly selected conjunctive treatment modalities chosen pertain to that of soft tissue therapy, which is primarily focused on muscular treatment.

Cryotherapy was selected with far greater frequency than that of heat therapy as an adjunctive therapy to SMT for a CEH. The combined use of heat and cold (contrast therapy) was selected by only 1.6% (1) of the participants. Thus it appears that the use of cryotherapy is the preferred choice of thermal therapy for a CEH in the participants group tested.

Cervical traction could be appropriate for muscle relaxation or if possible discogenic pain is suspected (Jellad *et al.* 2009; Bid *et al.* 2014). The direct impact of KT on a CEH has not been documented; any effects of KT on CEH may be indirectly related to addressing muscular dysfunction or movement patterns. The use of electro-modalities could be a useful conjunctive therapy to reduce the amount of pain experienced (Csapo and Alegre 2014; Parreira *et al.* 2014).

The activator gun/ impulse adjuster as an adjunctive therapy to SMT are mostly used for the same indications as SMT, it is therefore peculiar that these devices would be used along with SMT as theoretically they are designed to achieve the same outcome. This might be because these instruments place less physical demand on the clinician and may decrease physical fatigue or strains experienced by the clinician (Colloca *et al.* 2000).

The use of therapeutic ultrasound by the participants appears to be a less popular conjunctive modality for CEH. Only 3.2% (2) participants indicated that they would not use any modalities in conjunction with SMT, thus only using SMT as a treatment for CEH. There is evidence which suggest beneficial outcomes from the use of SMT for CEH (Nilsson, Christensen and Hartvigsen 1997; Bogduk and Govind 2009; Bryans *et al.* 2011). It is not clear how the application of supportive strapping could directly benefit CEH as the literature for the use of supportive strapping in CEH appears to be lacking. However supportive taping may be used to treat CEH indirectly to treat muscular dysfunction or postural abnormalities.

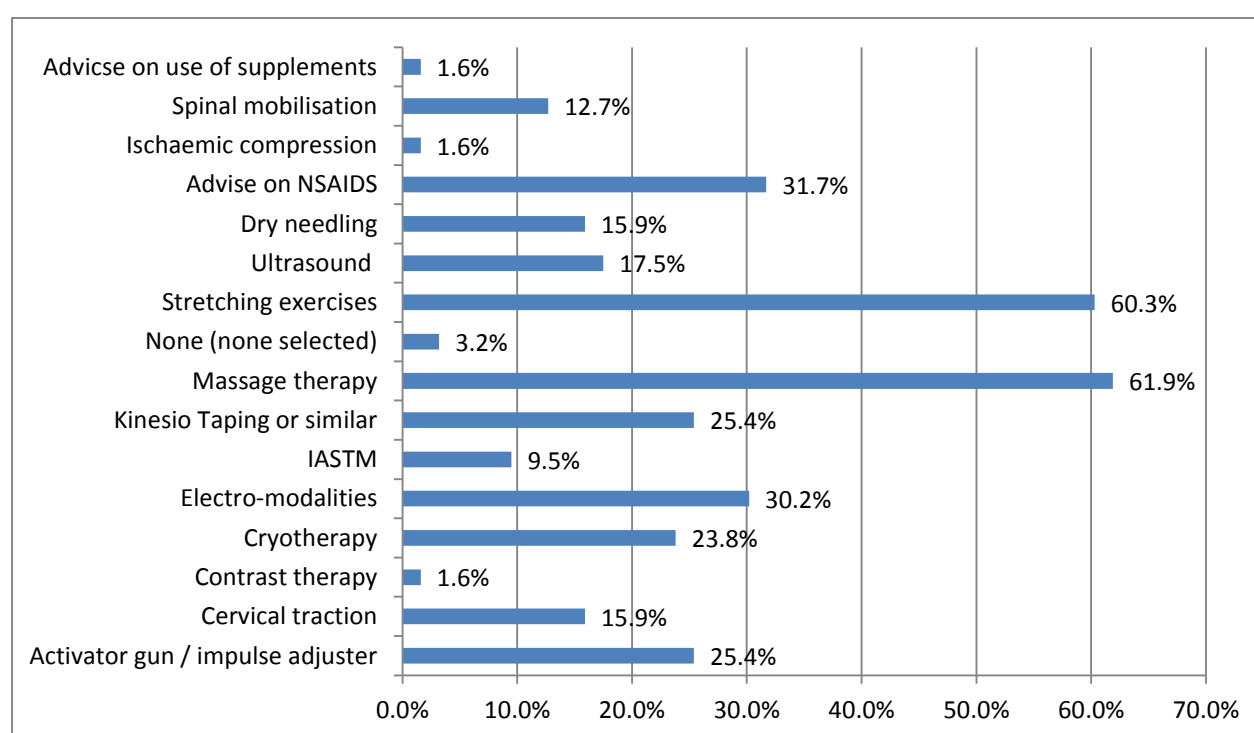
Most of the modalities chosen have their own theorised mechanism of action and particular effects which could be obtained. No specific treatment protocols have been outlined as the most suitable approach for a CEH; the information in Figure 12 indicates what is currently being used by chiropractors in the greater Durban area to address CEH. Research may have been done on each of these modalities individually but the efficacy of combined application for that of CEH has not yet been established.

4.4.1.6 Modalities used when spinal manipulation is contra indicated for a CEH

4.4.1.6.1 Results for “Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)”

The majority of the participants (61.9% (39)) selected massage therapy followed by stretching exercises (60.3% (38)). Advice on NSAIDS, electro-modalities, KT or similar, activator gun / impulse adjuster and cryotherapy were selected with frequencies between 23.8% (15) and 31.7% (20) (Figure 13).

Figure 13: Modalities used when spinal manipulation is contra indicated for a cervicogenic headache



4.4.1.6.2 Discussion of “Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)”

The majority of the participants indicated that the preferred treatment option to be used if SMT is contra-indicated is massage therapy closely followed by stretching exercises. With the contra-indication of SMT the usage of ultrasound therapy as well as instrument assisted manipulation devices increased as oppose to when selected to be used in conjunction with SMT. The use of cervical traction decreased with

ample margins. The participants indicated a relatively low frequency with regard to the use of spinal mobilisation which could indicate that the majority of the participants would perhaps prefer to stay clear from applying therapies which involve joint range of motion if contra-indications to SMT are suspected.

4.4.1.7 Treatment of MFTP associated with a CEH

4.4.1.7.1 Results for “If you find myofascial trigger points associated with this condition would you treat it?”

All of the participants agreed to treat MFTP if present in a patient with cervicogenic headache (Table 43).

Table 43: Treatment of MFTP associated with a cervicogenic headache

	Answer	N	Column %
Q6.1.6) “If you find myofascial trigger points associated with this condition would you treat it?”	No	0	0.0%
	Yes	63	100.0%

4.4.1.7.2 Discussion of “If you find myofascial trigger points associated with this condition would you treat it?”

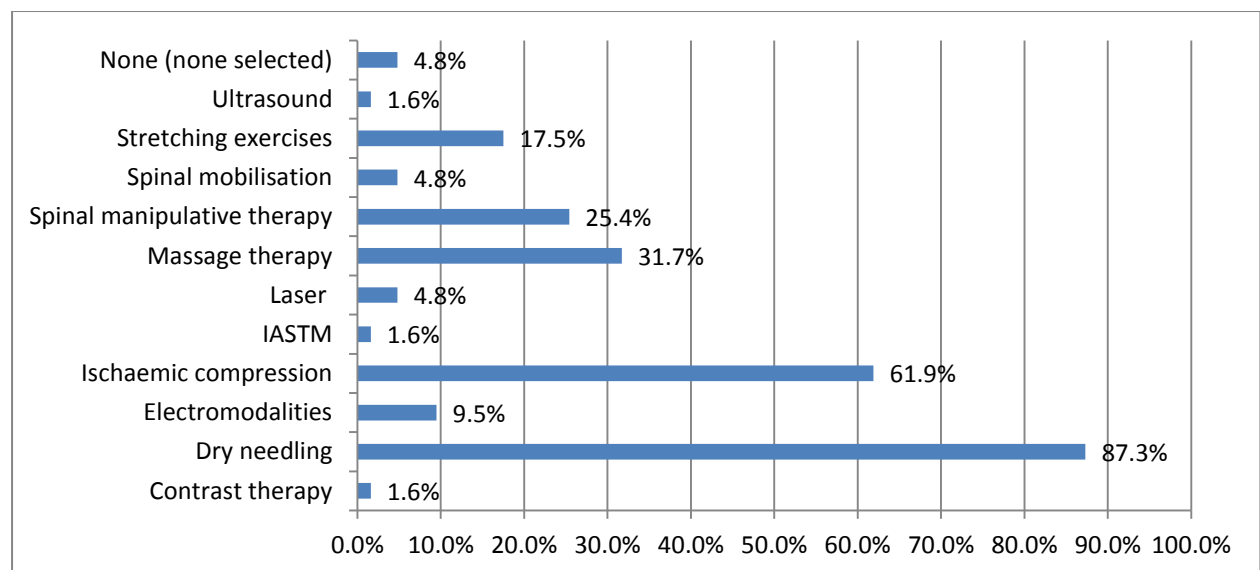
MFTP may be a contributor to headache and cervical spine dysfunction which may be associated with that of CEH (Simons *et al.* 1999). All of the participants indicated that they would treat MFTPs if it is associated with CEH. This could possibly indicate that the perceived importance of MFTPs, by the participants group, in the treatment of CEH is of high priority.

4.4.1.8 Modalities chosen to treat MFTP associated with a CEH

4.4.1.8.1 Results of “Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition”

Dry needling was selected by 87.3% (55) of the participants followed by ischaemic compression which was selected by 61.9% (39) of the participants and massage therapy was selected by 31.7% (20) of the participants (Figure 14).

Figure 14: Modalities chosen to treat MFTP associated with a cervicogenic headache



4.4.1.8.2 Discussion of “Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition”

A large variety of treatment options were listed by the participants indicating that the participants use many different modalities for MFTPs. Dry needling was the most selected modality for the treatment of MFTPs associated with CEH by a relatively large margin. Based on these results the preferred treatment option in practice appears to be dry needling, the efficacy of which appears to be supported in the literature (Rayegani *et al.* 2014).

4.4.1.9 Number of days to schedule a follow up after initial appointment for a CEH

4.4.1.9.1 Results for the “After how many days would you request a follow up appointment for this condition?”

The majority of the participants indicated that they would request to treat the patient two to three days after the initial appointment for a CEH (80.9% (51)) with 49.2% (31) leaning towards two days and 31.7% (20) leaning towards three days. A range between a minimum of one day and a maximum of 10 days was established (Figure 15).

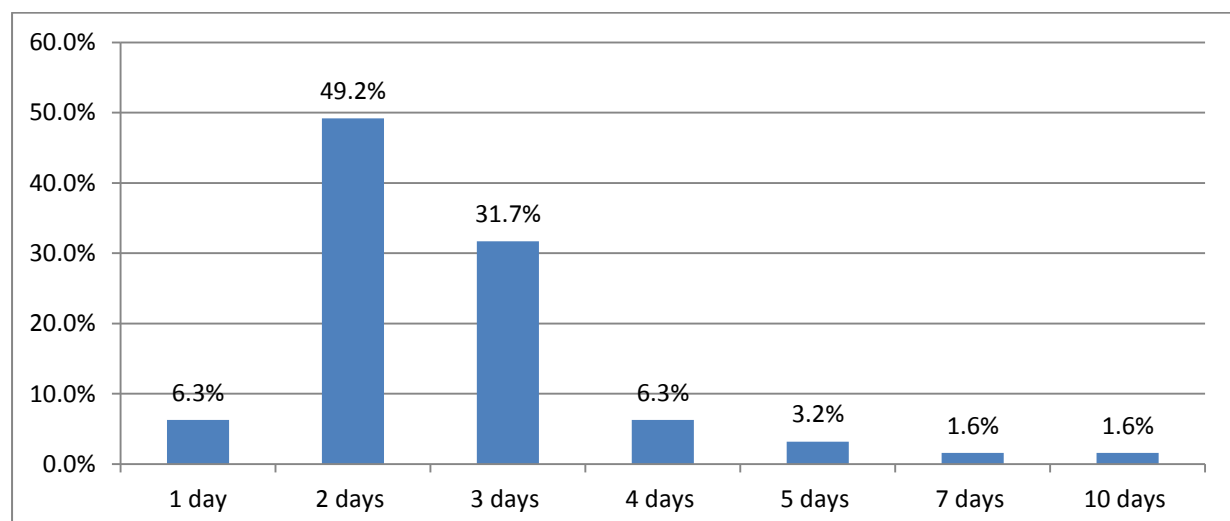


Figure 15: Amount of days to schedule a follow up after initial appointment for a cervicogenic headache

4.4.1.9.2 Discussion of “After how many days would you request a follow up appointment for this condition?”

There is moderate evidence to suggest that a patient diagnosed with a CEH could benefit from nine to 12 manual therapy sessions over a three week period whereas other evidence recommends two visits per week over three weeks (Haas *et al.* 2004; Bryans *et al.* 2011). The majority of the participants indicated a follow up appointment within two days and three days respectively. When combined, 80.9% (51) of the participants recommended a follow up two to three days following the

initial appointment and 93.5% (59) of the participants recommended a follow up within four days of the initial appointment which is consistent with regard to maintaining the amount of required treatments suggested by the literature.

4.4.1.10 Consideration of further investigation after specified amount of days with no relief of symptoms for a CEH

4.4.1.10.1 Results for “After how many days with no relief of symptoms would you consider further investigation necessary?”

The majority of the participants indicated that they would consider further investigations necessary after seven days with no relief of symptoms. 66.7% (42) of the participants indicated that they would consider further investigations necessary after one and up to seven days. 31.7% (20) of the participants indicated that they would consider further investigations necessary after eight and up to fourteen days (between one and two weeks) (Figure 16).

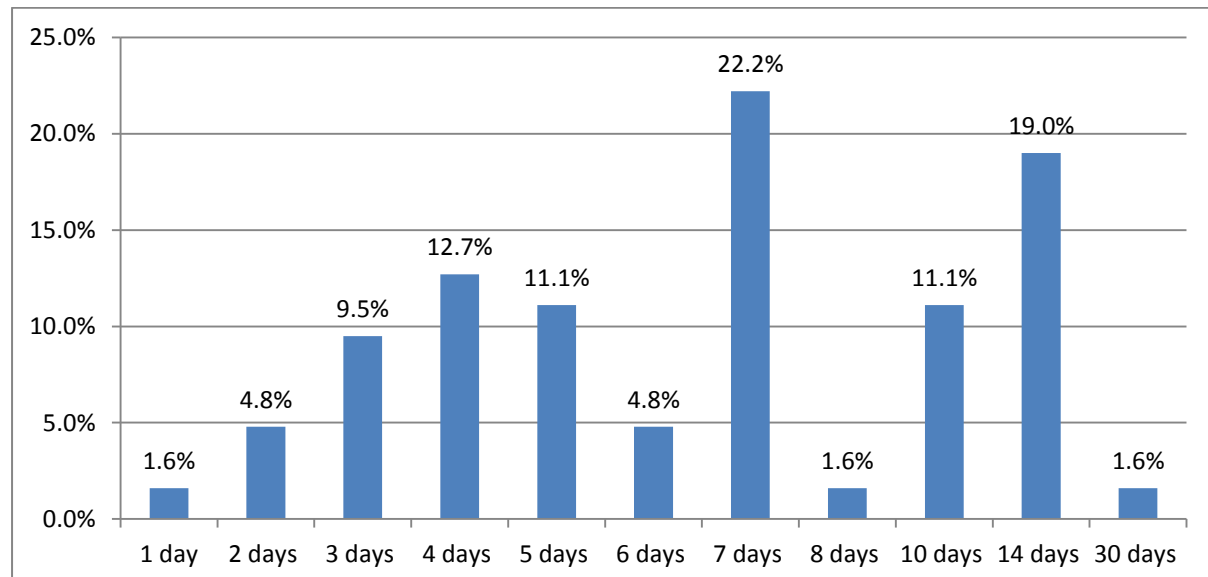


Figure 16: Consideration of further investigation after specified amount of days with no relief of symptoms for a cervicogenic headache

4.4.1.10.2 Discussion of “After how many days with no relief of symptoms would you consider further investigation necessary?”

A large range was observed which indicates that there appears to be a large difference of opinion with regard to when further investigations should be considered. A range from one day, up to 30 days was indicated as the appropriate time to consider further investigations if no relief of symptoms were experienced by the patient.

Considering that there is some evidence to suggest that relief of symptoms and sustained outcome measures for a CEH should be achieved within three weeks (Haas *et al.* 2004; Bryans *et al.* 2011), it would seem inappropriate to only consider further investigations necessary beyond or relatively close to a 21 day period. The majority of the participants indicated that they would consider further investigations necessary before and up to seven days without relief of symptoms which is within the 21 day period.

No specific literature was found with regard to when investigations should be considered for a CEH, apart from a lack of response to treatment as well as progressing symptoms which could be considered as red flags which should warrant further investigations.

4.4.1.11 Number of treatments expected for patient to experience relief of symptoms for a CEH

4.4.1.11.1 Results for the “After how many treatments do you expect the patient to experience relief of symptoms?”

All of the participants indicated that they would expect a patient with a CEH to experience relief of symptoms within a maximum of six days and a minimum of one day. The majority of the participants expected relief of symptoms after two days (Figure 17).

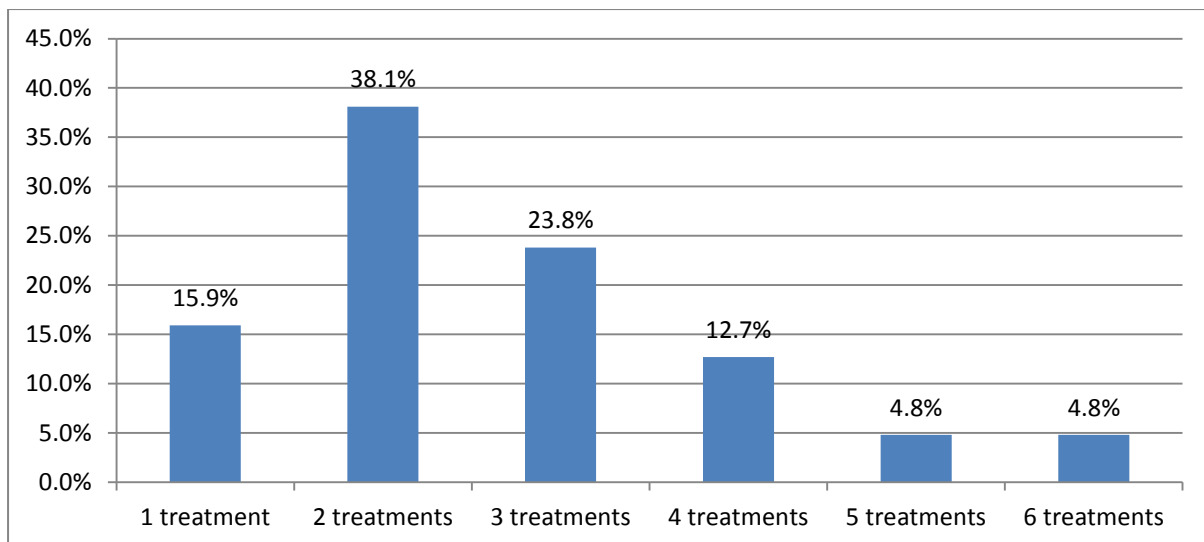


Figure 17: Amount of treatments expected for patient to experience relief of symptoms for a cervicogenic headache

4.4.1.11.2 Discussion of “After how many treatments do you expect the patient to experience relief of symptoms?”

Some of the research suggests that relief of symptoms and sustained treatment outcomes could be expected within nine to 12 treatments whereas other literature suggests two treatments over three weeks (which would add up to six treatments) (Haas *et al.* 2004; Bryans *et al.* 2011). All of the participants expected relief of symptoms within six treatments. The majority expected relief of symptoms within two treatments which is not consistent with that of the literature, which could possibly indicate that experience in practice for the management of CEH is inconsistent with research outcomes. One should keep in mind that the research rigour of the studies mentioned, delivered evidence of moderate strength which could suggest that it is not an absolute indication but more of a guideline recommendation. This could explain why the majority of the participants expected relief of symptoms sooner than the research might suggest.

4.4.1.12 Maintenance care if patient is pain free

4.4.1.12.1 Results of “Do you suggest maintenance care after the patient is pain free?”

79.4% (50) of the participants indicated that they would recommend maintenance care for a patient with CEH (Table 44).

Table 44: Maintenance care after the patient is pain free for a cervicogenic headache

	Answer	N	Column %	N
6.1.11) “Do you suggest maintenance care after the patient is pain free?”	No	13	20.6%	
	Yes	50	79.4%	

4.4.1.12.2 Discussion of “Do you suggest maintenance care after the patient is pain free?”

The majority of the participants recommended maintenance care after the patient is pain free, maintenance care could include exercises and postural training which could possibly be used to maintain normal functioning and increase stability and support around the previously dysfunctional area. Maintenance care may require the patient to visit the chiropractor for routine assessment of the condition.

Sustained treatment outcomes from chiropractic management of CEH could be expected within nine to 12 treatments (Haas *et al.* 2004; Bryans *et al.* 2011). Maintenance care beyond 12 treatments may be necessary if the clinician ascertains that the patient does not manage perpetuating or activating factors of CEH appropriately.

4.4.1.13 Post treatment patient advice or education suggested for a CEH

4.4.1.13.1 Results of “What post treatment patient advice or education would you suggest for this condition?”

93.7% (59) of the participants agreed that they would recommend postural or ergonomic advice for a patient with a CEH. 77.8% (49) of the participants agreed that home stretching exercises should be recommended. 76.2% (48) of the participants agreed that stress management techniques should be recommended. Proprioceptive exercises were recommended by 50.8% (32) of the participants. The majority of the participants considered themselves “neutral” when it came to the recommendation of starting cardiovascular exercise, strength training, over the counter analgesic medication and exercises performed with the supervision of an instructor (Table 45).

Table 45: Post treatment patient advice or education suggested for a cervicogenic headache

Q6.1.2) “What post treatment patient advice or education would you suggest for this condition?”	Answer	N	Column N %
Q6.1.12 A) Advise on starting a cardiovascular exercise program	Agree	25	39.7%
	Neutral	33	52.4%
	Disagree	5	7.9%
Q6.1.12 B) Advise on starting a strength training exercise	Agree	27	42.9%
	Neutral	31	49.2%
	Disagree	5	7.9%
Q6.1.12 C) Advise on taking over the counter analgesic medication	Agree	14	22.2%
	Neutral	27	42.9%
	Disagree	22	34.9%
Q6.1.12 D) Advise the patient to use a training instructor for exercises	Agree	15	23.8%
	Neutral	37	58.7%
	Disagree	11	17.5%
Q6.1.12 E) Home strengthening exercises	Agree	49	77.8%
	Neutral	12	19.0%
	Disagree	2	3.2%
Q6.1.12 F) Postural or ergonomic advice	Agree	59	93.7%
	Neutral	4	6.3%
	Disagree	0	0.0%
Q6.1.12 G) Proprioceptive exercises	Agree	32	50.8%
	Neutral	25	39.7%
	Disagree	6	9.5%

Q6.1.12 H) Stress management techniques

Agree	48	76.2%
Neutral	12	19.0%
Disagree	3	4.8%

4.4.1.13.2 Discussion of “What post treatment patient advice or education would you suggest for this condition?”

The use of postural and ergonomic advice, home stretching, stress management techniques and proprioceptive exercises may be of benefit to a patient with CEH as part of an active patient care system, thus these are appropriate responses (Bruflat *et al.* 2012; Anu, Aparna and Anand 2014).

The majority of the participants had neutral opinions about suggesting cardiovascular training, strength training, OTC analgesic medication and exercises performed with the supervision of an instructor. The literature does not seem to deliver evidence of direct benefits of cardiovascular exercise for CEH however indirect effects of cardiovascular training could benefit the overall physical conditioning of the patient which may be used as an adjunctive treatment option (Vina *et al.* 2012). The use of strength training could be of benefit for a patient with CEH (strength training of the deep cervical flexors) (Bryans *et al.* 2011). OTC analgesic medication could provide symptomatic pain relief for CEH. The use of exercises performed under the supervision of an instructor could be necessary if the patient does not grasp the technical skills or motivation to perform the exercises required.

4.4.1.14 Management proceeding if the patient with a CEH was not achieving the aims and/or goals of treatment

4.4.1.14.1 Results for “If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?”

If management outcomes do not progress according to the aims and/or goals of treatment 88.9% (56) of the participants agreed that they would reassess all previous positive findings. 82.5% (52) agreed that they would change the treatment method. 63.5% (40) agreed that they would assess the patient as if the patient was a new

patient. 60.3% (38) of the participants disagreed that they would continue treating with the original treatment protocol. 49.2% (31) disagreed that they would refer the patient to another chiropractor. 47.6% (30) of the participants agreed that they would refer to another health care practitioner other than a chiropractor and at the same time 47.6% (30) were neutral about this statement (Table 46).

Table 46: Management proceeding if the patient with a cervicogenic headache was not achieving the aims and/or goals of treatment

Q6.1.3) "If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?"	Answer	N	Column N %
6.1.13 A) Assess the patient as a new patient	Agree	40	63.5%
	Neutral	19	30.2%
	Disagree	4	6.3%
6.1.13 B) Change the treatment method	Agree	52	82.5%
	Neutral	11	17.5%
	Disagree	0	0.0%
6.1.13 C) Continue treating with original treatment protocol	Agree	1	1.6%
	Neutral	24	38.1%
	Disagree	38	60.3%
6.1.13 D) Reassess al previous positive findings	Agree	56	88.9%
	Neutral	6	9.5%
	Disagree	1	1.6%
6.1.13 E) Refer to another chiropractor	Agree	7	11.1%
	Neutral	25	39.7%
	Disagree	31	49.2%
6.1.13 F) Refer to another health care practitioner other than a chiropractor	Agree	30	47.6%
	Neutral	30	47.6%
	Disagree	3	4.8%

4.4.1.14.2 Discussion of "If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?"

A general pattern can be noted with regard to the management proceedings if the patient does not achieve desired outcome goals. The general pattern noted was that the majority of the participants agreed that the patient would be reassessed as a new patient and the original treatment method would be changed. All previous positive findings would be reassessed. If the patient requires referral for the presenting complaint the majority of the participants agreed to refer the patient to another health

care provider other than a chiropractor. This indicates that the majority of the participants would use a dynamic management approach to determine the cause and treat the patient effectively as a chiropractor and refer the patient if the outcome is not sufficient for the patient.

4.4.2 Results and discussion of question 7 (TTH)

4.4.2.1 Adjustment of a patient with a TTH if no red flags are present

4.4.2.1.1 Results for “Would you adjust a patient with this condition if no red flags are present?”

All of the participants agreed that they would adjust a patient with a TTH provided that there are no red flags present which would deter them from adjusting the patient (Table 47).

Table 47: Adjustment of a patient with a tension type headache if no red flags are present

Q7.1.1) “Would you adjust a patient with this condition if no red flags are present?”	Count	Column N %
No	0	0.0%
Yes	63	100.0%

4.4.2.1.2 Discussion of “Would you adjust a patient with this condition if no red flags are present?”

The efficacy of SMT for TTH is not soundly evident in the literature however all of the participants indicated that they would use SMT for TTH. This can’t be attributed to the philosophy some of the participants adhere to as all the participants (including all possible demographic backgrounds) indicated that they would adjust the patient (Bryans *et al.* 2011). The participants appear to support the use of SMT for TTH which indicates that the literature might not be consistent with results obtained in practice for the management of TTH. One should however take into account that SMT might not be the only treatment intervention used for the treatment of TTH thus it may appear as if SMT is effective when combined with other treatment protocols.

4.4.2.2 Adjustments used in practice if no red flags are present for a TTH

4.4.2.2.1 Results for “Which of the following adjustments would you use in practice for this condition if no red flags are present?”

If no red flags are present for a patient with a TTH, 84.1% (53) of the participants agreed that they would attempt to adjust only those segments which are suspected to be fixated. 77.8% (49) agreed that they would adjust multiple fixated segments throughout the cervical and thoracic spine. The majority of the participants disagreed that they would adjust multiple segments throughout the thoracic spine including those segments which are not fixated. The majority also disagreed that they would adjust multiple segments throughout the cervical spine including those which are not fixated. The majority of the participants also then disagreed that they would adjust thoracic spine fixations only. 49.2% (31) of the participants were “neutral” about adjusting the fixated segment on both sides (left and right side) (Table 48).

Table 48: Adjustments used in practice if no red flags are present for a tension type headache

Q7.1.2) “Which of the following adjustments would you use in practice for this condition if no red flags are present?”	Answer	Answer	Column N %
Q7.1.2 A) Attempt to adjust specific segments only (only those which are suspected to be fixated)	Agree	53	84.1%
	Neutral	9	14.3%
	Disagree	1	1.6%
Q7.1.2 B) Adjust the fixated segment on both sides	Agree	24	38.1%
	Neutral	31	49.2%
	Disagree	8	12.7%
Q7.1.2 C) Adjust multiple segments throughout the cervical spine including those which are not fixated.	Agree	5	7.9%
	Neutral	14	22.2%
	Disagree	44	69.8%
Q7.1.2 D) Adjust multiple fixated segments throughout the cervical and thoracic spine	Agree	49	77.8%
	Neutral	8	12.7%
	Disagree	6	9.5%
Q7.1.2 E) Adjust the thoracic spine fixations only	Agree	5	7.9%
	Neutral	15	23.8%
	Disagree	43	68.3%
Q7.1.2 F) Adjust multiple segments throughout the thoracic spine including those which are not fixated	Agree	4	6.3%
	Neutral	14	22.2%
	Disagree	45	71.4%

4.4.2.2.2 Discussion of “Which of the following adjustments would you use in practice for this condition if no red flags are present?”

The general consensus gathered was similar to that found in the corresponding results for CEH and MEH which suggests that the majority of the participants were mainly in favour of adjusting specific fixated segments only, the majority of the participants then disagreed to adjust multiple non-fixated segments or only thoracic spine fixations. This would indicate that the majority of the participants attempt to be specific or goal orientated when considering adjustments on a patient and do not necessarily just adjust the patient regardless of examination findings (in terms of which levels are suspected to be fixated).

The only statement for which the majority of the participants were neutral was for adjusting a fixated segment bilaterally. The literature suggests that with a unilateral adjustment the facet joints may undergo joint gapping bilaterally along with bilateral cavitation's, however this does not occur exclusively on every SMT procedure (Cramer *et al.* 2011; Dunning *et al.* 2013). The majority of the participants may therefore be neutral possibly because the facet joints have gapped bilaterally as the literature suggests or they've had mixed results based on experience in practice.

4.4.2.3 Primary focus of treatment for a TTH

4.4.2.3.1 Results of “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

Approximately two out of every three participants indicated that they regard SMT as the primary focus of treatment (Table 49).

Table 49: Primary focus of treatment for a tension type headache

Q7.1.3) “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”	Answer	N	Column N %
	No	21	33.3%
	Yes	42	66.7%

4.4.2.3.2 Discussion of “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

SMT for the management of TTH is not convincingly effective for the treatment of TTH (Bryans *et al.* 2011). Two thirds however did indicate that they regard SMT as the primary focus of treatment for a TTH which is not consistent with the literature. This could be due to personal experience in practice, the literature requires more research to make confirmed recommendations for or against SMT, thus because efficacy of SMT for TTH in the research studies is not currently supported does not mean that it is necessarily ineffective, this could be why the majority of the participants still regard SMT as the primary focus of treatment for TTH.

4.4.2.4 Reasons for not regarding spinal manipulation as the primary focus of treatment for a TTH

4.4.2.4.1 Results for “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

The majority (69.6% (16)) of those who did not regard SMT as the primary focus for treatment of a TTH indicated that soft tissue therapy is the primary of focus when treating TTH. More than one response could have been selected by each participant (Table 50).

Table 50: Reasons for not regarding spinal manipulation as the primary focus of treatment for a tension type headache

Q7.1.3) “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”	Count	Column N %
Due to personal interpretation of current literature	2	8.7%
Because soft tissue therapy is the primary focus of your treatment for this condition	16	69.6%
Primary focus is on stress management and lifestyle management	1	4.3%
Multifactorial aetiology requiring a multidisciplinary management approach	2	8.7%
Manipulative therapy and soft tissue regarded as equally important	1	4.3%
Focus depends on each individual case	1	4.3%
Total	23	100.0%

4.4.2.4.2 Discussion of “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

Soft tissue therapy is regarded as an important factor in the management of TTH, and there is literature to suggest that it could be of benefit for TTH (Bendtsen and Fernández-de-la-Peñas 2011). Because of the important role muscular dysfunction can play in a TTH, the response to regard soft tissue therapy as the primary focus of treatment is an appropriate opinion.

Two participants indicated that their personal interpretation of the literature does not support the use of SMT to be regarded as the primary focus of treatment for TTH. This could be because currently the literature appears to show relatively little evidence of the efficacy of SMT for TTH (Bendtsen and Fernández-de-la-Peñas 2011; Bryans *et al.* 2011).

Two participants indicated that a multifactorial aetiology which requires a multidisciplinary management approach is the reason why SMT is not regarded as the primary focus of treatment for TTH. TTH is a disorder which could involve more than one factor that contributes to the condition, thus a multidisciplinary management approach could be warranted depending on the individual patient's requirements as well as the health care providers' opinion with regard to what is required for successful treatment of the condition. This would also rationalise the statement selected by one participant which indicated that the primary focus of treatment depends on each individual case.

There is literature which suggests that stress management is an important perpetuating and aggravating factor in TTH which should be addressed for adequate management of a TTH (Chen 2009).

One participant indicated that soft tissue therapy and SMT are regarded as equally important in the management of TTH. At this stage the literature would suggest that SMT is less effective than soft tissue therapy for treatment of TTH (Bryans *et al.* 2011).

4.4.2.5 Modalities used in conjunction with spinal manipulation for a TTH

4.4.2.5.1 Results for “Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)”

The majority of the participants (81% (51)) selected massage therapy, followed by stretching exercises (77.8% (49)). Cervical traction, KT or similar, electro-modalities and cryotherapy had selection frequencies ranging between 20.6% (13) to 33.3% (21) (Figure 18).

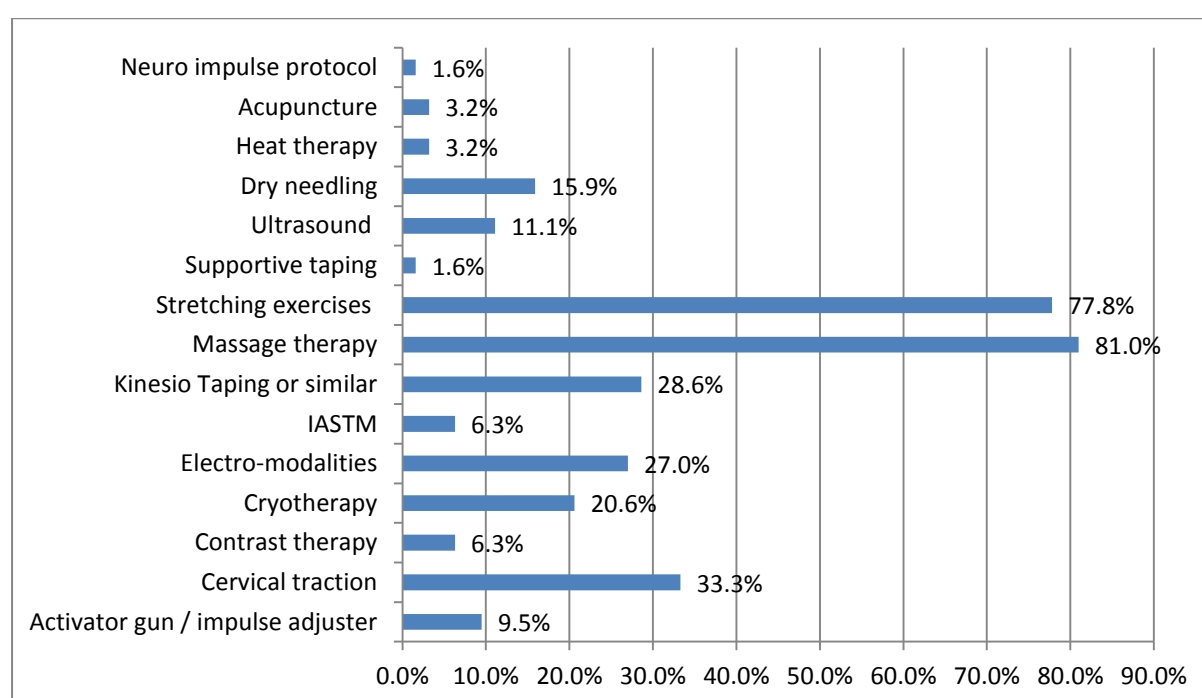


Figure 18: modalities used in conjunction with spinal manipulation for a tension type headache

4.4.2.5.2 Discussion of modalities used in conjunction with spinal manipulation for a TTH “Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)”

Massage therapy and stretching exercises could be of benefit for a patient with a TTH as it may relieve dysfunction in the soft tissue structures and muscles associated with a TTH. As associated muscular and soft tissue components may play an aetiological and perpetuating role in TTH (particularly that of CTTH), the use

of modalities which may affect these structures could provide possible benefits (Chen 2009; Olesen *et al.* 2013). Supportive and kinesio taping may be used as a method to support certain muscles or joints and promote particular movement patterns. Currently the modalities which have low evidence or lack of research for the treatment of TTH (shown in Figure 18) either directly or indirectly are acupuncture, neuro-impulse protocol and instrument assisted manipulation devices.

4.4.2.6 Modalities used when spinal manipulation is contra indicated for a TTH

4.4.2.6.1 Results for “Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)”

The majority of the participants selected massage therapy (65.1(41)) followed by stretching exercise (63.5% (40)) when SMT is contra-indicated. Advice on NSAIDS, cervical traction, electro-modalities, cryotherapy, KT or similar and activator gun / impulse adjuster were chosen with selection frequencies ranging between 23.8% (15) to 33.3% (21) (Figure 19).

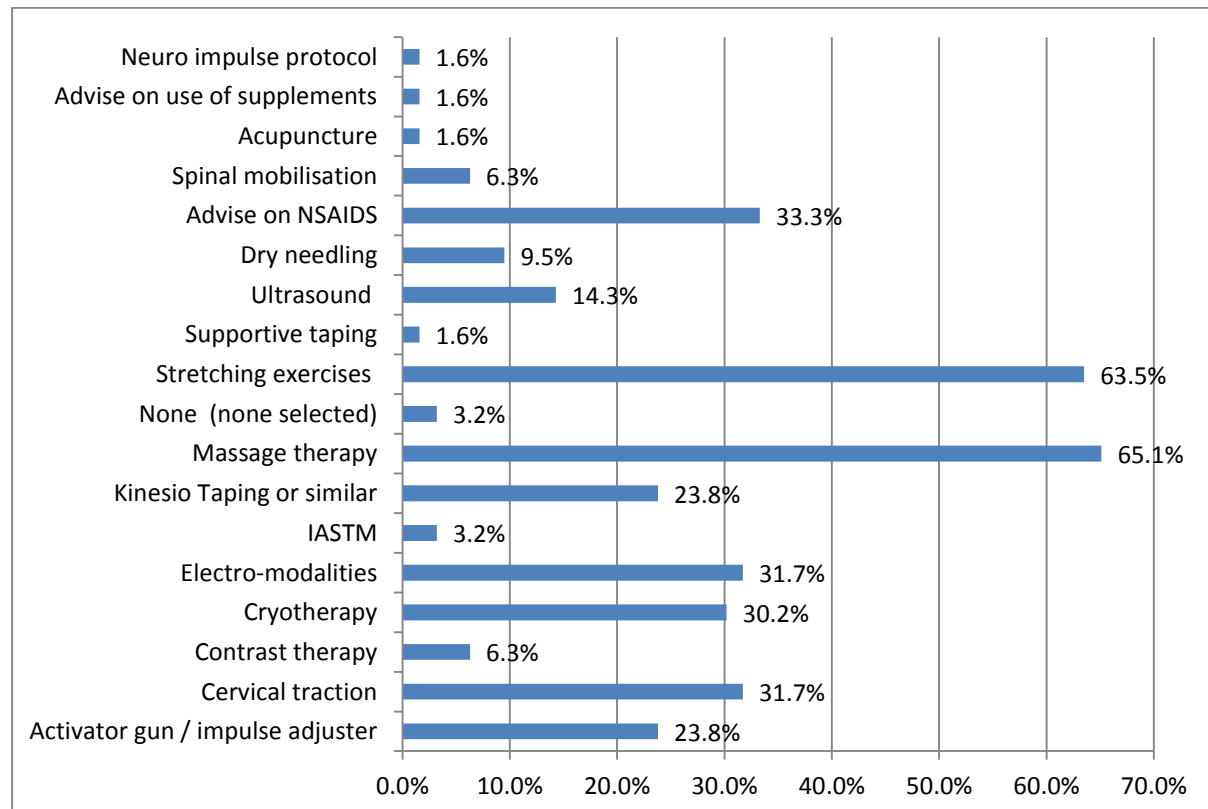


Figure 19: Modalities used when spinal manipulation is contra indicated for a tension type headache

4.4.2.6.2 Discussion of “(Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)”

Massage therapy and stretching exercises are the two most preferred treatment options used if SMT is contra-indicated, these modalities may be effective to address the muscular and possibly even the stress related associations with TTH (Bruflat *et al.* 2012). One third of the participants indicated the recommendation of NSAIDS for a TTH if SMT is contra-indicated which may be of benefit for reducing the pain intensity experienced by the patient. The use of instrument assisted manipulation devices and cryotherapy were notably increased when SMT is contra-indicated as oppose to when used as a conjunctive therapy to SMT. These modalities could possibly be used in attempt to decrease pain experienced by the patient as SMT cannot be used for these purposes.

4.4.2.7 Treatment of MFTP associated with TTH

4.4.2.7.1 Results for the “If you find myofascial trigger points associated with this condition would you treat it?”

The majority of the participants (98.4% (62)) indicated that they would treat MFTPs if associated with a TTH (Table 51).

Table 51: Treatment of MFTP associated with tension type headache

Q7.1.6) “If you find myofascial trigger points associated with this condition would you treat it?”	Answer	N	Column N %
	No	1	1.6%
	Yes	62	98.4%

4.4.2.7.2 Discussion of “If you find myofascial trigger points associated with this condition would you treat it?”

TTH can be associated with a muscular involvement; treatment of MFTPs may be of benefit for a patient with TTH (Bendtsen and Fernández-de-la-Peñas 2011). Therefore the majority of the participants responded appropriately to this question.

4.4.2.8 Modalities chosen to treat MFTP associated with a TTH

4.4.2.8.1 Results for “Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition”

The majority of the participants 88.7% (55) selected dry needling as the preferred treatment for MFTP associated with TTH followed by IC (59.7% (37)). Massage therapy (35.5% (22)), spinal mobilisation (32.3% (20)) and stretching exercises (32.3% (20)) had relatively close frequencies of selection (Figure 20).

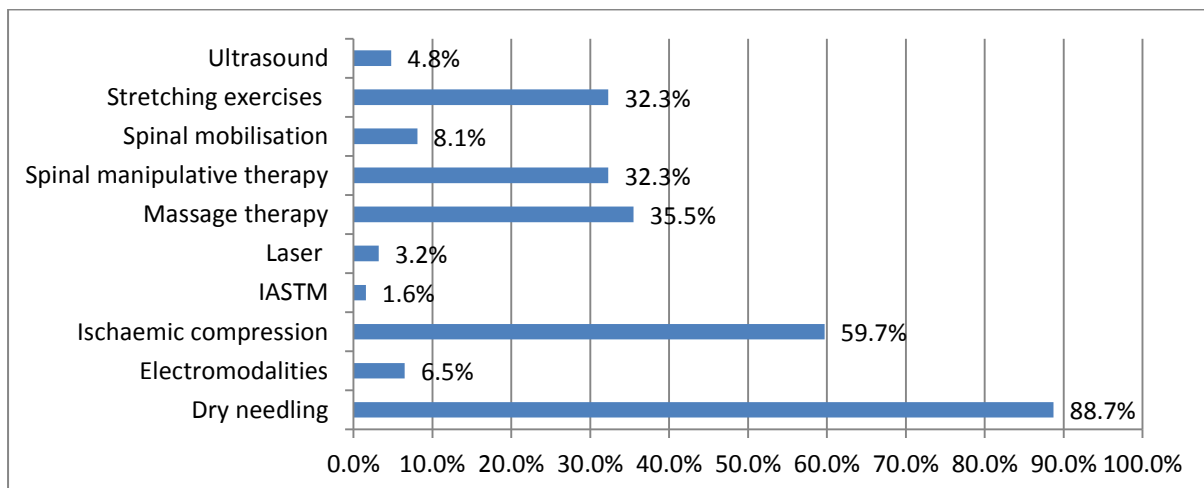


Figure 20: Modalities chosen to treat MFTP associated with a tension type headache

4.4.2.8.2 Discussion of treatment of MFTP associated with TTH “Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition”

The use of dry needling was selected as the preferred treatment for MFTP. Dry needling is an effective method of treating MFTP (Vernon and Schneider 2009; Cagnie *et al.* 2013). The majority of the participants selected an appropriate method of treating MFTP.

The use of massage therapy, SMT and stretching exercises had relatively similar frequencies of preference, all of which has some evidence to suggest that they

would be effective for the treatment of MFTP (Simons *et al.* 1999; Vernon and Schneider 2009).

4.4.2.9 Number of days to schedule a follow up after initial appointment for a TTH

4.4.2.9.1 Results for “After how many days would you request a follow up appointment for this condition?”

The majority of the participants (54% (34)) indicated that they would request the patient to return for treatment two days after the initial appointment. 30.2% (19) indicated a three day margin between the initial treatment and a follow up, thus 84.2% (53) of the participants requested a follow up appointment between two and three days after the initial appointment. A range between a minimum of one day and a maximum of seven days for a follow up appointment after the initial appointment was generated from the data supplied by the participants (Figure 21).

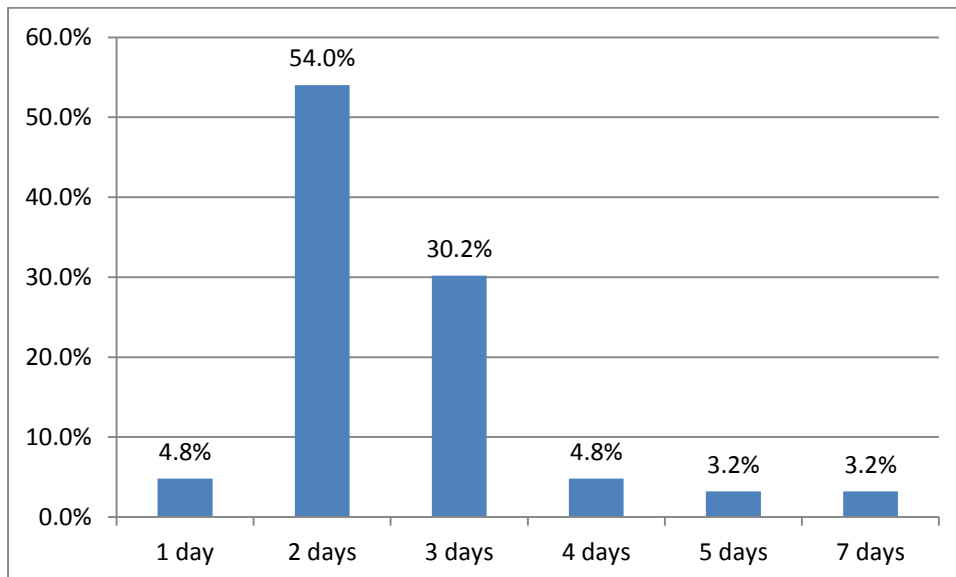


Figure 21: Amount of days to schedule a follow up after initial appointment for a tension type headache

4.4.2.9.2 Discussion of “After how many days would you request a follow up appointment for this condition?”

All of the participants indicated that they would request a follow up appointment within no more than seven days after the initial appointment. The majority of the participants indicated that they would request the patient to come for a follow up visit two days after the initial appointment. The literature does not seem to specify a specific recommendation with regard to the most appropriate treatment increments for a TTH. One case report indicated that five treatments over a two week period was sufficient to resolve a TTH, however one case report is not sufficient to establish practice protocols (Ohlsen 2012). Based on the outcome of this study the most common time for a follow up appointment after the initial appointment for a TTH is two days.

4.4.2.10 Consideration of further investigation after specified amount of days with no relief of symptoms for a for a TTH

4.4.2.10.1 Results for “After how many days with no relief of symptoms would you consider further investigation necessary?”

A range between one day and up to 40 days was calculated for the consideration of further investigations if no relief of symptoms is noted. 67.4% (42) of the participants considered further investigations necessary between one and seven days and the remaining 32.6% (21) considered investigations after seven days and up to 40 days. The highest number of the participants (22.2% (14)) selected seven days (Figure 22).

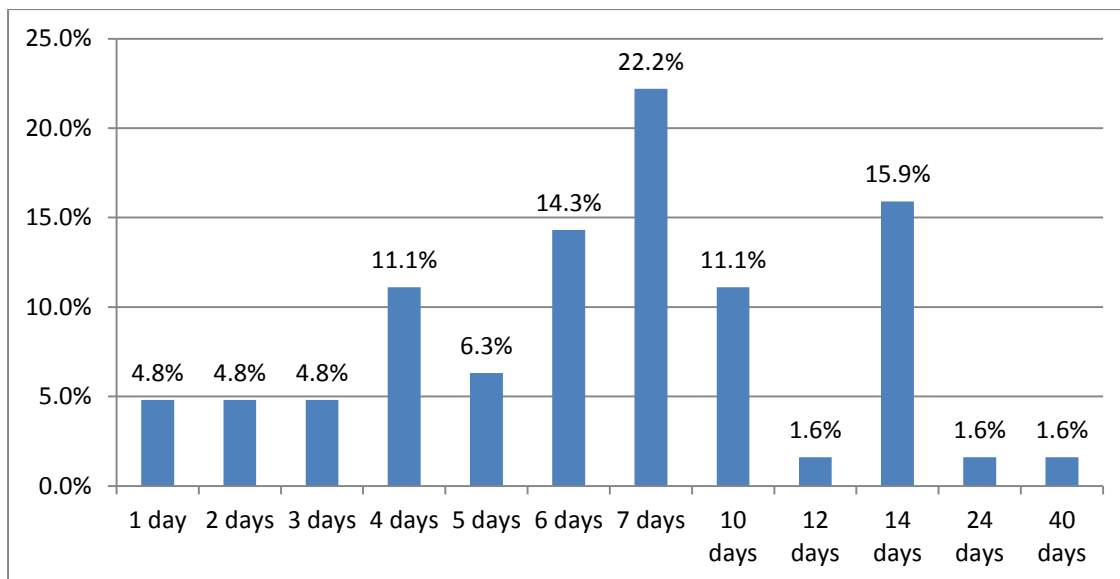


Figure 22: Consideration of further investigation after specified amount of days with no relief of symptoms for a for a tension type headache

4.4.2.10.2 Discussion of “After how many days with no relief of symptoms would you consider further investigation necessary?”

The wide range indicates that there is no particular consensus amongst the participants of when exactly to request further investigations for a TTH. Provided the diagnosis of TTH is accurate, TTH is a benign condition which does not have a life threatening progression (Bendtsen 2013). Therefore the delay in further investigation won't be potentially life threatening for a patient with TTH. The participants that chose to delay sending for further investigations are not being negligent or irresponsible in their management of their patients. However if at any point a secondary cause for the headache is suspected further investigations should be considered immediately.

4.4.2.11 Number of treatments expected for patient to experience relief of symptoms for a TTH

4.4.2.11.1 Results for “After how many treatments do you expect the patient to experience relief of symptoms?”

The majority of the participants (57.2% (36)) expected a patient with a TTH to experience relief of symptoms for a TTH within two (30.2% (19)) to three (27% (17)) treatments. A range between a minimum of one treatment and a maximum of seven treatments was determined (Figure 23).

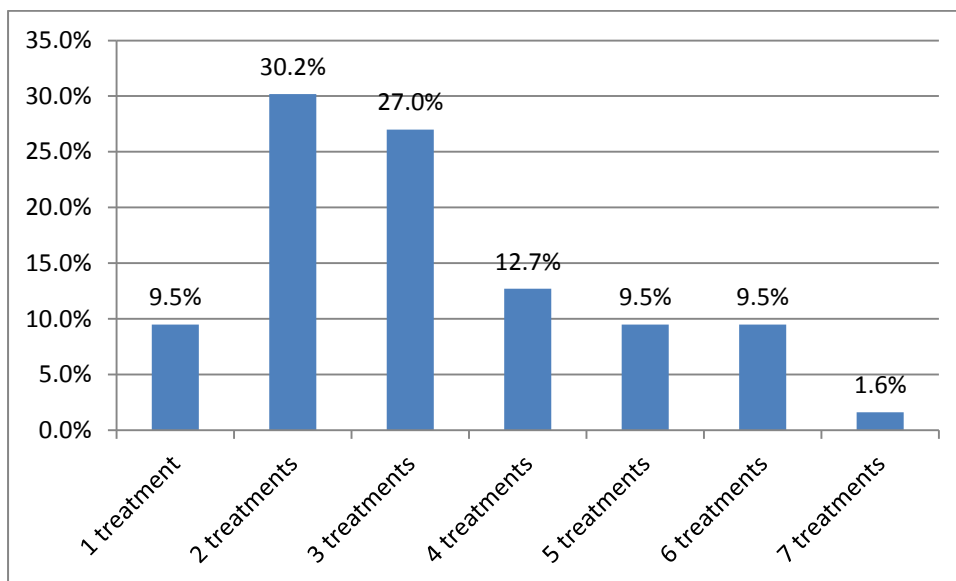


Figure 23: Number of treatments expected for patient to experience relief of symptoms for a tension type headache

4.4.2.11.2 Discussion of “After how many treatments do you expect the patient to experience relief of symptoms?”

The majority of the participants indicated that they expect the patient to experience relief of symptoms after two or three treatments. No specific timelines are available for the conservative management of TTH, however some research suggests that recommendations cannot be made for or against the use of SMT of two treatments per week over six weeks for more severe cases of TTH (Bryans *et al.* 2011). The most treatments suggested for the expected relief of TTH was no more than seven treatments and a minimum of one treatment. The majority of the participants appear to expect relief of symptoms relatively quickly via chiropractic management.

4.4.2.12 Maintenance care for a TTH if patient is pain free

4.4.2.12.1 Results for “Do you suggest maintenance care after the patient is pain free?”

The majority of the participants (84.1% (53)) indicated that they would recommend maintenance care for a patient with a TTH (Table 52).

Table 52: Maintenance care after the patient is pain free for a tension type headache

Q7.1.11) “Do you suggest maintenance care after the patient is pain free?”	Answer	N	Column N %
	No	10	15.9%
	Yes	53	84.1%

4.4.2.12.2 Discussion of “Do you suggest maintenance care after the patient is pain free?”

Some maintenance therapy such as low-load craniocervical mobilisation is suggested as an appropriate recommendation for long term management of patients with TTH. The majority of the participants did suggest maintenance care. It would appear that the literature delivers moderate evidence to support this suggestion (Bryans *et al.* 2011).

4.4.2.13 Post treatment patient advice or education suggested for a TTH

4.4.2.13.1 Results for “What post treatment patient advice or education would you suggest for this condition?”

The majority of the participants (92.1% (58)) agreed that postural or ergonomic advice should be recommended to a patient with a tension type headache. 90.5% (57) agreed that a TTH patient should be advised to perform stress management techniques. 69.8% (44) agreed that home stretching exercises should be recommended. 60.3% (38) agreed to recommend starting a cardiovascular exercise program. 4.7% (3) agreed to recommend dietary advice and 1.6% (1) agreed to recommend referring the patient for treatment with medicine. The participants were

predominantly neutral on advising strength training, using over the counter analgesic medication and using an instructor for exercises. 46% (29) agreed and 46% (29) disagreed on the use of proprioceptive exercises for TTH (Table 53).

Table 53: Post treatment patient advice or education suggested for a tension type headache

Q7.1.2) "What post treatment patient advice or education would you suggest for this condition?"	Answer	N	Column N %
Q7.1.12A) Advise on starting a cardiovascular exercise program	Agree	38	60.3%
	Neutral	21	33.3%
	Disagree	4	6.3%
Q7.1.12 B) Advise on starting a strength training exercise	Agree	22	34.9%
	Neutral	36	57.1%
	Disagree	5	7.9%
Q7.1.12 C) Advise on taking over the counter analgesic medication	Agree	17	27.0%
	Neutral	33	52.4%
	Disagree	13	20.6%
Q7.1.12 D) Advise the patient to use a training instructor for exercises	Agree	15	23.8%
	Neutral	39	61.9%
	Disagree	9	14.3%
Q7.1.12 E) Home stretching exercises	Agree	44	69.8%
	Neutral	17	27.0%
	Disagree	2	3.2%
Q7.1.12 F) Postural or ergonomic advice	Agree	58	92.1%
	Neutral	5	7.9%
	Disagree	0	0.0%
Q7.1.12 G) Proprioceptive exercises	Agree	29	46.0%
	Neutral	29	46.0%
	Disagree	5	7.9%
Q7.1.12 H) Stress management techniques	Agree	57	90.5%
	Neutral	5	7.9%
	Disagree	1	1.6%
Q7.1.12 I) Refer for treatment with medicine	Agree	1	1.6%
	Neutral	0	0.0%
	Disagree	0	0.0%
Q7.1.12 J) Dietary advice	Agree	3	4.7%
	Neutral	0	0.0%
	Disagree	0	0.0%

4.4.2.13.2 Discussion of “What post treatment patient advice or education would you suggest for this condition?”

The majority of the participants agreed stress management techniques should be recommended for a TTH, there is evidence in literature which would indicate that this could be of benefit for a patient with a TTH (Chen 2009; Bryans *et al.* 2011; Cathcart *et al.* 2012).

The majority of the participants also agreed that postural and ergonomic advice as well as starting cardiovascular training and dietary advice should be suggested to the patient for which there is limited proof of its efficacy in the literature for TTH. Cardiovascular training may however have an indirect impact on life style and stress management for which it may contribute to the management plan for a TTH (Vina *et al.* 2012). The participants were predominantly neutral with regard to advising strength training and training with the supervision of an instructor. The literature suggests that physical exercise training has limited evidence to support its efficacy in the treatment of TTH; indirect use of exercise may be used to manage stress which may contribute to the management of TTH (Bryans *et al.* 2011). The use of OTC analgesics may be of temporary benefit in reducing the perceived pain in TTH.

4.4.2.14 Management proceeding if the patient with a TTH was not achieving the aims and/or goals of treatment

4.4.2.14.1 Results for “If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?”

If management proceedings do not progress according to the aims and/or goals of treatment for a TTH 85.7% (54) of the participants agreed that they would change the treatment method, 82.5% (52) agreed that they would reassess all previous positive findings, 61.9% (39) agreed that they would assess the patient as a new patient and 58.7% (37) agreed that they would refer to another health care practitioner other than a chiropractor. 61.9% (39) of the participants disagreed that they would continue treating with the original treatment protocol. 54.5% (34) of the

participants considered themselves neutral about referring the patient to another chiropractor (Table 54).

Table 54: Management proceeding if the patient with a tension type headache was not achieving the aims and/or goals of treatment

Q7.1.3) "If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?"	Answer	N	Column N %
Q7.1.13 A) Assess the patient as a new patient	Agree	39	61.9%
	Neutral	23	36.5%
	Disagree	1	1.6%
Q7.1.13 B) Change the treatment method	Agree	54	85.7%
	Neutral	9	14.3%
	Disagree	0	0.0%
Q7.1.13 C) Continue treating with original treatment protocol	Agree	4	6.3%
	Neutral	20	31.7%
	Disagree	39	61.9%
Q7.1.13 D) Reassess al previous positive findings	Agree	52	82.5%
	Neutral	10	15.9%
	Disagree	1	1.6%
Q7.1.13 E) Refer to another chiropractor	Agree	2	3.2%
	Neutral	34	54.0%
	Disagree	27	42.9%
Q7.1.13 F) Refer to another health care practitioner other than a chiropractor	Agree	37	58.7%
	Neutral	24	38.1%
	Disagree	2	3.2%

4.4.2.14.2 Discussion of "If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?"

The way in which the majority of the participants responded for question 7.1.13 in the questionnaire revealed a specific consistency as the majority of the participants agreed with all statements which would result in re-evaluation of the patient with a change in treatment plan. The majority of the participants were however neutral with regard to referring the patient to another chiropractor, this could be because the patient has already received chiropractic treatment and the participant feels that his/her skills as a chiropractor is sufficient.

4.4.3 Results and discussion of question eight (MEH)

4.4.3.1 Adjustment of a patient with a MEH if no red flags are present

4.4.3.1.1 Results for “Would you adjust a patient with this condition if no red flags are present?”

The majority of the participants 98.6% (61) indicated that they would adjust a patient with a MEH if no red flags are present to deter them from treating the patient (Table 55).

Table 55: Adjustment of a patient with a migraine headache if no red flags are present

Q8.1.1) “Would you adjust a patient with this condition if no red flags are present?”	Answer	Count	Column N %
	No	2	3.2%
	Yes	61	96.8%

4.4.3.1.2 Discussion of “Would you adjust a patient with this condition if no red flags are present?”

A small portion of the participants indicated that they would not adjust a patient presenting with a MEH even if no contra-indications to SMT are present. There is low to moderate evidence to suggest that SMT may be beneficial for patients with MEH (Tuchin, Pollard and Bonello 2000; Harris 2005; Bryans *et al.* 2011; Chaibi, Tuchin and Russell 2011). Currently it appears as if the majority of the participants uses SMT for MEH indicating that based on practical experience and knowledge gained, the participants may expect benefits from SMT for MEH.

4.4.3.2 Adjustments used in practice if no red flags are present for a MEH

4.4.3.2.1 Results for “Which of the following adjustments would you use in practice for this condition if no red flags are present?”

If no red flags are present 87.1% (54) of the participants agreed that they would adjust only the segments which are suspected to be fixated, 69.4% (43) agreed that

multiple fixated segments throughout the cervical and thoracic spine should be adjusted. 72.6% (45) of the participants disagreed that multiple non-fixated segments throughout the thoracic spine should be adjusted, 69.4% (43) disagreed that only thoracic spine fixations should be adjusted and 69.4% (43) disagreed that multiple non-fixated segments throughout the cervical and thoracic spine should be adjusted. 41.9% (43) of the participants regarded themselves as neutral towards adjusting the fixated segment bilaterally (Table 56).

Table 56: Adjustments used in practice if no red flags are present for a MEH

Q8.1.2) "Which of the following adjustments would you use in practice for this condition if no red flags are present?"	Answer	N	Column N %
Q8.1.2 A) Attempt to adjust specific segments only (only those which are suspected to be fixated)	Agree	54	87.1%
	Disagree	8	12.9%
	Neutral	0	0
Q8.1.2 B) Adjust the fixated segment on both sides	Agree	24	38.7%
	Neutral	26	41.9%
	Disagree	12	19.4%
Q8.1.2 C) Adjust multiple segments throughout the cervical spine including those which are not fixated.	Agree	3	4.8%
	Neutral	16	25.8%
	Disagree	43	69.4%
Q8.1.2 D) Adjust multiple fixated segments throughout the cervical and thoracic spine	Agree	43	69.4%
	Neutral	13	21.0%
	Disagree	6	9.7%
Q8.1.2 E) Adjust the thoracic spine fixations only	Agree	4	6.5%
	Neutral	15	24.2%
	Disagree	43	69.4%
Q8.1.2 F) Adjust multiple segments throughout the thoracic spine including those which are not fixated	Agree	4	6.5%
	Neutral	13	21.0%
	Disagree	45	72.6%

4.4.3.2.2 Discussion of "Which of the following adjustments would you use in practice for this condition if no red flags are present?"

The general consensus gathered was similar to that found in the corresponding results for CEH and TTH which suggests that the majority of participants was mainly in favour of adjusting specific segments or fixated segments only found in both the thoracic and cervical spine, the majority of the participants then disagreed to adjust multiple non-fixated segments or only thoracic spine fixations. This would indicate that the majority of the participants attempt to be specific or goal orientated when

considering adjustments on a patient and do not necessarily just adjust the patient regardless of examination findings (in terms of which levels are suspected to be fixated).

The only statement which for which the majority of the participants was neutral was for adjusting a fixated segment bilaterally. The literature suggests that with a unilateral adjustment the facet joints may undergo joint gapping bilaterally along with bilateral cavitation's, however this does not occur exclusively on every SMT procedure (Dunning *et al.* 2013). The majority of the participants may therefore be neutral possibly because the facet joints have gapped bilaterally or they've had mixed results based on experience.

The data gathered in 4.3.2.2.1 was remarkably similar to that of 4.3.1.2.1 and 4.3.3.2.1. As the results of this question across the corresponding questions in CEH, TTH and MEH produced very similar responses according to what the majority of the participants indicated (the percentages differ slightly) it could serve as a possible indication that the participants in this sample have a fixed approach as to when and where adjustments should be applied. The participants appear to maintain that specificity of the adjustment is of importance rather than adjusting multiple segments which may not be regarded as fixated or problematic. These findings are not influenced by the type of headache being treated.

4.4.3.3 The primary focus of treatment for a MEH

4.4.3.3.1 Results for “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

The majority of the participants (79.4% (50)) indicated that they regard spinal manipulation as the primary focus of treatment for a MEH (Table 57).

Table 57: Spinal manipulation as primary focus of treatment

Q8.1.3) “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”	Answer	N	Column N %
	No	13	20.6%
	Yes	50	79.4%

4.4.3.3.2 Discussion “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

Approximately four out of every five participants regarded SMT as the primary focus of treatment for MEH. As the exact pathogenesis of MEH is not clear the most appropriate treatment option for specific outcomes have not been confirmed. There is low to moderate evidence that SMT may be beneficial for a patient with MEH (Tuchin, Pollard and Bonello 2000; Harris 2005; Bryans *et al.* 2011; Hubbard and Kane 2012). The results show that the majority of the participants appear to regard SMT as effective as they regard it as the primary focus of treatment for a MEH.

4.4.3.4 Reasons for not regarding spinal manipulation as the primary focus of treatment for a MEH

4.4.3.4.1 Results for “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

The majority of those who did not regard spinal manipulation as the primary focus of treatment indicated that it is due to personal interpretation of the literature (31.6% (6)) and because soft tissue therapy is the primary focus of treatment for MEH (31.6% (6)) (Table 58).

Table 58: Reasons for not regarding spinal manipulation as the primary focus of treatment for a migraine.

Q8.1.3) “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”	N	Column N %
Due to lack of positive results from personal experience	2	10.5%
Due to personal interpretation of current literature	6	31.6%
Because soft tissue therapy is the primary focus of your treatment for this condition	6	31.6%
Multifactorial etiology requiring a multidisciplinary management approach	2	10.5%
Manipulative therapy and soft tissue regarded as equally important	1	5.3%
Focus depends on each individual case	1	5.3%
Not specified	1	10.5%
Total	19	

4.4.3.4.2 Discussion of “Would you regard spinal manipulation as your primary focus of your treatment of this condition?”

There is no confirmatory evidence indicating that SMT should be used for MEH although there is also some quality evidence from those studies that do suggest possible benefits from SMT. Therefore, it could be interpreted that SMT should not be the primary focus of treatment for MEH (Tuchin, Pollard and Bonello 2000; Harris 2005; Chaibi, Tuchin and Russell 2011).

The use of soft tissue therapy has moderate evidence to suggest that it could be of benefit for a patient with a MEH, the evidence to suggest that it should be regarded as a primary focus of treatment for MEH is not justified (Bryans *et al.* 2011). This does not mean that soft tissue therapy or SMT should be excluded or overlooked as a possible beneficial treatment option, more research is necessary to provide firm conclusions in favour thereof. One participant indicated that SMT and soft tissue therapy are regarded as equally important treatment options. Currently there is more evidence to support the use of soft tissue therapy for MEH than there is evidence to support SMT (Tuchin, Pollard and Bonello 2000; Harris 2005; Chaibi, Tuchin and Russell 2011).

Two participants indicated that they did not regard SMT as the primary focus of treatment for a MEH, thus a relatively low amount of participants indicated a lack of results based on personal/practical experience.

Those who indicated that MEH has a multifactorial aetiology and requires a multidisciplinary management approach is consistent with some guidelines in the literature in terms of the benefits from a multidisciplinary treatment approach (Bryans *et al.* 2011).

One participant indicated that the primary focus of treatment depends on each individual case; this could be due to different severities of MEH and whether prodromal symptoms are present or absent.

4.4.3.5 Modalities used in conjunction with spinal manipulation for a MEH

4.4.3.5.1 Results of the “Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)”

The majority of the participants selected massage therapy (68.3% (43)) followed by stretching exercises (63.5% (40)) as the preferred modality to use in conjunction with SMT. Cryotherapy, cervical traction and electro-modalities were selected with a frequency range between 27% (17) and 34.9% (22) (Figure 24).

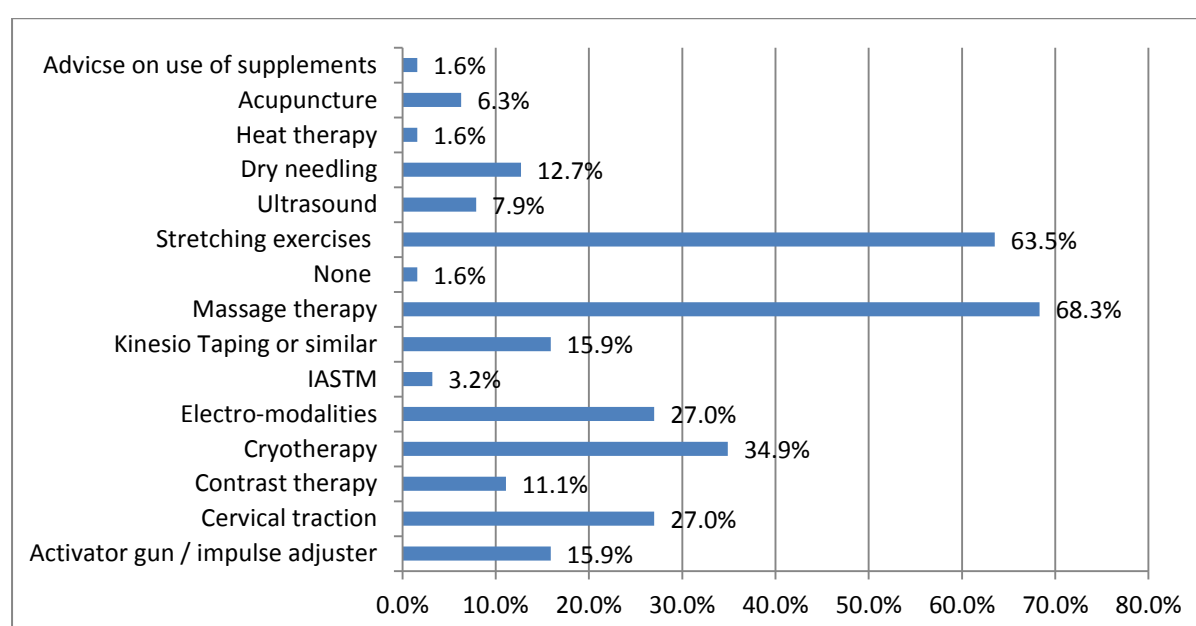


Figure 24: modalities used in conjunction with spinal manipulation for a migraine

4.4.3.5.2 Discussion of “Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)”

The majority of the participants indicated that they would use massage therapy closely followed by stretching exercises in conjunction with SMT for treatment of a MEH. These modalities may be used to indirectly address biomechanical dysfunction or lesions although no direct effect of these modalities on MEH has been proven to be specifically effective for a MEH however they may provide pain relief (Vina *et al.* 2012; Roecker *et al.* 2013; Field 2014).

Cryotherapy has no clear direct impact on MEH; it may be used to address muscular dysfunction and inflammatory related pain of associated structures around the head and cervical spine which may cause relief of pain (Hing *et al.* 2008).

Only one participant indicated that he/she would not use any modalities in conjunction with SMT, thus a very low percentage (1.6% (1)) of the participants felt that SMT alone would be sufficient for the treatment of MEH. As no specific guidelines exist for the use of modalities in conjunction with SMT for MEH, it may be of interest to the chiropractic profession to investigate the clinical efficacy of popular modalities used in conjunction with SMT for MEH.

4.4.3.6 Modalities used when SMT is contra-indicated for a MEH

4.4.3.6.1 Results for “Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)”

Stretching exercises (69.8% (44)) followed by massage therapy (63.5% (40)) and advisement of the use of NSAIDS (44.4% (28)) were the most frequently selected modalities to be used if SMT is contra-indicated (Figure 25).

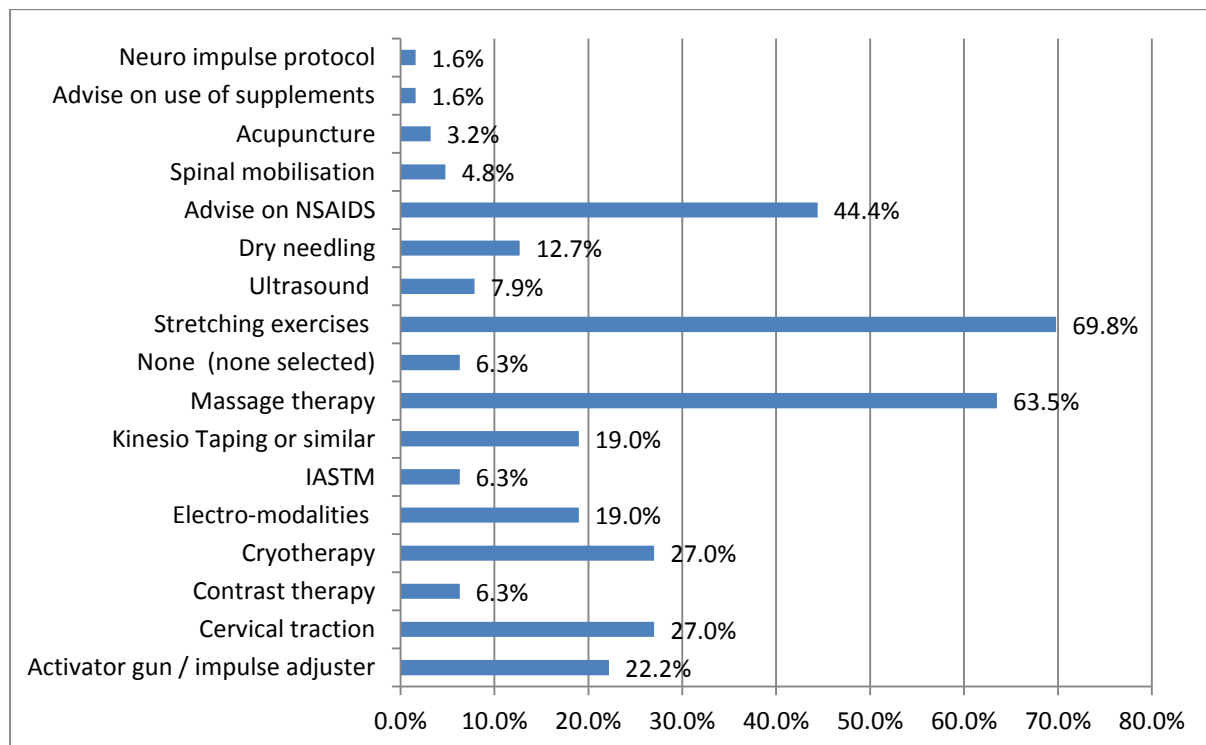


Figure 25: Modalities used when spinal manipulation is contra indicated for a migraine

4.4.3.6.2 Discussion of “Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)”

Stretching exercises and massage therapy still appears to be the most preferred modalities as both conjunctive and primary modalities for treatment of MEH which is an acceptable choice of modalities considering that the use of massage therapy and stretching could relate to potential benefits for a patient with MEH (Bryans *et al.* 2011). Slightly less than half of the participants indicated that they would advise on the use of NSAIDS which could be used for some pain relief for MEH. The use of NSAIDS for MEH may provide some relief in certain patients. No other significant changes in the use of certain modalities were noted between the modalities chosen to treat MEH when used in conjunction with SMT or when SMT was contra-indicated.

4.4.3.7 Treatment of MFTP associated with MEH

4.4.3.7.1 Results for “If you find myofascial trigger points associated with this condition would you treat it?”

The majority of the participants (98.4% (62)) indicated that they would treat MFTP if present in a patient with MEH (Table 59).

Table 59: Treatment of MFTP associated with migraine headache

Q8.1.6) “If you find myofascial trigger points associated with this condition would you treat it?”	Answer	N	Column N %
	No	1	1.6%
	Yes	62	98.4%

4.4.3.7.2 Discussion of “If you find myofascial trigger points associated with this condition would you treat it?”

Only one participant indicated that they would not treat MFTPs associated with a MEH. The exact involvement of MFPTs in MEH has not been fully established. MFTPs may contribute to muscular components of headaches such as CEH or TTH (Simons *et al.* 199F9), however a muscular component in MEH has not been

conclusively proven with rigorous evidence. The majority of the participants appeared to treat MFTP associated with MEH, thus it is currently being used in practice which could indicate a need for further research on the impact and efficacy of treating MFTP when found in a patient with MEH.

4.4.3.8 Modalities chosen to treat MFTP associated with a MEH

4.4.3.8.1 Results for “Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition”

The most commonly selected modalities to treat MFPTs were dry needling (83.9% (53)) followed by IC (53.2% (34)) and massage therapy (33.9% (21)) (Figure 26).

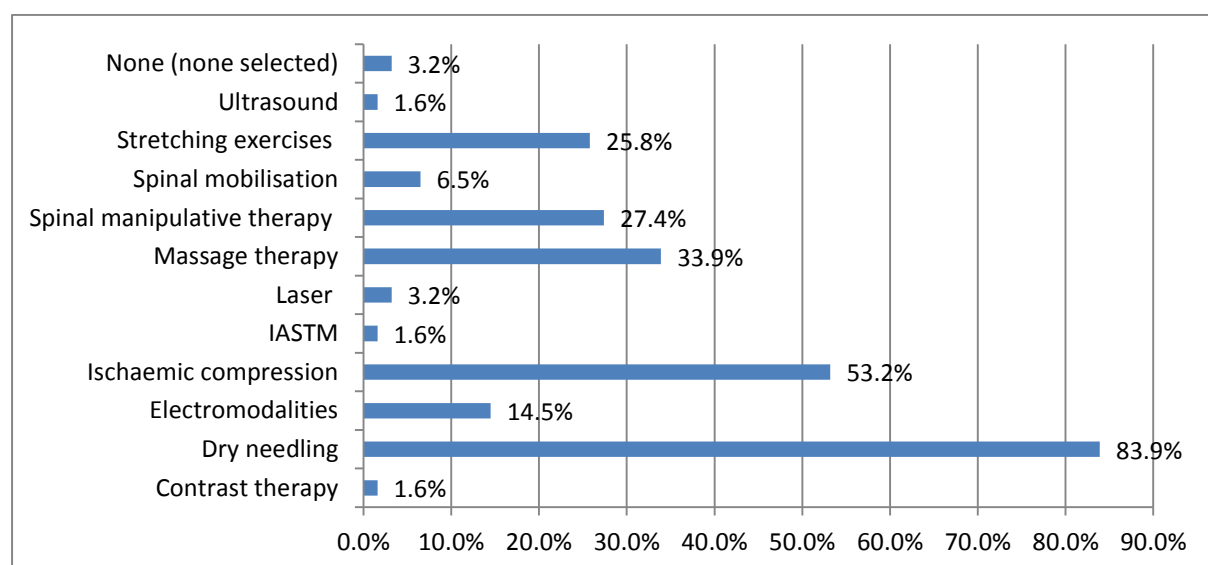


Figure 26: Modalities chosen to treat MFTP associated with a migraine

4.4.3.8.2 Discussion of “Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition”

The results in 4.4.3.8.1 are consistent with the corresponding results from the CEH and TTH management sections which could indicate that the modalities chosen to treat MFTP are not necessarily dependant on the condition but rather the preferred treatment of MFTP regardless of the associated condition. Thus it appears that dry

needling is the most preferred treatment intervention for MFTPs followed by IC and massage therapy regardless of the associated condition.

4.4.3.9 Amount of days to schedule a follow up after initial appointment for a MEH

4.4.3.9.1 Results for the “After how many days would you request a follow up appointment for this condition?”

The majority of the participants indicated (55.6% (35)) that a two day period would be sufficient to see the patient for a follow up treatment after the initial appointment. A range between a minimum of one day and a maximum of seven days was calculated (Figure 27).

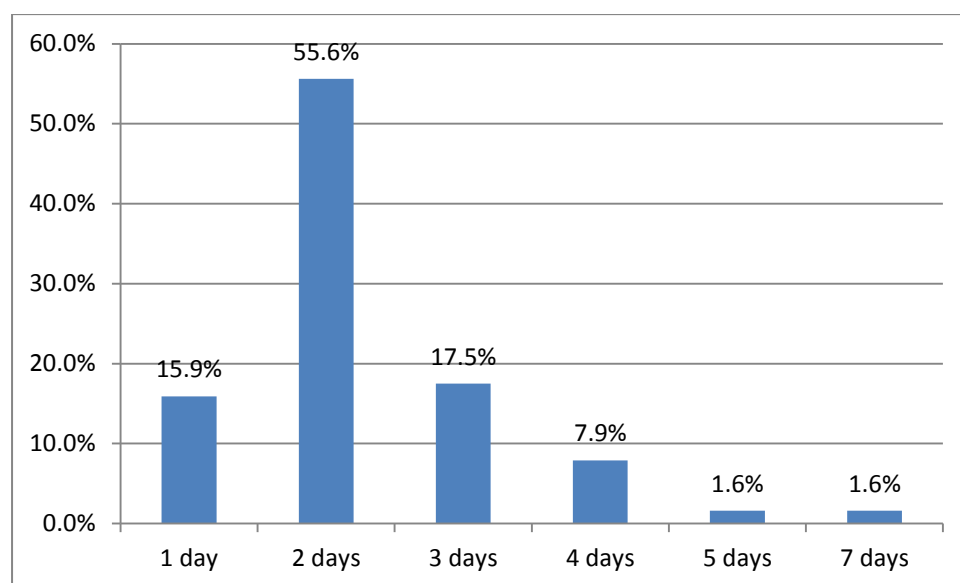


Figure 27: number of days to schedule a follow up after initial appointment for a migraine

4.4.3.9.2 Discussion of “After how many days would you request a follow up appointment for this condition?”

The majority recommended a follow up appointment within two days of the initial appointment for a MEH. The maximum margin for a follow up appointment was within seven days of the initial appointment. This is consistent with some research

guidelines which recommend one or two treatments (depending on the severity) within one week (Bryans *et al.* 2011).

4.4.3.10 Consideration of further investigation after specified amount of days with no relief of symptoms for a MEH

4.4.3.10.1 Results for the “After how many days with no relief of symptoms would you consider further investigation necessary?”

The majority (17.7% (11)) of the participants indicated that they would consider further investigation necessary after three days with no relief of symptoms for a migraine headache. A range between a minimum of one day and a maximum of 50 days was recorded indicating a relatively large dispersion of data. 64.5% (41) of the participants considered investigations necessary from one to seven days with no relief of symptoms and the remaining 35.5% (22) considered investigations necessary from between eight to 50 days (Figure 28).

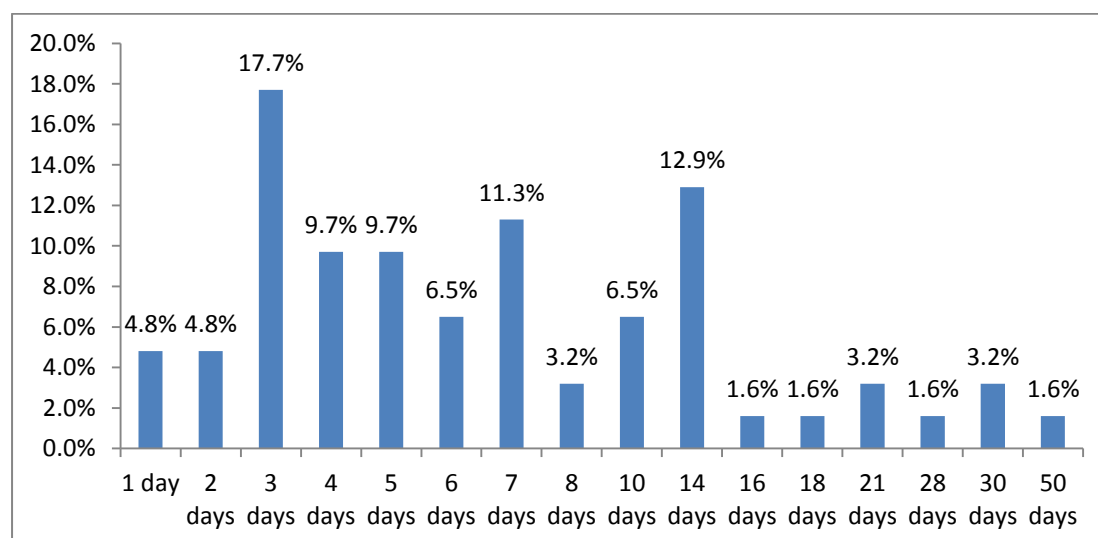


Figure 28: Consideration of further investigation after specified number of days with no relief of symptoms for a migraine

4.4.3.10.2 Discussion of “After how many days with no relief of symptoms would you consider further investigation necessary?”

A wide range as well as a relatively equal distribution was observed with regard to the amount of days with no relief of symptoms before the consideration of further investigations. There does not appear to be a consensus among the participants with regard to when further investigations are required in a patient with MEH. Migraine is a clinical diagnosis; further investigations are primarily used to exclude any other differential diagnoses or comorbidities (Longmore *et al.* 2010; Olesen *et al.* 2013).

4.4.3.11 Amount of treatments expected for patient to experience relief of symptoms for a MEH

4.4.3.11.1 Results for “After how many treatments do you expect the patient to experience relief of symptoms?”

The majority of the participants (33.9% (21)) expected a patient with MEH to experience relief of symptom after two days. A range with a minimum of one day and a maximum of 11 days was recorded (Figure 29).

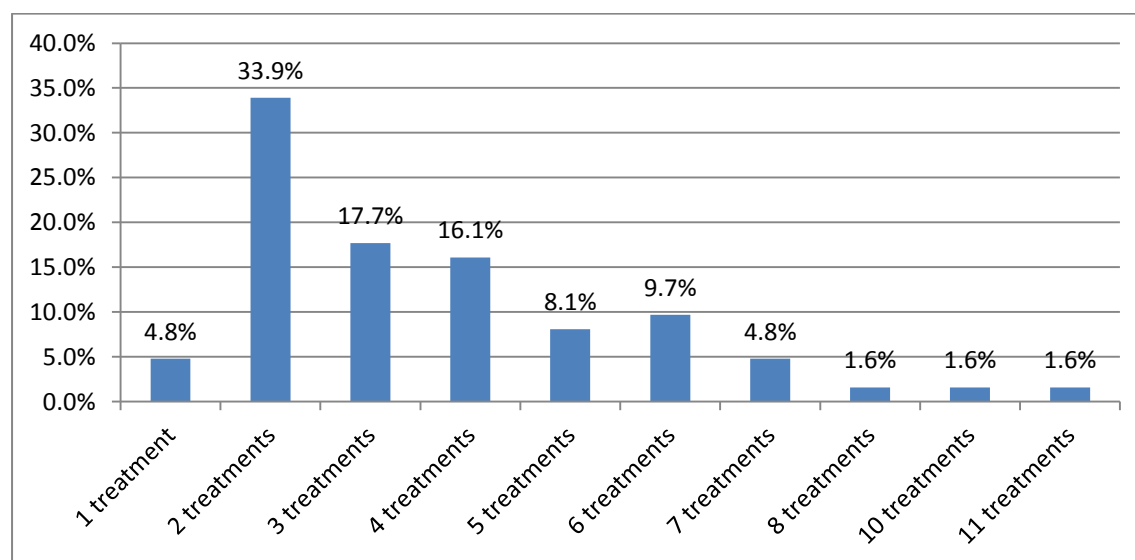


Figure 29: Amount of treatments expected for patient to experience relief of symptoms for a migraine

4.4.3.11.2 Discussion of “After how many treatments do you expect the patient to experience relief of symptoms?”

Limited literature is available with regard to the expected relief of symptoms for a MEH from chiropractic treatment, some evidence suggests that one to two treatments per week for eight weeks could be used as a guideline for chiropractic management of a MEH. This would bring the estimated maximum of expected treatments between eight to sixteen treatments (over eight weeks). According to this guideline, the majority of the participants responded optimistically as 95.1% (60) indicated that they expect relief of symptoms before that of eight treatments with the majority indicating that they expect relief within two treatments. The guidelines are not absolute and should not be substituted for a practitioner’s clinical experience and expertise (Bryans *et al.* 2011). Based on these results further research may be warranted for the combined treatment approaches (as indicated in this study) to determine its clinical efficacy for the treatment of MEH, as the participants indicated a relatively low amount of treatments to relieve symptoms.

4.4.3.12 Maintenance care for a MEH if patient is pain free

4.4.3.12.1 Results for the “Do you suggest maintenance care after the patient is pain free?”

The majority (85.7% (54)) of the participants suggested maintenance care for a patient with a MEH (Table 60).

Table 60: Maintenance care after the patient is pain free for a migraine headache

Q8.1.11) “Do you suggest maintenance care after the patient is pain free?”	Answer	N	Column N %
	No	9	14.3%
	Yes	54	85.7%

4.4.3.12.2 Discussion of “Do you suggest maintenance care after the patient is pain free?”

The suggestion of maintenance care of a patient presenting with a MEH requires investigation as the research for long term chiropractic management, in particular that of pain free care of MEH, is lacking. The suggestion of maintenance care after the patient is pain free may come from a basis of practical experience.

4.4.3.13 Post treatment patient advice or education suggested for a MEH

4.4.3.13.1 Results for “What post treatment patient advice or education would you suggest for this condition?”

As part of post treatment patient advice or education 96.8% (61) of the participants agreed to recommend stress management techniques for a patient with a MEH. 92.1% (58) agreed to recommend postural or ergonomic advice, 66.7% (42) agreed to recommend home stretching exercises, 60.3% (38) agreed to recommend starting a cardiovascular exercise program, 52.4% (33) agreed to recommend taking over the counter analgesic medication, 47.6% (30) agreed to recommend proprioceptive exercises and only 4.8% (3) recommended dietary advice. Dietary advice was an additional statement which was added by 4.8% (3) of the participants. The majority of the participants were neutral with regard to advising strength training and using an instructor for exercises (Table 61).

Table 61: Post treatment patient advice or education suggested for a migraine

Q8.1.12) “What post treatment patient advice or education would you suggest for this condition?”	Answer	N	Column N %
Q8.1.12 A) Advise on starting a cardiovascular exercise program	Agree	38	60.3%
	Neutral	19	30.2%
	Disagree	6	9.5%
Q8.1.12 B) Advise on starting a strength training exercise	Agree	25	39.7%
	Neutral	31	49.2%
	Disagree	7	11.1%
Q8.1.12 C) Advise on taking over the counter analgesic medication	Agree	33	52.4%
	Neutral	26	41.3%
	Disagree	4	6.3%

Q8.1.12 D) Advise the patient to use a training instructor for exercises	Agree	15	23.8%
	Neutral	38	60.3%
	Disagree	10	15.9%
Q8.1.12 E) Home stretching exercises	Agree	42	66.7%
	Neutral	18	28.6%
	Disagree	3	4.8%
Q8.1.12 F) Postural or ergonomic advice	Agree	58	92.1%
	Neutral	4	6.3%
	Disagree	1	1.6%
Q8.1.12 G) Proprioceptive exercises	Agree	30	47.6%
	Neutral	28	44.4%
	Disagree	5	7.9%
Q8.1.12 H) Stress management techniques	Agree	61	96.8%
	Neutral	2	3.2%
Q8.1.12 I) Dietary advice	Disagree	3	4.8%

4.4.3.13.2 Discussion of “What post treatment patient advice or education would you suggest for this condition?”

The literature was consistent with the majority of the participants in terms of agreeing that stress management techniques, exercise programs (mostly related to cardiovascular and possibly proprioceptive exercises) and dietary advice could be beneficial for a patient with a MEH. The use of exercise as part of a multidisciplinary approach may be beneficial however there is not enough evidence to recommend or discourage exercise alone or in combination for treatment of MEH (Bryans *et al.* 2011; Finkel, Yerry and Mann 2013). The same applies to stretching or postural and ergonomic advice.

4.4.3.14 Management proceedings if the patient with a MEH was not achieving the aims and/or goals of treatment

4.4.3.14.1 Results for “If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?”

If management outcomes do not progress according to the aims and/or goals of treatment for a MEH; 83.9% (52) agreed to reassess all previous positive findings. 81% (51) of the participants agreed to refer that patient to another health care

practitioner other than a chiropractor, 77.4% (48) agreed to change the method of treatment and 61.3% (38) agreed to assess the patient as a new patient. 62.9% (39) disagreed to continue with the original treatment protocol. 46.8% (29) were neutral and 46.8% (29) disagreed to refer to another chiropractor (Table 62).

Table 62: Management proceeding if the patient with a migraine was not achieving the aims and/or goals of treatment

Q8.1.13) "If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?"	Answer	N	Column N %
Q8.1.13 A) Assess the patient as a new patient	Agree	38	61.3%
	Neutral	19	30.6%
	Disagree	5	8.1%
Q8.1.13 B) Change the treatment method	Agree	48	77.4%
	Neutral	12	19.4%
	Disagree	2	3.2%
Q8.1.13 C) Continue treating with original treatment protocol	Agree	3	4.8%
	Neutral	20	32.3%
	Disagree	39	62.9%
Q8.1.13 D) Reassess all previous positive findings	Agree	52	83.9%
	Neutral	9	14.5%
	Disagree	1	1.6%
Q8.1.13 E) Refer to another chiropractor	Agree	4	6.5%
	Neutral	29	46.8%
	Disagree	29	46.8%
Q8.1.13 F) Refer to another health care practitioner other than a chiropractor	Agree	51	81.0%
	Disagree	12	19.0%

4.4.3.14.2 Discussion of "If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?"

A consistent pattern was noted in terms of the general response from the participants for question 8.1.12 of the questionnaire, the majority of the participants agreed with those statements which indicate a change in management protocol and consideration of referral of the patient to another health care provider other than a chiropractor. The majority of the participants were equivocal with regard to referring the patient to another chiropractor. This would indicate dynamic involvement of the practitioner in the management of a patient with a MEH as the participants do not

continue with the same management approach when the management outcome is not progressing.

4.4.4 Relationships between demographic information and diagnostic outcome.

During the data analysis cross correlations were run between demographic information and diagnostic information as well as demographic information and management information. The results were analysed and the data of significant relevance are reported and discussed below.

All demographic information was used for correlation with diagnostic and management information with the exception of the following demographic information:

- Institution of graduation: The vast majority of the participants graduated from DUT with no significant differences comparable between the data sets.
- Short courses attended, journals and conferences attended as well as the impact it had on headache management: these data sets created a large quantity of statistics with too many variables which rendered the comparison invalid (Esterhuizen 2015, pers. comm.12 April).
- Gender: No differences in gender were expected due to findings in the literature (Forand *et al.* 2004).

Due to the extensive length of the questionnaire a large amount of statistical information was generated. The majority of the statistical information generated indicated little relative differences between demographic and diagnostic information and demographic and management information.

None of the comparisons were valid according to the chi square test due to too many categories with zero counts, therefore no comparisons were possible, in those instances where the chi square test was invalid, the stats were descriptively analysed and the trends shown in the cross tabulations were interpreted instead (Esterhuizen 2015, pers. comm.12 April).

The relative differences that were noted (results of statistical interest) were added into this chapter for reporting and discussion of the results. If no significance was noted the statistical information was not represented in the results and discussion chapter. For the remainder of the statistical information which was not regarded as pertinent to the discussion see Appendix O for the workings.

In context of this research study the null hypothesis for the following correlations would be that there are no differences between the data sets being correlated.

A P value of 0.05 and lower is considered to indicate statistical significance as an indication of probable reproducibility of the results in an identical setting. Thus high P (higher than 0.05) values are likely supportive of the null hypothesis and low P values indicate that the data are less likely supportive of the null hypothesis.

4.4.4.1 Correlation between age and diagnostic outcome

4.4.4.1.1 Results for the relationships between age and diagnostic outcome

For cases 1 to 3 there were significant age differences in the diagnoses categories.

For case 1 nearly all participants responded accurately with only one participant classified as an adequate response; it was found that this participant was significantly older than those who gave accurate responses. The P value calculated for case 1 was less than 0.001. For case 2, those who gave inaccurate diagnoses were significantly older than those who gave accurate or adequate diagnoses. The P value calculated for case 2 was 0.049. For case 3, those who gave inaccurate diagnoses were significantly older than those who gave accurate or adequate diagnoses. The P value calculated for case 3 was less than 0.001. The age differences between the diagnostic outcomes of cases 4 and 5 did not show any significant difference with P values of 0.515 and 0.697 respectively (Table 63).

Table 63: Relationship between age and diagnostic outcome

			A) Age		ANOVA	
			Mean	Standard Deviation	Valid N	P value
Diagnosis and differential diagnosis case 1	Accurate		36.3	8.2	62	<0.001
	Adequate		*Withheld	.	1	
	Inaccurate		.	.	0	
Diagnosis and differential diagnosis case 2	Accurate		34.8	6.7	30	0.049
	Adequate		37.4	9.3	28	
	Inaccurate		45.2	15.0	5	
Diagnosis and differential diagnosis case 3	Accurate		35.6	7.2	52	<0.001
	Adequate		36.0	4.5	7	
	Inaccurate		53.3	18.8	4	
Diagnosis and differential diagnosis case 4	Accurate		36.4	8.7	52	0.515
	Adequate		39.4	10.8	10	
	Inaccurate		*withheld	.	1	
Diagnosis and differential diagnosis case 5	Accurate		38.0	7.3	19	0.697
	Adequate		36.6	8.7	37	
	Inaccurate		34.7	14.4	7	

*For purposes of confidentiality the age information of the one participant in table 63 is withheld as not to give away any information which could identify the participant.

4.4.4.1.2 Discussion of the correlation between age and diagnostic outcome

In case 1 it was noted that the one participant who did not accurately diagnose case 1 gave an adequate diagnosis. A similar observation could be made for case 2 for which five participants diagnosed inaccurately; these participants were also older than the mean age of the participants. In case 3, a similar result is obtained in which four participants who gave inaccurate diagnoses were significantly older than the mean age of the participants group. There appears to be a probability that the older population had less accurate diagnostic acumen for cases 1, 2 and 3 as presented in this research study.

The results were not consistent throughout all five cases. It is not possible to conclude that for those cases where significant P values were obtained that the older population appears to have a reduced accuracy of diagnosing that particular type of headache as only one case scenario was presented for each headache in this study. The significant P value could however indicate a significant probability to reproduce these findings given similar circumstances. Future research should be aimed at

investigating differences between demographic criteria, such as age, and diagnostic outcomes for a particular headache where more than one scenario for each headache is presented.

No differences of statistical significance were noted for the following correlations:

- Comparison between duration of practice and the diagnostic outcome.
- Correlation between additional tertiary qualifications and diagnostic outcome.
- Comparison between those who practiced internationally and the diagnostic outcome. There were only 11 with additional tertiary qualifications and strong trends are unlikely to be accurate when performing a correlation with such low response frequencies, the results should therefore be interpreted with caution.
- Comparison of philosophy of chiropractic and the diagnostic outcome. Some of the categories of philosophy of chiropractic had low frequencies (e.g. only one participant to present the category) thus comparisons with other categories with higher counts would not be accurate.

4.4.5 Correlation between management and demographic information

Due to the extensive length of the questionnaire cross correlations between each individual set of information would generate a vast amount of statistical information. In order to simplify statistical analysis certain information of similar characteristics was grouped together and scoring systems were used (Esterhuizen 2015, pers. comm.12 April).

For purposes of developing criteria according to which comparisons between the management information and demographic information could be made the following approach was used.

The statements in question 6.1.2 combined A, D and E (grouped together), it was then determined if each individual participant predominantly agreed; predominantly disagreed; was predominantly neutral or if there was an equal distribution of opinion (one tick in each column on the questionnaire) across 6.1.2 A, D and E. Thus the

statements indicating that only fixated segments would be adjusted were grouped together. Therefore 6.1.2 B, C and F were grouped together and scored in the same way.

Question 6.1.2 A, D and E were the following statements in the questionnaire:

- A: Attempt to adjust specific segments only (only those which you suspect to be fixated).
- D: Adjust multiple fixated segments throughout the cervical and thoracic spine.
- E: Adjust thoracic spine fixations only.

The statements indicating that non-fixated segments would be adjusted were grouped together thus 6.1.2 B, C and F were the following statements:

- B: Adjust the fixated segment on both sides.
- C: Adjust multiple segments throughout the cervical spine including those which are not fixated.
- F: Adjust multiple segments throughout the thoracic spine including those which are not fixated.

The same method was used for the correlating question numbers in questions 7 and 8.

Question 6.1.4; 6.1.5 and 6.1.7 were combined as a general response and scored. All of these questions dealt with additional modalities and techniques that a practitioner could use in treatment. Thus the treatment methods used across these questions were determined.

The following categories were developed:

1. Auxiliary modalities (e.g. ultrasound, laser and electro-modalities).
2. Thermal therapy (e.g. contrast therapy, cryotherapy, heat packs or any other specified thermal therapies).
3. Joint therapy (e.g. spinal traction, joint mobilisation, spinal manipulative therapy instrument assisted joint mobilisation etc.)
4. Supportive therapy (e.g. strapping).
5. Soft tissue therapy (e.g. IASTM, massage therapy etc.).

6. Muscle conditioning (e.g. stretching exercises, dry needling, ischaemic compression etc.).
7. Advice on NSAIDS.
8. Dietary/supplement advice.
9. None.
10. Neurological modality (e.g. neuro-impulse protocol)

These categories were then used to allow for a general representation of modalities used in practice to be compared with demographic information. This sequence was repeated for the corresponding questions in questions 7 and 8.

If the participant agreed to a statement from A-I they were allocated to the following categories:

1. Exercise based conditioning
2. Advise on OTC medication
3. Postural advice
4. Stress management
5. Dietary advice
6. None recommended

These categories were then used to be compared with the demographic information. This sequence was repeated for the corresponding questions in questions 7 and 8.

For question 6.1.13 statements A to D were scored in terms of the following criteria: it was determined if each individual participant predominantly agreed; predominantly disagreed; was predominantly neutral or if there was an equal distribution of opinion. Thus all of the statements referring to a change in the treatment procedure were combined and it was determined if the sample agreed with those statements or not.

Question 6.1.13 A to D stated the following:

- A: Assess the patient as a new patient.
- B: Change the treatment method.
- C: Continue treating with original treatment protocol.
- D: Reassess all previous positive findings.

The same grouping and scoring was used for question 6.1.13 E and F which included the following statements:

E: Refer to another chiropractor.

F: Refer to another health care practitioner other than a chiropractor.

Thus the statements mostly referring to a change in assessment were grouped together and the statements that indicated that the patient would be referred were grouped together.

The research tool was not designed to determine specific differences in management approaches but rather to give a generalised indication of management approaches and combinations used in practice.

The above mentioned method of statistical representation for question 6 (CEH) was repeated for the corresponding questions in questions 7 (TTH) and 8 (MEH).

The relative differences that were noted (results of statistical interest) were added into chapter Four for reporting and discussion of the results. If no significance was noted the statistical information was not represented in the results and discussion chapter. For the remainder of the statistical information which was not regarded as pertinent to the discussion see Appendix O for the workings.

The following results were considered to have relative value for discussion and interpretation:

4.4.5.1 Correlation between age and adjustments used for TTH

4.4.5.1.1 Results for the correlation between age and adjustments used for TTH

For question 7.1.2 a significant difference in age was noted as those who were predominantly neutral with those statements which would suggest adjusting fixated

segments (statement A, D and E) had a mean age of 49.3 with a standard deviation of 15.8, the P value was 0.006. This difference was only noted for the management section of a TTH, no such significant difference was noted in CEH or MEH. The mean age for those who predominantly agreed, disagreed and were predominantly equal had a mean age of 36.3, 34.6 and 32.8 respectively which indicates a relatively similar age distribution (Table 64).

Table 64: Correlation between age and adjustments used for TTH.

		A) Age		ANOVA	
		Mean	Standard Deviation	Valid N	P value
Question 7.1.2 A;D and E combined	Predominantly agree	36.3	7.7	37	0.006*
	Predominantly disagree	34.6	7.6	5	
	Predominantly neutral	49.3	15.8	6	
	Equally distributed	32.8	3.8	5	
Question 7.1.2 B;C and F combined	Predominantly agree	38.3	2.9	3	0.157
	Predominantly disagree	35.9	6.1	32	
	Predominantly neutral	41.5	14.7	15	
	Equally distributed	30.3	2.3	3	

4.4.5.1.2 Discussion of the correlation between age and adjustments used for TTH

The older participants were predominantly neutral with regard to adjusting only fixated levels in a patient with TTH. This could be as a result of experience gathered over the years or it could be an indication that those participants were equivocal with regard to the potential role that adjusting plays in TTH. It should be noted that a statistically significant age difference was not noted for those statements which generally indicate the opposite of statements A, D and E. If it were true that those who were predominantly neutral were equivocal with regard to the potential role that SMT plays in a patient with TTH, reasonable logic would dictate that the same result should be expected for all forms of SMT whether specific or non-specific which is not the case in this correlation. The exact reason as to why those who regarded specific SMT as a “neutral opinion” is not overtly clear, however there does appear to be some difference in opinion. Further research should be conducted to establish

specific causal relationships between differences age of the practitioner may have in the use of SMT for TTH.

4.4.5.2 Correlation between age and modalities used for TTH

A combination of questions 7.14, 7.15 and 7.17 compared to age in terms of the broad categories of modalities chosen over the range of the mentioned questions indicated rather similar age distributions except for advice on NSAIDS for which the mean age was slightly older than the others, with a standard deviation of 10.7. Note, however, that no valid P values were established thus the information should only be interpreted as a descriptive observation and any conclusions should be interpreted with caution (Table 65).

Table 65: Relationship between age data and modalities used for TTH

		A) Age		
		Mean	Standard Deviation	Valid N
\$q7.14q7.15q7.17_combined	Auxiliary	36.7	10.4	24
	Thermal therapy	35.7	9.6	23
	Joint therapy	36.4	9.3	34
	Supportive therapy	34.4	7.9	20
	Soft tissue therapy	36.4	7.5	54
	Muscle conditioning	36.7	9.2	58
	Advise on NSAIDS	45.1	10.7	7
	Dietary advice	35.0	2.8	2
	Neurological modality	40.0	.	1

4.4.5.2.1 Discussion of the correlation between age and modalities used for TTH

The majority of the modalities which were selected to treat a patient with TTH had similar mean age distributions, although it was noted that a relatively older mean was calculated for those who selected to advise their patients on the use of NSAIDS.

This could potentially indicate a tendency of the older practitioners to recommend the use of NSAIDS for TTH. The same relative difference was not noticed for CEH and MEH. The exact reason for the difference in age observed is not clear.

4.4.5.3 Correlations which yielded no statistical significance

- Correlation between age and the combined response for question 6.1.2 A, D and E.
 - Correlation between age and the combined response for question 6.1.2 B, C and F.
 - Correlation between duration of practice and the combined response for question 6.1.2 A, D and E.
 - Correlation between duration of practice and the combined response for question 6.1.2 B, C and F.
 - Correlation between additional tertiary qualification obtained and the combined response for question 6.1.2 A, D and E.
 - Correlation between additional tertiary qualification obtained and the combined response for question 6.1.2 B, C and F.
 - Correlation between international practice experience and the combined response for question 6.1.2 A, D and E.
 - Correlation between international practice experience and the combined response for question 6.1.2 B, C and F.
 - Correlation between the philosophy of chiropractic and the combined response for question 6.1.2 A, D and E.
 - Correlation between the philosophy of chiropractic and the combined response for question 6.1.2 B, C and F.
-
- Correlation between age and the combined response for question 6.1.4, 6.1.5 and 6.1.7.
 - Correlation between duration of practice and the combined response for question 6.1.4, 6.1.5 and 6.1.7.
 - Correlation between additional tertiary qualification obtained and the combined response for question 6.1.4, 6.1.5 and 6.1.7.

- Correlation between international practice experience and the combined response for question 6.1.4, 6.1.5 and 6.1.7.
 - Correlation between the philosophy of chiropractic and the combined response for question 6.1.4, 6.1.5 and 6.1.7.
-
- Correlation between age and the combined response for question 6.1.12.
 - Correlation between duration of practice and the combined response for question 6.1.12.
 - Correlation between additional tertiary qualification obtained and the combined response for question 6.1.12.
 - Correlation between international practice experience and the combined response for question 6.1.12.
 - Correlation between the philosophy of chiropractic and the combined response for question 6.1.12.
-
- Correlation between age and the combined response for question 6.1.13 A, B; C and D.
 - Correlation between age and the combined response for question 6.1.13 E and F.
 - Correlation between duration of practice and the combined response for question 6.1.13 A, B; C and D.
 - Correlation between duration of practice and the combined response for question 6.1.13 E and F.
 - Correlation between additional tertiary qualification obtained and the combined response for question 6.1.13 A, B; C and D.
 - Correlation between additional tertiary qualification obtained and the combined response for question 6.1.13 E and F.
 - Correlation between international practice experience and the combined response for question 6.1.13 A, B, C and D.
 - Correlation between international practice experience and the combined response for question 6.1.13 E and F.
 - Correlation between the philosophy of chiropractic and the combined response for question 6.1.13 A, B, C and D.

- Correlation between the philosophy of chiropractic and the combined response for question 6.1.13 E and F.
- Correlation between age and the combined response for question 7.1.2 B, C and F.
- Correlation between duration of practice and the combined response for question 7.1.2 A, D and E.
- Correlation between duration of practice and the combined response for question 7.1.2 B, C and F.
- Correlation between additional tertiary qualification obtained and the combined response for question 7.1.2 A, D and E.
- Correlation between additional tertiary qualification obtained and the combined response for question 7.1.2 B, C and F.
- Correlation between international practice experience and the combined response for question 7.1.2 A, D and E.
- Correlation between international practice experience and the combined response for question 7.1.2 B, C and F.
- Correlation between the philosophy of chiropractic and the combined response for question 7.1.2 A, D and E.
- Correlation between the philosophy of chiropractic and the combined response for question 7.1.2 B, C and F.
- Correlation between duration of practice and the combined response for question 7.1.4, 7.1.5 and 7.1.7.
- Correlation between additional tertiary qualification obtained and the combined response for question 7.1.4, 7.1.5 and 7.1.7.
- Correlation between international practice experience and the combined response for question 7.1.4, 7.1.5 and 7.1.7.
- Correlation between the philosophy of chiropractic and the combined response for question 7.1.4, 7.1.5 and 7.1.7.
- Correlation between age and the combined response for question 7.1.12.

- Correlation between duration of practice and the combined response for question 7.1.12.
 - Correlation between additional tertiary qualification obtained and the combined response for question 7.1.12.
 - Correlation between international practice experience and the combined response for question 7.1.12.
 - Correlation between the philosophy of chiropractic and the combined response for question 7.1.12.
-
- Correlation between age and the combined response for question 7.1.13 A, B, C and D.
 - Correlation between age and the combined response for question 7.1.13 E and F.
 - Correlation between duration of practice and the combined response for question 7.1.13 A, B, C and D.
 - Correlation between duration of practice and the combined response for question 7.1.13 E and F.
 - Correlation between additional tertiary qualification obtained and the combined response for question 7.1.13 A, B, C and D.
 - Correlation between additional tertiary qualification obtained and the combined response for question 7.1.13 E and F.
 - Correlation between international practice experience and the combined response for question 7.1.13 A, B, C and D.
 - Correlation between international practice experience and the combined response for question 7.1.13 E and F.
 - Correlation between the philosophy of chiropractic and the combined response for question 7.1.13 A, B, C and D.
 - Correlation between the philosophy of chiropractic and the combined response for question 7.1.13 E and F.
-
- Correlation between age and the combined response for question 8.1.2 A, D and E.

- Correlation between age and the combined response for question 8.1.2 B, C and F.
 - Correlation between duration of practice and the combined response for question 8.1.2 A, D and E.
 - Correlation between duration of practice and the combined response for question 8.1.2 B, C and F.
 - Correlation between additional tertiary qualification obtained and the combined response for question 8.1.2 A, D and E.
 - Correlation between additional tertiary qualification obtained and the combined response for question 8.1.2 B, C and F.
 - Correlation between international practice experience and the combined response for question 8.1.2 A, D and E.
 - Correlation between international practice experience and the combined response for question 8.1.2 B, C and F.
 - Correlation between the philosophy of chiropractic and the combined response for question 8.1.2 A, D and E.
 - Correlation between the philosophy of chiropractic and the combined response for question 8.1.2 B, C and F.
-
- Correlation between age and the combined response for question 8.1.4, 8.1.5 and 8.1.7.
 - Correlation between duration of practice and the combined response for question 8.1.4, 8.1.5 and 8.1.7.
 - Correlation between additional tertiary qualification obtained and the combined response for question 8.1.4, 8.1.5 and 8.1.7.
 - Correlation between international practice experience and the combined response for question 8.1.4, 8.1.5 and 8.1.7.
 - Correlation between the philosophy of chiropractic and the combined response for question 8.1.4, 8.1.5 and 8.1.7.
-
- Correlation between age and the combined response for question 8.1.12.
 - Correlation between duration of practice and the combined response for question 8.1.12.

- Correlation between additional tertiary qualification obtained and the combined response for question 8.1.12.
 - Correlation between international practice experience and the combined response for question 8.1.12.
 - Correlation between the philosophy of chiropractic and the combined response for question 8.1.12.
-
- Correlation between age and the combined response for question 8.1.13 A, B, C and D.
 - Correlation between age and the combined response for question 8.1.13 E and F.
 - Correlation between duration of practice and the combined response for question 8.1.13 A, B, C and D.
 - Correlation between duration of practice and the combined response for question 8.1.13 E and F.
 - Correlation between additional tertiary qualification obtained and the combined response for question 8.1.13 A, B, C and D.
 - Correlation between additional tertiary qualification obtained and the combined response for question 8.1.13 E and F.
 - Correlation between international practice experience and the combined response for question 8.1.13 A, B, C and D.
 - Correlation between international practice experience and the combined response for question 8.1.13 E and F.
 - Correlation between the philosophy of chiropractic and the combined response for question 8.1.13 A, B, C and D.
 - Correlation between the philosophy of chiropractic and the combined response for question 8.1.13 E and F.

For statistical workings of above mentioned correlations please see Appendix O.

4.4.5.3.1 Discussion of lack of differences noted

For the majority of the relationships investigated, no statistically significant or obvious descriptively analysed differences were noted. This potentially indicates that the management approach used by the participants is influenced very little by demographic criteria. This could indicate that the demographic criteria (those that were used for correlations) have little significance with regard to the management a patient could expect to receive. The majority of the participants appear to use management strategies or approaches that do not appear to be based on their demographic background.

Note that this study is the first of its kind in which the correlation between general or broad categories of management and demographics was investigated; more specific analysis could potentially yield different results. The conclusions should be interpreted with caution as not all of the correlated statistics had sufficient frequencies of data.

CHAPTER 5 : CONCLUSION

5.1 Demographic information

5.1.1 Objective of demographic information

“To determine the demographic information and professional history of chiropractors in the greater Durban area (age; gender; years in practice; philosophy of chiropractic; postgraduate courses and conferences attended; qualifications obtained, experience practicing outside of South Africa)”.

5.1.2 Conclusion of demographic information

The sample size consisted of 63 chiropractors in the greater Durban area, South Africa, of which 49.2% (31) were male and 50.8% (32) were female. The age of participants ranged from 25 to 71 years of age, with a mean age of 37 years. The majority of the participants had between six to nine years of practice experience. The majority (92.1% (58)) of the participants had graduated from DUT. 82.5% (52) of the participants practiced full time. 17.5% (11) of the participants had additional tertiary qualifications, the most common of which was a Master's degree of medical sciences (sports medicine). Additional short courses were attended by 79.4% (50) of the participants. 75.1% (41) of the participants indicated usage of chiropractic specific journals with 38.1% (24) indicating that these journals did impact the way they manage headaches in practice. 77.8% (49) of the participants attended health related conferences on a regular basis with 38.1% (24) indicating that these conferences did influence the management of headaches in practice. 17.5% (11) of the participants practiced internationally, with a range of international practice from one month to 12 years. The majority of the participants indicated that they practice according to a combination of mixer and evidence based philosophy.

5.2 Diagnostic information

5.2.1 Objective of diagnostic information

“To determine diagnoses and identification of ‘red flags’ based on case presentations.”

5.2.2 Conclusion of diagnostic information

5.2.2.1 Conclusion for case 1

The primary diagnosis for case 1 (meningitis) was correctly diagnosed by 98.4% (62) of the participants (note: encephalitis was considered as a correct diagnosis due to the clinical similarity to meningitis). The list of differential diagnoses provided by the participants was substantial (16 differential diagnoses), eight differential diagnoses of which were not considered likely to be associated with the case presented in case 1. Thus the specificity in the differential diagnosis of case 1 was not particularly adequate. Most of the investigations chosen by the majority of the participants were of value; however only a minority of the participants indicated referral for investigations which would confirm meningitis. This is of concern as this could delay appropriate and specific treatment. The patient would potentially receive more accurate investigations if referred directly for medical management. The majority of the participants indicated that they would not treat the patient described in case 1; however 4.8% (3) of the participants did indicate that they would treat the patient. Chiropractic treatment of the patient described in case 1 should not be considered to be appropriate, as the patient requires prompt medical referral. Red flags were appropriately detected by 95.2% (60) of the participants for case 1 which is a good clinical outcome as this is an integral part to establishing the primary diagnosis and deferring from chiropractic treatment of the patient (at least initially). All of the referrals for the primary presenting complaint in case 1 were appropriate. For those who did opt to treat the patient as a chiropractor, at the very least, they did refer the patient for co-management appropriately; however this does not justify treatment of the patient as a chiropractor.

Recommendation:

- The diagnostic accuracy for case 1 delivered favourable results for the participants as 98.4% of the participants correctly diagnosed the presented headache as meningitis. There appears to be a need for more specific education regarding the most appropriate investigation for meningitis (as described in the context of case 1).

5.2.2.2 Conclusion for Case 2

Case 2 (TTH) was misdiagnosed by the majority of the participants as a CEH. All of the participants diagnosed case 2 as a primary headache disorder which indicates good sensitivity for excluding a secondary cause; however the specificity of the primary diagnosis was not accurate. There appears to be a misunderstanding or misinterpretation of the signs and symptoms as described in case 2. The guidelines for the diagnosis of TTH should be sufficient to differentiate TTH from CEH. However the results from case 2 indicate that confusion exists when differentiating the signs and symptoms of a TTH from CEH. The most frequently selected differential diagnoses given by the participants were TTH, CEH, MEH and cluster headache (in descending order) which show that the most frequently selected differential diagnoses are all primary headaches. Approximately three out of every four participants considered further investigations necessary. The majority of the participants, with the exception of 1.6% (1) of the participants indicated that they would treat the patient as a chiropractor. Deductive reasoning would indicate that the majority of the participants expect chiropractic treatment to be of benefit for the patient described in case 2. The majority of the participants decided not to incorporate multi-disciplinary management of the patient described in case 2 which would indicate that they deem chiropractic management sufficient. It appears that the majority of the participants deem chiropractic management sufficient for a patient presenting with signs and symptoms of TTH as described in case 2.

Recommendation:

- There appears to be a need for more specific education regarding the specific differentiating symptoms of TTH from CEH (as described in context of case

- 2). Further investigation into the diagnosis of TTH, and its clinical differentiation from CEH, by chiropractors could provide more insight into the diagnostic acumen of the participants.

5.2.2.3 Conclusion for Case 3 (MEH)

The majority of the participants correctly diagnosed case 3 as MEH. The other diagnoses were all considered as primary headache disorders with the exception of temporal cell arteritis (selected by 1.6% (1) participant). Approximately six out of every ten participants considered further investigations necessary. The use of investigations is not of specific diagnostic value for a MEH. The investigations chosen for case 3 each had potential value for the management of the patient described in case 3 with the exception of diagnostic ultrasound and autoimmune testing. The majority of the participants indicated that they would treat the patient described in case 3 as a chiropractor potentially indicating that the majority of the participants expects to benefit a patient presenting with MEH like symptoms as described in case 3. Half of those who opted to treat the patient as a chiropractor did not opt to refer the patient for multi-disciplinary management indicating that chiropractic treatment alone could be of benefit for a MEH. The selected options for co-management of the patient described in case 3 include a homeopath, GP, neurologist, massage therapist and physiotherapist (in descending order).

The general outcome for the diagnostic management of MEH (as described in case 3) appears to be sufficient. As the literature with regard to the chiropractic management of MEH is not conclusive, recommendations for or against the chiropractic treatment of MEH cannot be made at this stage. Based on the results from this study, the majority of the participants can at the very least accurately diagnose MEH (as described in case 3).

5.2.2.4 Conclusion for Case 4 (CEH)

The majority of the participants correctly diagnosed case 4 as a CEH. The list of differential diagnoses delivered a surprising result as none of the participants selected TTH as a differential diagnosis as TTH can be confused for a CEH as noted

in case 2. The majority of the participants considered further investigations necessary. The vast majority of those who considered further investigations necessary for the patient opted to send the patient for plain film x-rays, which could be used as a first line investigation to determine if any secondary causes for the headache are present. The majority of the participants decided not to refer the patient for co-management thus indicating that the majority of the participants regard chiropractic treatment as sufficient for CEH as described in case 4.

The diagnosis and referral patterns for CEH (as described in case 4), appears to be sufficiently executed by the majority of the participants.

5.2.2.5 Conclusion for Case 5 (intracranial haemorrhage – epidural haematoma)

The participants appeared to have a poor accuracy with regard to selecting the correct primary diagnosis for case 5. Only 27% (17) of the participants selected the correct primary diagnosis. Considering the potentially fatal prognosis of intracranial haemorrhage it is concerning that the majority of the participants' misdiagnosed case 5. The majority of the participants selected intracranial haemorrhage as part of their differential diagnosis, however once again due to the serious nature of intracranial haemorrhage it is dangerous not to consider the condition as the primary diagnosis. The majority of the participants did however indicate that they would consider further investigations, of which the majority selected neuroimaging which would be sufficient to detect intracranial haemorrhage, at which stage the patient should be sent for emergency management. Another concern for case 5 is that 9.5% (6) of the participants indicated that they would treat the patient as a chiropractor which is not appropriate in this case. Those who did not choose to treat the patient described in case 5 indicated valid deterring signs and symptoms for such decision. All of the referral patterns for the primary presenting complaint were appropriate for subsequent management of the condition.

Further research should be conducted to establish if there truly is a lack of accurate diagnoses for headaches associated with trauma (such as intracranial haemorrhage)

as it could increase the clinical awareness of such disorders and improve the subsequent management.

Recommendation:

- There appears to be a need for more specific education n regarding diagnosis of intracranial haemorrhage type headaches.
- Research into the clinical diagnosis of headaches associated with trauma by chiropractors is necessary to determine if this sub-group of headaches are accurately diagnosed. Patients with post-traumatic headaches may consult a chiropractor, it is therefore of importance for an accurate diagnosis to be established.

5.3 Management information

5.3.1 Objective of management information

“To determine how the sample will manage cervicogenic headaches, tension type headaches and migraine headaches (spinal manipulative techniques used; modalities used; patient education and self-management; referral; treatment option for patients with contra-indications to spinal manipulation).”

5.3.2 Conclusion of management information

The following management protocol or preferred management strategies was obtained from the majority of the participants for each of CEH, TTH and MEH. This is an indication of what is currently being used by the majority of the participants tested.

5.3.2.1 CEH management conclusion

The tendency of treatment noted for CEH appeared to indicate that all the participants opted to adjust a patient with a CEH if no contra-indications are present. Furthermore the participants predominantly preferred application of specific

adjustments to the cervical and thoracic spine (only those which are suspected to be fixated). SMT was regarded as the primary focus of treatment. The most popular modalities to be used in conjunction with SMT were stretching exercises and massage therapy. Similar selections of modalities were chosen with relatively similar frequency when SMT was contra-indicated. The use of instrument assisted spinal manipulation devices, NSAIDS and cervical traction was selected more often when SMT was contra-indicated. All of the participants agreed to treat MFTP's if associated with CEH. The treatment option of choice for MFTP's was dry needling. The interval of choice for a follow up appointment (after the initial appointment) was two to three days and the number of treatments expected for relief of symptoms for a patient with a CEH was two to three treatments. Further investigations were considered necessary by the majority of the participants after seven days without any relief of symptoms. Almost four out of every five participants recommended maintenance care for a patient with CEH. Participants tended to agree that patient advice and education consist of postural and ergonomic advice, home stretching, stress management techniques and proprioceptive exercises. If treatment goals are not obtained, the participants agreed to change the treatment plan and reassess all of the previous findings. The participants agreed to refer the patient to another health care provider other than another chiropractor if treatment outcomes were not achieved.

5.3.2.2 TTH management conclusion

All the participants agreed to adjust a patient with a TTH if no contra-indications to SMT are present. The participants predominantly preferred application of specific adjustments to the cervical and thoracic spine (only those which are suspected to be fixated). Two thirds of the participants regarded SMT as the primary focus of treatment for TTH even though literature suggests that currently the recommendation for or against SMT for TTH cannot be established. The majority of those who did not consider SMT as the primary focus of treatment regarded soft tissue therapy as the primary focus of treatment for TTH, which is a valid opinion. Stretching exercises and massage therapy were the most frequently chosen modalities to be used in conjunction with SMT and at least one out of every four participants indicated the utilisation of cervical traction, electro-modalities and KT as conjunctive modalities.

Similar modalities were selected when SMT was contra-indicated; however a marked increase in the use of cryotherapy and NSAIDS was noted. Nearly all the participants agreed to treat MFTPs associated with TTH and the preferred treatment thereof was dry needling. The majority of the participants recommended a follow up appointment two to three days from the initial appointment and expected relief of symptoms within two to three treatments. The majority of the participants considered further investigations necessary after seven days without any relief of symptoms. Maintenance care was recommended by more than eight out of every ten participants. Patient advice and education recommended by the participants included stress management techniques, postural and ergonomic advice as well as starting cardiovascular training and dietary advice. If treatment outcomes are not achieved the general approach included re-evaluation of the patient with a change in treatment plan and possible referral to another health care provider other than a chiropractor.

5.3.2.3 MEH management conclusion

The majority of the participants indicated that they would adjust a patient with MEH if no contra-indications to SMT are present. The participants predominantly preferred application of specific adjustments to the cervical and thoracic spine (only those which are suspected to be fixated). Almost four out of every five participants indicated that the primary focus of treatment was SMT for a MEH. Similar to that of CEH and TTH stretching exercises and massage therapy were the most frequently chosen modalities used in conjunction with SMT for MEH. More than one in every four participants selected the use of cryotherapy, cervical traction and electro-modalities as conjunctive modalities. Similar selections of modalities were used when SMT was contra-indicated, although 44.4% (30) participants indicated the use of NSAIDS as a treatment option. The majority of the participants indicated that they would treat MFTPs associated with MEH and the most frequently selected treatment option for MFTPs was dry needling. The most frequently selected interval for a follow up treatment after the initial appointment was two days and the majority of the participants expected relief of symptoms associated with a MEH after two treatments. In terms of patient advice and education the majority of the participants agreed to recommend stress management techniques, exercise programs (mostly

related to cardiovascular and possibly proprioceptive exercises) and dietary advice for a patient with MEH. If treatment goals were not obtained the majority of the participants indicated that they would reevaluate the patient and change the treatment strategy, referral of the patient to another health care provider other than a chiropractor was considered.

A similar pattern or management approach was noted across all three headaches (CEH, TTH and MEH). Most of the treatment methods used by most of the participants have moderate evidence of efficacy in the treatment of musculoskeletal conditions. The management options chosen by the majority of the participants could be of benefit for the patients. The use of a treatment protocol or strategy as described in the conclusion has not been tested in such a combination for the treatment of headaches; there is literature regarding treatment options individually, but not in a combination as observed in this study.

Recommendation:

- Future research into the management of CEH, TTH and MEH by chiropractors should investigate the efficacy of the protocol or combined use of management approaches as used for each headache as described in the conclusion.
- Future research should investigate the specific methods of how the different treatment approaches, modalities and patient education are applied to the patient.

5.4 Correlation between data sets

5.4.1 Objective of correlations

“To compare the above objectives for correlation of data.”

5.4.2 Relationships between demographic information and diagnostic outcome

Few differences were noted with regard to the impact of demographic information on the diagnostic outcome across the five cases. Some, but not enough, evidence

indicates that the older participants gave less accurate diagnoses. The headaches which were less accurately diagnosed possibly due to an age difference were meningitis, TTH and MEH. As the participants for each of the age groups (especially the older age groups) was too small no specific conclusions can be made without caution to its interpretation. More research is needed into each headache (particularly that of meningitis, TTH and MEH) in order to conclusively determine if any shortfalls exist with regard to the diagnosis as a result of older age. No other significant differences were noted between demographic information and diagnostic outcome. This potentially indicates that the diagnoses given by the participants are not dependant on the demographic background. The apparent uniformity and lack of differences associated with the demographic information could be due to the majority of the participants graduating from the same institution. A limitation to be noted however is that not all demographic information was valid for correlation.

5.4.3 Correlation between demographic information and management options used

The only statistically significant differences were noted for the management of TTH. Age appeared to influence the specificity used for adjustments in TTH. Those who were equivocal or neutral about adjusting specific segments (mostly only those fixations which were suspected to be fixated) were significantly older than the rest of the participants. A relative statistical difference was noted as those who recommended the use of NSAIDS for a patient with a TTH were older than most of the participants. The exact reasoning for why the older participants of the sample responded in this manner for TTH, and not for any of the other headaches investigated, is not clear.

5.5 Recommendations for future studies

- The diagnostic accuracy for case 1 delivered favourable results for the participants. However, there appears to be a need for more specific education regarding the most appropriate investigation for meningitis (as described in the context of case 1).

- There appears to be a need for more specific education regarding the specific differentiating symptoms of TTH from CEH (as described in context of case 2). Further investigation into the diagnosis of TTH, and its clinical differentiation from CEH, by chiropractors could provide more insight into the diagnostic acumen of the participants.
- There appears to be a need for more specific education regarding diagnosis of secondary headaches associated with trauma.
- Research into the clinical diagnosis of headaches associated with trauma by chiropractors is necessary to determine if this sub-group of headaches are accurately diagnosed within this population. Patients with post-traumatic headaches may consult a chiropractor, it is therefore of importance for an accurate diagnosis to be established.
- Future research into the management of CEH, TTH and MEH by chiropractors should investigate the efficacy of the protocol or combined use of management approaches as used for each headache as described in the conclusion.
- Further investigation is recommended to determine if the age of a practitioner affects the diagnostic accuracy of headaches.
- Future research questionnaires investigating the diagnostic information similar to this study should be specific with regard to the order in which investigations and referrals take place.
- Future research questionnaires investigating the management of CEH, TTH and MEH should investigate the specific methods of how different treatment approaches, modalities and patient education are applied to the patient. This is important for future clinical trials investigating the efficacy of these treatments.

- Future research questionnaires which investigate correlations between demographic information and other data sets should limit the variables to improve the statistical validity of the information gathered.

5.6 Limitations of study

Many P values in chapter 4.4 suggest that the null hypothesis is more likely to be reproduced. However, one should take into account the specificity and purpose of the data collection tool. The questionnaire was developed to indicate general treatment approaches regarding the use of different modalities and adjustments etc. for particular types of headaches, however the detail according to how these treatment modalities would be physically applied was not specified. For investigation of more specific differences in treatment approaches the specificity of the questionnaire should be modified. The purpose of this study was to investigate the current diagnostic and management approaches used which could possibly lead to a basis or rationale for further and more specific enquiries and clinical trials regarding management and diagnostic protocols.

Confirmatory conclusions can't be made from only one presentation per condition. The results from this study could however serve as pointer for more specific research to be conducted and indicate possible areas of interest for researchers to further the management of headaches. The clinical outcome could be different to that of theoretical case scenarios as used in this study. These considerations should be taken into account when interpreting the conclusions.

For the diagnostic section, the order in which the management proceedings are executed was not determined which limited the critical review of the information gathered. For example it was not specified when those participants who indicated that they would treat a patient with a red flag headache would treat; it is possible that they would first refer the patient for appropriate management of the condition and then treat any residual musculoskeletal complaints the patient could have. Such conclusions or explanations were not possible as the research questionnaire did not specify or gather such information.

The correlations made in this study were largely limited due to a high variable count. Due to the extensive length of the questionnaire a large amount of statistical information was generated. The majority of the statistical information generated indicated little relative differences between demographic and diagnostic information and demographic and management information.

None of the comparisons were valid according to the chi square test due to too many categories with zero counts, therefore no comparisons were possible, in those instances where the chi square test was invalid, the stats were descriptively analysed and the trends shown in the cross tabulations were interpreted instead (Esterhuizen 2015, pers. comm.12 April). The analysis of the data was to a certain extent restricted due to limited funding. For future studies the use of tests such as the Kruskal-Willis test (or similar tests) should be used as a one way ANOVA test to compare relationships between data sets.

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LIST OF APPENDIXES

Appendix A: Questionnaire letter of information and consent



Questionnaire letter of Information and Consent

Thank you for your interest in this research study.

Title of the Research Study:

An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area.

Principle Investigator/s: Stefan Kleingeld

Co-Investigator/s: Supervisor: Dr. Grant David Matkovich (M.Tech chiropractic)

Brief Introduction and Purpose of the Study:

This study will highlight and analyse management options between chiropractors and could therefore highlight tendencies to use certain management approaches. Investigations into such tendencies are needed for headache research in order to provide information for future development of headache management.

The diagnostic accuracy of the sample group will be determined which will provide an insight into the diagnostic skills of chiropractors when patients present with headaches.

There is a worldwide need for research into the field of headaches in order to improve and add onto the current model of literature to aid in the development of efficient management of headaches.

There are approximately 120 registered chiropractors in the greater Durban area which will be invited to participate in this study.

Outline of the Procedures:

Please complete the questionnaire according to the instructions given.

All answers are confidential thus you are requested to be honest and answer all questions. Mark the appropriate box with an X and specify answers where it is required.

Hand delivery/return

Once you have completed the questionnaire in full, place the questionnaire into the envelope provided and seal the envelope. The researcher will collect the letter of information and consent as well as the questionnaire from you and place it into two separate sealed boxes.

Email delivery/return

The letter of information and consent should be printed, completed, signed and faxed to 086 648 6360. Alternatively those who have the facilities to electronically sign documentation are welcome to do so and email the completed letter of information and consent to Charmak@dut.ac.za. The questionnaire can then be completed on the computer. Please save the document before sending in order to ensure that the completed document will be sent. Send the questionnaire to Charmak@dut.ac.za. Please delete the questionnaire from your computer after sending the completed questionnaire to the researcher.

All of the data will be analysed by a qualified statistician and the results will be represented in aggregate, thus no personal details will appear in the results and no single practitioner's results will be displayed in isolation. Once the research has been completed the results will be available at the Durban University of Technology library.

Risks/Discomforts to the Subject:

All of the results will be used for research purposes and all personal data will remain **confidential**.

Benefits:

Benefits to the subject: To keep up to date with what patient management protocols are being used in the greater Durban area.

Benefits to the researcher: The accolade of a Master's degree in Chiropractic.

Reason/s why the Subject May Withdraw from the Study:

At any time during the research process you may withdraw from the study, however once your questionnaire is posted into the sealed container it may not be removed to protect the confidentiality of the other respondents.

Remuneration:

Participation is voluntary and there is no direct remuneration for your participation in this study.

Costs of the Study: There are no costs involved for your participation in this study.

Confidentiality:

All information will be confidential and the results will be used for research purposes only.

Research-related Injury: This is not applicable to this study, as there will be no physical interventions.

In case of any queries regarding the questionnaire please contact the following personnel:

Principle investigator: Stefan Kleingeld

Cell: 083 612 0253

Supervisor: Dr. Grant David Matkovich

Telephone (practice): 031 201 8204

or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Stefan Kleingeld, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 39/14.
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full name of the participant

Date

Time

Signature

I Stefan Kleingeld herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full name of the Researcher

Date

Signature

Full name of the Witness

Date

Signature

Full name of the Legal Guardian
(If applicable)

Date

Signature

Appendix B: Expert group letter of information and consent



Expert group Letter of Information and Consent

Thank you for participating in this expert group, your contribution is much appreciated.

Title of the Research Study: An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area.

Principle Investigator/s: Stefan Kleingeld

Co-Investigator/s: Supervisor: Dr. Grant David Matkovich

Brief Introduction and Purpose of the Study:

This study will highlight and analyse the diagnosis and management of headaches by chiropractors practicing in the greater Durban area and could therefore highlight tendencies to use certain management approaches. Investigations into such tendencies are needed in the field of headache research in order to provide information for future development of headache management.

The diagnostic accuracy of the sample group will be determined which will provide an insight into the diagnostic reliability of chiropractors when patients present with headaches.

There is a worldwide need for research into the field of headaches in order to improve and add onto the current model of literature to aid in the development of efficient management of headaches.

Study objectives:

- To determine the demographic information of chiropractors in the greater Durban area (Age; gender; years in practice; philosophy of chiropractic; postgraduate courses and conferences attended; qualifications obtained etc.)
- To determine how accurately the sample can diagnose selected headaches and identify 'red-flag' headaches.
- To determine the management of Cervicogenic headaches, tension type headaches, migraine headaches and red flag headaches (spinal manipulative techniques used; modalities used; patient education and self-management; referral; treatment option for patients with contra-indications to spinal manipulation) based on the above mentioned diagnoses.
- To compare the above mentioned objectives for correlation of data.

Outline of the Procedures:

Please read and complete the informed consent letter and the code of conduct and confidentiality statement prior to commencement of the expert group meeting. Each member of the expert group will receive a copy of the questionnaire before the discussion begins. During the expert group meeting each question will be discussed in a sequential order. As a member of the expert group please feel free to make your opinion or suggestions known to the

researcher. All comments made can contribute to the questionnaire validity. The expert group meeting will be recorded in order for the researcher to reflect on the comments made.

Risks/Discomforts to the participant: There are no risks involved in this study. The expert group discussion will remain confidential; all information will be used for research purposes only.

Benefits:

The expert group is very important to ensure validity of the questionnaire.

Reason/s why the Subject May Withdraw from the Study:

You may withdraw from the study at any time during the research process.

Remuneration:

Participation is voluntary and there is no direct remuneration for your participation in this study other.

Costs of the Study: There are no costs involved for your participation in this study.

Confidentiality: All information will be confidential and the results will be used for research purposes only. *Please do not divulge any information about the research study and the questionnaire discussed during the expert group meeting. Do not discuss the case scenarios mentioned in the questionnaire outside of the expert group meeting.*

Research-related Injury: This is not applicable to this study, as there will be no physical interventions.

In case of any queries regarding the questionnaire please contact the following personnel:

Supervisor: Dr. Grant David Matkovich

Telephone (practice): 031 201 8204

Principle investigator: Stefan Kleingeld

Cell: 083 612 0253

CONSENT

Statement of Agreement to Participate in the Research Study:

I....., ID number....., have read this Document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by..... to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore voluntarily agree to participate in this study.

Full name of the participant

Date

Time

Signature

I Stefan Kleingeld herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full name of the Researcher

Date

Signature

Full name of the Witness

Date

Signature

Full name of the Legal Guardian
(If applicable)

Date

Signature

Appendix C: Confidentiality statement and code of conduct: expert group



CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: EXPERT GROUP

Please read and complete this form prior to the commencement of the expert group.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the expert group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. None of the information shall be communicated to any other individual or organisation outside of this specific expert group as to the decisions of this expert group.
3. The information gathered from this expert group by the researcher will be made public in terms of a dissertation and journal publication. The researcher will ensure that any participants in the expert group and research remain anonymous and confidential.
4. The expert group may be either voice or video recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.
5. All data generated from this expert group (including the recording) will be kept for 15 years in a secure location at Durban University of Technology and thereafter will be destroyed.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Full name of the participant

Signature

Full name of the Witness

Signature

Full name of the Researcher

Signature

Full name of Supervisor

Signature

Appendix D: Confidentiality statement and code of conduct: pilot study



CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: Pilot Study

Please read and complete this form prior to the commencement of the expert group.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the expert group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. None of the information shall be communicated to any other individual or organisation outside of this specific expert group as to the decisions of this expert group.
3. The information gathered from this expert group by the researcher will be made public in terms of a dissertation and journal publication. The researcher will ensure that any participants in the expert group and research remain anonymous and confidential.
4. The expert group may be either voice or video recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.
5. All data generated from this expert group (including the recording) will be kept for 15 years in a secure location at Durban University of Technology and thereafter will be destroyed.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Full name of the participant

Signature

Full name of the Witness

Signature

Full name of the Researcher

Signature

Full name of Supervisor

Signature

Appendix E: Pilot study letter of information and consent



Pilot study Letter of Information and Consent

Thank you for your participation in this pilot study, your contribution is much appreciated.

Title of the Research Study: An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area.

Principle Investigator/s: Stefan Kleingeld

Co-Investigator/s: Supervisor: Dr. Grant David Matkovich (M.Tech Chiropractic)

Brief Introduction and Purpose of the Study:

This study will highlight and analyse management of headaches by chiropractors practicing in the greater Durban area and could therefore highlight tendencies to use certain management approaches. Investigations into such tendencies are needed in the field of headache research in order to provide information for future development of headache management.

The diagnostic accuracy of the sample group will be determined which will provide an insight into the diagnostic reliability of chiropractors when patients present with headaches.

There is a worldwide need for research into the field of headaches in order to improve and add onto the current model of literature to aid in the development of efficient management of headaches.

Study objectives:

- To determine the demographic information of chiropractors in the greater Durban area (age; gender; years in practice; philosophy of chiropractic; postgraduate courses and conferences attended; qualifications obtained etc.)
- To determine how accurately the sample can diagnose selected headaches and identify 'red-flag' headaches.
- To determine the management of cervicogenic headaches, tension type headaches, migraine headaches and red flag headaches (spinal manipulative techniques used; modalities used; patient education and self-management; referral; treatment option for patients with contra-indications to spinal manipulation) based on the above mentioned diagnoses.
- To compare the above mentioned objectives for correlation of data.

Outline of the Procedures:

Please read and complete the informed consent letter and the code of conduct and confidentiality statement prior to evaluation of the questionnaire. Please evaluate the letter of information and consent for the questionnaire as well as the questionnaire itself. As a member of the pilot study please feel free to make your opinion or suggestions known to the

researcher by completing the evaluation form and/or adding any comments on the evaluation form. All comments made can contribute to the questionnaire validity.

Risks/Discomforts to the participant:

There are no risks involved in this study. The information sourced from the pilot study will remain confidential; all information will be used for research purposes only.

Benefits:

The pilot study is very important to ensure the questionnaire is user friendly.

Reason/s why the Subject May Withdraw from the Study:

You may withdraw from the pilot study at any time during the research process, until the forms have been returned to the researcher.

Remuneration:

Participation is voluntary and there is no direct remuneration for your participation in this study.

Costs of the Study: There are no costs involved for your participation in this study.

Confidentiality: All information will be confidential and the results will be used for research purposes only. *Please do not divulge any information about the research study and the questionnaire. Do not discuss the case scenarios mentioned in the questionnaire outside of the expert group meeting.*

Research-related Injury: This is not applicable to this study, as there will be no physical interventions.

In case of any queries regarding the questionnaire please contact the following personnel:

Supervisor: Dr. Grant David Matkovich

Telephone (practice): 031 201 8204

Principle investigator: Stefan Kleingeld

Cell: 083 612 0253

CONSENT

Statement of Agreement to Participate in the Research Study:

I....., ID number....., have read this Document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by..... to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore voluntarily agree to participate in this study.

Full name of the participant

Date

Time

Signature

I Stefan Kleingeld herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full name of the Researcher

Date

Signature

Full name of the Witness

Date

Signature

Full name of the Legal Guardian
(If applicable)

Date

Signature

Appendix F: Research questionnaire

Research Questionnaire

Principle investigator: Stefan Kleingeld

Supervisor: Dr. Grant David Matkovich (M.Tech Chiropractic)

Research title:

An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area.

Instructions:

Please read and complete the letter of information and consent before answering the questionnaire.

Please tick the appropriate box and specify answers where necessary.

Average time required for completion of questionnaire: 25 min

Key	
BMI	Body mass index
CT	Computed tomography
°C	Degrees Celsius
GCS	Glasgow coma scale
I.F.C	Interferential current
MRI	Magnetic resonance imaging
T.E.N.S	Transcutaneous electrical nerve stimulation
U/S	Ultrasound

Section A: Demographic information										
A) Age (in years):										
B) Gender:		Male				Female				
C) From which institution did you receive your qualification?		Durban University of Technology (Technikon Natal)		University of Johannesburg (Technikon Witwatersrand)		Other (please specify)				
D) How long have you been practicing chiropractic?		Years:				Months:				
E) Are you currently practicing chiropractic part time or full time?		Full time				Part time				
F) Do you have any other tertiary qualifications other than a degree in chiropractic?		No		Yes (please specify)						
G) Please indicate if you have attended any of the following health related short courses since you qualified.		Paediatrics			No	Yes	If <u>yes</u> , did it influence the way you manage headaches in practice?	No	Yes	
		Geriatrics			No	Yes		No	Yes	
		Kinesiotaping			No	Yes		No	Yes	
		Graston technique			No	Yes		No	Yes	
		Other (specify)								
					No	Yes		No	Yes	
					No	Yes		No	Yes	
					No	Yes		No	Yes	
H) Do you read any chiropractic specific journals?		No	Yes	If yes, did any of the journals provide literature regarding headaches?		No	Yes	If yes, did it influence the way you manage headaches in practice?	No	Yes
I) Do you attend any health related conferences on a regular basis (annually, biannually or more often)?		No	Yes	If yes, did any of the conferences provide detailed discussions and/or information about headaches		No	Yes		No	Yes
J) Have you ever practiced outside of South Africa?		No		Yes (please specify the <u>country</u> and <u>duration</u> of practice outside of South-Africa).						
K) Which philosophy of chiropractic do you subscribe to (more than one option may be selected)?		Evidence based - Treatment options based on scientific literature.					No	Yes		
		Mixer - The vertebral subluxation is an important but not the only cause of disease which should be addressed, different treatment approaches and modalities are used					No	Yes		
		Straight - To induce healing by removing the vertebral subluxation and restoring innate intelligence of the nervous system. Defective innate intelligence and nervous function is the primary risk factor for most disease conditions.					No	Yes		

Please read the case studies on the following pages and continue to answer the diagnostic questions that follow for each case.

case 1

A 39-year-old woman with advanced HIV disease diagnosed 3 years ago was evaluated in the clinic for confusion and headache. The patient had a CD4 count of 22 cells/mm³ and HIV RNA of 210,000 copies/ml. She was started on trimethoprim-sulfamethoxazole (Septra_{tm}, Bactrim_{tm}) and azithromycin (Zithromax_{tm}), with plans to start antiretroviral therapy in the next several weeks. She has a 1 week history of headache, fever, and slight confusion. Her physical examination is normal except for a temperature of 38.6°C; neck stiffness during active and passive neck flexion and a decreased performance on her mini-mental status examination. The patient had a pulse rate of 81 bpm, a respiratory rate of 18 bpm, blood pressure of 128/85 mmHg, a GCS of 14 and a BMI of 24 Kg/m².

Diagnostic information: case 1						
1.1) What is your primary diagnosis (select only one)	Brain tumour		Cervicogenic headache		Cluster headache	
	Encephalitis		Glaucoma		Hypertensive headache	
	Meningitis		Migraine		Post-concussive syndrome	
	Temporal cell arteritis		Temporomandibular joint syndrome		Tension type headache	
	Other (please specify)					
1.2) Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)	Brain tumour		Cervicogenic headache		Cluster headache	
	Encephalitis		Glaucoma		Hypertensive headache	
	Meningitis		Migraine		Post-concussive syndrome	
	Temporal cell arteritis		Temporomandibular joint syndrome		Tension type headache	
	Other (please specify)					
1.3) Would you consider further investigations for this patient?	No	Yes (if yes please tick all the investigations you would send this patient for)	Allergy testing	Autoimmune tests	Cardiac enzymes	Coagulation profile
			CT (refer for CT)	Diagnostic ultrasound	Glucose metabolism	Haematology (e.g. FBC, ESR etc.)
			Lipid profile	Liver function tests	MRI (refer for MRI)	Thyroid screen
			Tumour markers	Urinalysis	X-ray	Other (please specify)
1.4.1) Would you treat this patient as a chiropractor at this stage?				No (if no please answer question 1.4.2 below)		Yes (if yes, please continue to question 1.5.2)
1.4.2) What sign and/or symptom in case 1 deters you from treating this patient?						
If you answered no to question 1.4.1 please continue to answer question 1.5.1						
If you answered yes to question 1.4.1 please continue to answer question 1.5.2						
1.5.1) Would you	No	Yes (if yes)	Biokineticist	Endocrinologist	General practitioner	Homeopath

refer this patient to another health care professional for the patient's primary presenting complaint?		please tick the appropriate box)	Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon	
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist	
			Other (please specify)				
1.5.2) Would you refer this patient for co-management?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath	
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon	
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist	
			Other (please specify)				

Case 2

An 18 year old female patient presented with headache episodes lasting for 12 to 48 hours which could start at any time of the day. The pain had a constrictive character and frontal bilateral localization. The patient also reported concomitant pain in the cervical region.

The intensity of pain was moderate to severe and the patient mentioned no accompanying symptoms such as photophobia, vertigo or nausea. The frequency of these episodes was between two and four per month. Past medical history reveals no significant findings. The patient did not smoke but used alcohol socially. The patient denies any previous trauma. The paternal history reveals hypertension and heart disease, maternal history indicates panic disorder.

The patient's vital signs revealed an axillary temperature of 36.9 °C, blood pressure of 125/75 mmHg, pulse rate of 68 bpm, respiratory rate of 11 bpm, BMI of 19.7 Kg/m² and a GCS of 15.

During the physical examination the patient experienced moderate pain during forward neck flexion and tenderness to palpation of the sub-occipital muscles.

Diagnostic information: case 2							
2.1) What is your primary diagnosis (select only one)	Brain tumour		Cervicogenic headache		Cluster headache		Cerebrovascular accident
	Encephalitis		Glaucoma		Hypertensive headache		Intra cranial haemorrhage
	Meningitis		Migraine		Post-concussive syndrome		Sinusitis
	Temporal cell arteritis		Temporomandibular joint syndrome		Tension type headache		Trigeminal neuralgia
	Other (please specify)						
2.2) Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)	Brain tumour		Cervicogenic headache		Cluster headache		Cerebrovascular accident
	Encephalitis		Glaucoma		Hypertensive headache		Intra cranial haemorrhage
	Meningitis		Migraine		Post-concussive syndrome		Sinusitis
	Temporal cell arteritis		Temporomandibular joint syndrome		Tension type headache		Trigeminal neuralgia
	Other (please specify)						
2.3) Would you consider further investigations for this patient?	No	Yes (if yes please tick all the investigations you would send this patient for)	Allergy testing	Autoimmune tests	Cardiac enzymes	Coagulation profile	
			CT (refer for CT)	Diagnostic ultrasound	Glucose metabolism	Haematology (e.g. FBC, ESR etc.)	
			Lipid profile	Liver function tests	MRI (refer for MRI)	Thyroid screen	
			Tumour markers	Urinalysis	X-ray	Other (please specify)	
2.4.1) Would you treat this patient as a chiropractor at this stage?				No (if no please answer question 2.4.2 below)		Yes (if yes, please continue to question 2.5.2)	
2.4.2) What sign and/or symptom in case 2 deters you from treating this patient?							

If you answered no to question 2.4.1 please continue to answer question 2.5.1						
If you answered yes to question 2.4.1 please continue to answer question 2.5.2						
2.5.1) Would you refer this patient to another health care professional for the patient's primary presenting complaint?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			
2.5.2) Would you refer this patient for co-management?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			

Case 3

A 16-year-old male presented with unilateral pain in the right neck that spread to the postorbital region on the same side, the attacks occur six to 12 times per year and lasting as long as 24 hours. At maximum the pain was pulsatile and accompanied by photophobia, phonophobia and occasional nausea. The pain can start at any time during the day. The patient uses over the counter medication which occasionally helps to lessen the severity of the headache but does not relieve the symptoms. The patient's vital signs revealed an axillary temperature of 36.5 °C, blood pressure of 129/75 mmHg, pulse rate of 71 bpm, respiratory rate of 13 bpm, BMI of 19.7 and a GCS of 15.

Diagnostic information: case 3						
3.1) What is your primary diagnosis (select only one)	Brain tumour		Cervicogenic headache	Cluster headache	Cerebrovascular accident	
	Encephalitis		Glaucoma	Hypertensive headache	Intra cranial haemorrhage	
	Meningitis		Migraine	Post-concussive syndrome	Sinusitis	
	Temporal cell arteritis		Temporomandibular joint syndrome	Tension type headache	Trigeminal neuralgia	
	Other (please specify)					
3.2) Please list your differential diagnoses, excluding your primary diagnosis (select a minimum of one or a maximum of three)	Brain tumour		Cervicogenic headache	Cluster headache	Cerebrovascular accident	
	Encephalitis		Glaucoma	Hypertensive headache	Intra cranial haemorrhage	
	Meningitis		Migraine	Post-concussive syndrome	Sinusitis	
	Temporal cell arteritis		Temporomandibular joint syndrome	Tension type headache	Trigeminal neuralgia	
	Other (please specify)					
3.3) Would you	No	Yes (if yes)	Allergy	Autoimmune tests	Cardiac	Coagulation profile

consider further investigations for this patient?		please tick all the investigations you would send this patient for)	testing		enzymes	
			CT (refer for CT)	Diagnostic ultrasound	Glucose metabolism	Haematology (e.g. FBC, ESR etc.)
			Lipid profile	Liver function tests	MRI (refer for MRI)	Thyroid screen
			Tumour markers	Urinalysis	X-ray	Other (please specify)
3.4.1) Would you treat this patient as a chiropractor at this stage?			No (if no please answer question 3.4.2 below)		Yes (if yes, please continue to question 3.5.2)	
3.4.2) What sign and/or symptom in case 3 deters you from treating this patient?						
If you answered no to question 3.4.1 please continue to answer question 3.5.1 If you answered yes to question 3.4.1 please continue to answer question 3.5.2						
3.5.1) Would you refer this patient to another health care professional for the patient's primary presenting complaint?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			
3.5.2) Would you refer this patient for co-management?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			

Case 4

A 40-year-old Caucasian female kindergarten teacher presented with symptoms of neck pain and headache which started three years before after falling down a flight of stairs, the patient did not think that the impact was great enough to seek any medical attention. The patient's main complaints were right-sided occipital and temporal headaches; the headache was dull aching in character and mild to moderate in severity. She had missed work due to the headaches. The neck pain and headache was aggravated by working at the low tables in a stooped posture for more than 30 minutes. Relieving factors included resting, change in position of the neck, supporting the head in a supine or reclined position, and taking over-the-counter anti-inflammatory medications. The headache and neck pain was occasionally present at night when at its worst. Vital signs revealed a blood pressure of 135/85 mmHg pulse rate of 73 bpm, a respiratory rate of 13 bpm, an axillary temperature of 36.4 °C, a GCS of 15 and a BMI of 24 Kg/m².

Postural observation revealed a slight degree of forward head posture with protracted shoulders (right more noticeable than left), decreased curvatures of the thoracic and cervical spine and right scapular winging. Palpation revealed increased muscle tone and tenderness of the suboccipital, bilateral upper and lower trapezius, levator scapulae and rhomboid muscles, most pronounced on the right side. Palpation of the right-sided C1- C2 and C2-C3 facet joints produced a localised dull pain response. Neurovascular assessment was unremarkable.

Diagnostic information: case 4							
4.1) What is your primary diagnosis (select only one)	Brain tumour		Cervicogenic headache		Cluster headache		Cerebrovascular accident
	Encephalitis		Glaucoma		Hypertensive headache		Intra cranial haemorrhage
	Meningitis		Migraine		Post-concussive syndrome		Sinusitis
	Temporal cell arteritis		Temporomandibular joint syndrome		Tension type headache		Trigeminal neuralgia
	Other (please specify)						
4.2) Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)	Brain tumour		Cervicogenic headache		Cluster headache		Cerebrovascular accident
	Encephalitis		Glaucoma		Hypertensive headache		Intra cranial haemorrhage
	Meningitis		Migraine		Post-concussive syndrome		Sinusitis
	Temporal cell arteritis		Temporomandibular joint syndrome		Tension type headache		Trigeminal neuralgia
	Other (please specify)						
4.3) Would you consider further investigations for this patient?	No	Yes (if yes please tick all the investigations you would send this patient for)	Allergy testing	Autoimmune tests	Cardiac enzymes	Coagulation profile	
			CT (refer for CT)	Diagnostic ultrasound	Glucose metabolism	Haematology (e.g. FBC, ESR etc.)	
			Lipid profile	Liver function tests	MRI (refer for MRI)	Thyroid screen	
			Tumour markers	Urinalysis	X-ray	Other (please specify)	
4.4.1) Would you treat this patient as a chiropractor at this stage?				No (if no please answer question 4.4.2 below)		Yes (if yes, please continue to question 4.5.2)	
4.4.2) What sign and/or symptom in case 4 deters you from treating this patient?							
If you answered no to question 4.4.1 please continue to answer question 4.5.1							
If you answered yes to question 4.4.1 please continue to answer question 4.5.2							
4.5.1) Would you refer this patient to another health care professional for the patient's primary presenting complaint?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath	
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon	
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist	
			Other (please specify)				
4.5.2) Would you refer this patient	No	Yes (if yes please tick	Biokineticist	Endocrinologist	General practitioner	Homeopath	
			Massage	Naturopath	Neurologist	Orthopaedic	

for co-management?		the appropriate box)	therapist			surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			

Case 5

A 17-year-old boy sustained a head injury when engaging in gymnastics six days previously. The patient experienced transient loss of consciousness immediately after the injury, but he regained consciousness within a few minutes and did not seek medical attention. Two days later the patient presented to a local hospital with a complaint of intermittent headache. The patient has a prior medical history of idiopathic thrombocytopenic purpura (ITP), which has been in remission for several years and for which no medication was required. The platelet count has also been within the normal range. A brain CT scan was performed, but failed to show any intracranial lesions, and the patient was sent home.

His headache has continued over the past few days. He now presents to you with the headache which has worsened and is associated with vomiting. The patient's vitals show an axillary temperature of 36.8°C, blood pressure of 130/84 mmHg, pulse rate of 79 bpm, respiratory rate of 14 bpm, GCS of 15, BMI of 20.6 Kg/m². During physical examination you notice sluggish response of the pupils to follow your finger during the H-test with slight horizontal nystagmus bilaterally; the right pupil is slightly more dilated in comparison to the left. The patient shows resistance to neck flexion and mentions that his neck has been stiff since his gymnastic accident. No other significant findings are recorded.

Diagnostic information: case 5						
5.1) What is your primary diagnosis(select only one)	Brain tumour		Cervicogenic headache	Cluster headache	Cerebrovascular accident	
	Encephalitis		Glaucoma	Hypertensive headache	Intra cranial haemorrhage	
	Meningitis		Migraine	Post-concussive syndrome	Sinusitis	
	Temporal cell arteritis		Temporomandibular joint syndrome	Tension type headache	Trigeminal neuralgia	
	Other (please specify)					
5.2) Please list your differential diagnoses, excluding your primary diagnosis (list at least one or a maximum of three)	Brain tumour		Cervicogenic headache	Cluster headache	Cerebrovascular accident	
	Encephalitis		Glaucoma	Hypertensive headache	Intra cranial haemorrhage	
	Meningitis		Migraine	Post-concussive syndrome	Sinusitis	
	Temporal cell arteritis		Temporomandibular joint syndrome	Tension type headache	Trigeminal neuralgia	
	Other (please specify)					
5.3) Would you consider further investigations for this patient?	No	Yes (if yes please tick all the investigations you would send this patient for)	Allergy testing	Autoimmune tests	Cardiac enzymes	Coagulation profile
			CT (refer for CT)	Diagnostic ultrasound	Glucose metabolism	Haematology (e.g. FBC, ESR etc.)
			Lipid profile	Liver function tests	MRI (refer for MRI)	Thyroid screen
			Tumour markers	Urinalysis	X-ray	Other (please specify)

5.4.1) Would you treat this patient as a chiropractor at this stage?			No (if no please answer question 5.4.2 below)		Yes(if yes, please continue to question 5.5.2)	
5.4.2) What sign and/or symptom in case 5 deters you from treating this patient?						
If you answered no to question 5.4.1 please continue to answer question 5.5.1 If you answered yes to question 5.4.1 please continue to answer question 5.5.2						
5.5.1) Would you refer this patient to another health care professional for the patient's primary presenting complaint?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			
5.5.2) Would you refer this patient for co-management?	No	Yes (if yes please tick the appropriate box)	Biokineticist	Endocrinologist	General practitioner	Homeopath
			Massage therapist	Naturopath	Neurologist	Orthopaedic surgeon
			Physiotherapist	Psychiatrist	Psychologist	Reflexologist
			Other (please specify)			

Please complete the following section which involves the management of non-complicated, typical cervicogenic headaches, migraine headache and tension type headache. Please tick the appropriate box and specify where necessary.

Section B: CERVICOGENIC HEADACHE management										
6.1.1) Would you adjust a patient with this condition if no red flags are present?				Yes, if yes please continue to question 6.1.2		No, if no please continue to question 6.1.3				
6.1.2) Which of the following adjustments would you use in practice for this condition if no red flags are present?						Agree	Neutral	Disagree		
A	Attempt to adjust specific segments only (only those which you suspect to be fixated).									
B	Adjust the fixated segment on both sides.									
C	Adjust multiple segments throughout the cervical spine including those which are not fixated.									
D	Adjust multiple fixated segments throughout the cervical and thoracic spine.									
E	Adjust the thoracic spine fixations only.									
F	Adjust multiple segments throughout the thoracic spine including those which are not fixated.									
6.1.3) Would you regard spinal manipulation as your primary focus of your treatment of this condition?		Yes	No, if no please indicate why	Lack of positive results from personal experience	Personal interpretation of current literature	Lack of experience to perform the required adjustment				
		Fear of injuring the patient	Lack of confidence	Soft tissue therapy is the primary focus of your treatment for this condition						
		Other (please specify)								
6.1.4) Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)		Activator gun / impulse adjuster		Cervical traction	Contrast therapy	Cryotherapy				
		Electro-modalities		Instrument assisted soft tissue mobilization (e.g. Graston Technique/ FAKTR etc.)			Kinesio Taping or similar			
		Massage therapy		None	Stretching exercises		Supportive taping			
		Ultrasound		Other (please specify)						
6.1.5) Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)		Activator gun / impulse adjuster		Advise NSAIDS	Cervical traction	Contrast therapy				
		Cryotherapy		Electro-modalities	Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)					
		Kinesio Taping or similar		Massage therapy	Stretching exercises		Supportive taping			
		Ultrasound		Other (please specify)						
6.1.6) If you find myofascial trigger points associated with this condition would you treat it?				Yes If yes, please answer question 6.1.7, if no skip question 6.1.7						No
6.1.7) Please select your preferred treatment option for treatment of myofascial trigger		Contrast therapy			Dry needling		Electro-modalities	Ischaemic compression		
		Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)			Laser		Massage	Spinal manipulative therapy		

points associated with this condition.	Spinal mobilisation	Stretching exercises		Ultrasound
	Other (please specify)			
Patient management: CERVICOGENIC HEADACHE patient education and advise				
6.1.8) After how many days would you request a follow up appointment for this condition?				day/s
6.1.9) After how many days with no relief of symptoms would you consider further investigation necessary?				day/s
6.1.10) After how many treatments do you expect the patient to experience relief of symptoms?				treatment/s
6.1.11) Do you suggest maintenance care after the patient is pain free?				Yes No
6.1.12) What post treatment patient advice or education would you suggest for this condition?		Agree	Neutral	Disagree
A	Advise on starting a cardiovascular exercise program.			
B	Advise on starting a strength training exercise.			
C	Advise on taking over the counter analgesic medication.			
D	Advise the patient to use a training instructor for exercises.			
E	Home strengthening exercises (e.g. cervical isometric exercises).			
F	Postural or ergonomic advice e.g. sleeping and sitting posture etc.).			
G	Proprioceptive exercises.			
H	Stress management techniques.			
I	Other (please specify):			
6.1.13) If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?				
A	Assess the patient as a new patient.			
B	Change the treatment method.			
C	Continue treating with original treatment protocol.			
D	Reassess al previous positive findings.			
E	Refer to another chiropractor.			
F	Refer to another health care practitioner other than a chiropractor.			
Section B: TENSION TYPE HEADACHE management				
7.1.1) Would you adjust a patient with this condition if no red flags are present?		Yes, if yes please continue to question 7.1.2		No, if no please continue to question 7.1.3
7.1.2) Which of the following adjustments would you use in practice for this condition if no red flags are present?		Agree	Neutral	Disagree
A	Attempt to adjust specific segments only (only those which you suspect to be fixated).			
B	Adjust the fixated segment on both sides.			
C	Adjust multiple segments throughout the cervical spine including those which are not fixated.			
D	Adjust multiple fixated segments throughout the cervical and thoracic spine.			
E	Adjust the thoracic spine fixations only.			
F	Adjust multiple segments throughout the thoracic spine including those which are not fixated.			
7.1.3) Would you regard spinal manipulation as your primary focus of your	Yes	No, if no please indicate why	Lack of positive results from personal experience	Personal interpretation of current literature
				Lack of experience to perform the required adjustment

treatment of this condition?	Fear of injuring the patient	Lack of confidence	Soft tissue therapy is the primary focus of your treatment for this condition		
	Other (please specify)				
7.1.4) Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)	Activator gun / impulse adjuster		Cervical traction	Contrast therapy	Cryotherapy
	Electro-modalities		Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)		Kinesio Taping or similar
	Massage therapy		None	Stretching exercises	Supportive taping
	Ultrasound		Other (please specify)		
7.1.5) Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)	Activator gun / impulse adjuster		Advise NSAIDS	Cervical traction	Contrast therapy
	Cryotherapy		Electro-modalities	Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)	
	Kinesio Taping or similar		Massage therapy	Stretching exercises	Supportive taping
	Ultrasound		Other (please specify)		
7.1.6) If you find myofascial trigger points associated with this condition would you treat it?			Yes If yes, please answer question 7.1.7, if no skip question 7.1.7		No
7.1.7) Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition.	Contrast therapy		Dry needling	Electro-modalities	Ischaemic compression
	Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)		Laser	Massage	Spinal manipulative therapy
	Spinal mobilisation		Stretching exercises		Ultrasound
	Other (please specify)				
Patient management: TENSION TYPE HEADACHE patient education and advise					
7.1.8) After how many days would you request a follow up appointment for this condition?					day/s
7.1.9) After how many days with no relief of symptoms would you consider further investigation necessary?					day/s
7.1.10) After how many treatments do you expect the patient to experience relief of symptoms?					treatment/s
7.1.11) Do you suggest maintenance care after the patient is pain free?					Yes No
7.1.12) What post treatment patient advice or education would you suggest for this condition?				Agree	Neutral Disagree
A	Advise on starting a cardiovascular exercise program.				
B	Advise on starting a strength training exercise.				
C	Advise on taking over the counter analgesic medication.				
D	Advise the patient to use a training instructor for exercises.				
E	Home strengthening exercises (e.g. cervical isometric exercises).				
F	Postural or ergonomic advice e.g. sleeping and sitting posture etc.).				
G	Proprioceptive exercises.				
H	Stress management techniques.				
I	Other:				

7.1.13) If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?					
A	Assess the patient as a new patient.				
B	Change the treatment method.				
C	Continue treating with original treatment protocol.				
D	Reassess all previous positive findings.				
E	Refer to another chiropractor.				
F	Refer to another health care practitioner other than a chiropractor.				
Section B: MIGRAINE HEADACHE management					
8.1.1) Would you adjust a patient with this condition if no red flags are present?			Yes, if yes please continue to question 8.1.2	No, if no please continue to question 8.1.3	
8.1.2) Which of the following adjustments would you use in practice for this condition if no red flags are present?			Agree	Neutral	Disagree
A	Attempt to adjust specific segments only (only those which you suspect to be fixated).				
B	Adjust the fixated segment on both sides.				
C	Adjust multiple segments throughout the cervical spine including those which are not fixated.				
D	Adjust multiple fixated segments throughout the cervical and thoracic spine.				
E	Adjust the thoracic spine fixations only.				
F	Adjust multiple segments throughout the thoracic spine including those which are not fixated.				
8.1.3) Would you regard spinal manipulation as your primary focus of your treatment of this condition?	Yes	No, if no please indicate why	Lack of positive results from personal experience	Personal interpretation of current literature	Lack of experience to perform the required adjustment
	Fear of injuring the patient	Lack of confidence	Soft tissue therapy is the primary focus of your treatment for this condition		
	Other (please specify)				
8.1.4) Which modalities would you use in conjunction with spinal manipulation for this condition (more than one option may be selected)	Activator gun / impulse adjuster		Cervical traction	Contrast therapy	Cryotherapy
	Electro-modalities		Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)		Kinesio Taping or similar
	Massage therapy		None	Stretching exercises	Supportive taping
	Ultrasound		Other		
8.1.5) Which of the following do you use if manual manipulation is contra-indicated? (more than one option possible)	Activator gun / impulse adjuster		Advise NSAIDS	Cervical traction	Contrast therapy
	Cryotherapy		Electro-modalities	Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)	
	Kinesio Taping or similar		Massage therapy	Stretching exercises	Supportive taping
	Ultrasound		Other (please specify)		

8.1.6) If you find myofascial trigger points associated with this condition would you treat it?		Yes If yes, please answer question 8.1.7, if no skip question 8.1.7			No
8.1.7) Please select your preferred treatment option for treatment of myofascial trigger points associated with this condition.	Contrast therapy		Dry needling	Electro-modalities	Ischaemic compression
	Instrument assisted soft tissue mobilization (e.g. Graston Technique / FAKTR etc.)		Laser	Massage	Spinal manipulative therapy
	Spinal mobilisation		Stretching exercises		Ultrasound
	Other (please specify)				
Patient management: MIGRAINE HEADACHE patient education and advise					
8.1.8) After how many days would you request a follow up appointment for this condition?					day/s
8.1.9) After how many days with no relief of symptoms would you consider further investigation necessary?					day/s
8.1.10) After how many treatments do you expect the patient to experience relief of symptoms?					treatment/s
8.1.11) Do you suggest maintenance care after the patient is pain free?					Yes No
8.1.12) What post treatment patient advice or education would you suggest for this condition?				Agree	Neutral Disagree
A	Advise on starting a cardiovascular exercise program.				
B	Advise on starting an strength training exercise.				
C	Advise on taking over the counter analgesic medication.				
D	Advise the patient to use a training instructor for exercises.				
E	Home strengthening exercises (e.g. cervical isometric exercises).				
F	Postural or ergonomic advice e.g. sleeping and sitting posture etc.).				
G	Proprioceptive exercises.				
H	Stress management techniques.				
I	Other:				
8.1.13) If your patient was not achieving your aims and/or goals of treatment, how would you proceed with management?					
A	Assess the patient as a new patient.				
B	Change the treatment method.				
C	Continue treating with original treatment protocol.				
D	Reassess al previous positive findings.				
E	Refer to another chiropractor.				
F	Refer to another health care practitioner other than a chiropractor.				

Appendix G: Pilot study evaluation sheet

Pilot study evaluation sheet

Please tick the appropriate box

1) What is your opinion of the subject presented in this questionnaire?	Extremely interesting	Interesting	Average	Boring	Very boring
2) Do you think the topics raised in this questionnaire were adequately covered?	Yes		No (if no, please explain why in the space provided at the end of the form)		
3) What is your opinion about the cover letter?	Very clear	Clear	Adequate	Unclear	Needs revising
4) How would you describe the instructions accompanying each of the questions?	Very clear	Clear	Adequate	Unclear	Needs revising
5) Do you think the questionnaire is too long?	Yes		No (if no, please explain why in the space provided at the end of the form).		
6) What is your opinion of the wording of the questionnaire?	The meaning of all questions is absolutely clear.				
	The meaning of most questions is clear.				
	There is too much chiropractic/ medical jargon.				
	The questions will not be understood by chiropractors.				
	The questionnaire needs to be revised because it is unclear.				
7) Do you think the case scenarios (case 1 to case 5) are presented reasonably?	Yes		No (if no, please explain why in the space provided at the end of the form)		

If you have any questions in the questionnaire with which you have complaints and/or suggestions to improve the questionnaire please list the number of the question and provide your comments:

If you have any other comments please feel free to write them in the space provided below:

Appendix H: Suggested expert group corrections for pre-expert group questionnaire

Suggested expert group corrections for pre-expert group questionnaire

The following suggestions were made during the expert group to enhance the quality and validity of the pre-expert group questionnaire.

Title page:

It was suggested that:

The supervisor's qualifications should be added to the title page.

The instructions on the title page should be combined into sentences rather than bulleted statements.

Demographic information:

It was suggested that:

The demographic information should follow a numbering system similar to the rest of the questionnaire for ease of summarising data once all data has been collected and for the purpose of having a point of reference to refer to during any period of evaluation, for e.g. If the research participants have any queries during the research process. Thus question one of the demographic information should be labelled A and end with the last question labelled J

**Note for the purpose of establishing a reference frame for the demographic information of the pre-expert group questionnaire, the demographic information will be discussed using the above mentioned labelling system from here on out.*

The last option of question C should allow the participant to specify which institution they qualified from outside of South Africa as the other two options are specific to an institution; the reason for doing so is that all options should gather information to the same specificity in this case.

Question F should allow more space for the participants to specify any other options which apply to the question. Suggestions were made to merge tables which contain repeated information to make the questionnaire more convenient for the participant to answer.

Question H required more detail in the question in order to make the question more specific to headaches.

Question I should specify a time frame for the conferences attended in order to make the question more relevant and significant. The question as stated in the pre-expert group questionnaire was too vague as the participant could have attended a health related short course many years ago and could have forgotten about the course, thus it would be of greater significance to enquire if the participant attends conferences annually or more often.

Question J should allow the participant to select more than one option as some chiropractors feel that they adhere to more than one philosophy of chiropractic. The definitions used in this question needs to be referenced.

Case scenarios:

Case 1

It was suggested that a history of trauma to the cervical spine should be added to case 1 to offer greater support for the diagnosis of cervicogenic headache as cervicogenic headaches and tension type headaches often present similarly.

The unremarkable results should be removed from all cases, by adding unremarkable results to some cases and not others will confuse the participant to the relevance of the information given or left out. Unremarkable results should only be added if pertinent to the case.

Vital signs should be added to the case to maintain consistency throughout the questionnaire.

Case 2

Case 2 presented a tension type headache, this case presented a patient with dry and red eyes along with other signs and symptoms characteristic of a tension type headache, however it was suggested that the dry and red eyes could result in ambiguity, as presented in this case, as it could be indicative of various pathology. Thus this information was removed in order to avoid ambiguity with the diagnosis.

Case 3

Vital signs should be added to the case to maintain consistency throughout the questionnaire.

Case 4

Case 4 presented a patient with meningitis, it was suggested that signs of nuchal rigidity should be added to the case to make the case more specific.

Case 5

No changes were necessary to case 5.

Diagnostic information:

It was suggested that:

- For question 1.1 and all other questions the options provided should be listed alphabetically
- For question 1.1 and 1.2 sinusitis should be added to the list of diagnoses.
- For question 1.3 urine dip stick should be removed as an investigation which you would send for as you can perform a urine dip stick test in practice.
- For Question 1.5.1 and 1.5.2 should contain the same options to be selected as both questions enquire information about professional referrals thus the information should be kept constant.

Patient management:

At this point it was noticed that the questions were numbered incorrectly as the numbers 1.5.1 and 1.5.2 were repeated and thus all the questions from question 1.5 onwards would need to be adjusted accordingly.

It was suggested that:

The options for question 1.6 and 1.7 should combine all the different types of electro-modalities into one option as it was not necessary to provide sub categories of electro-modalities, this would also decrease the space occupied on the questionnaire.

For question 1.9 it was suggested that L.A.S.E.R and spinal manipulative therapy should be added as options to be selected, it was also noted that taping techniques and other short course techniques should be added to the list of options however these are less commonly preferred techniques for treatment of headaches and they can be specified under the option “other” if the participant uses these techniques.

For question 1.10, 1.11 and 1.12 it was suggested that the participant should merely specify a number of days in hand writing rather than providing numerous options to select as this would save time for the participant and save space on the questionnaire.

For question 1.13 it was noted that the options to be selected by the participant should conform to the entire list of differentials given in question 1.1 and 1.2, this should be done to prevent biased selection of options and to prevent leading the

participant into a particular thinking pattern. This would however make the questionnaire substantially longer and unpleasant to answer. It was suggested that the questionnaire should rather be split into different sections, one section should then cover the case scenarios and the diagnostic information should be obtained from those cases. The next section should then be independent from the previous case scenarios, the participants should then be told which condition the following information would be based on so that there is no need to provide options for an entire list of differentials as the condition to be managed will be specified and the list of options in question 1.13 will conform to those conditions.

It was also noted that the case scenarios should be separate from the management section in the event that a participant misdiagnoses a condition; this misdiagnosis would lead to information about management about a condition which the study does not aim to retrieve information about. The literature as compiled by the researcher supports the management of CEH, TEH, and MEH headaches by chiropractors. Thus the management section of the questionnaire will focus on these headaches and will be independent from the case scenario with the subsequent diagnostic information.

** Please note that question 1.1 to 1.14 was identical for each case scenario given in the questionnaire, Thus 1.1 to 1.14 contains identical questions as 2.1 to 2.14 and the same applies for questions three to five. All of the suggested corrections were made while taking into account the information from all 5 case scenarios of the questionnaire. Thus the corrections for 2.1 to 5.14 will be identical to 1.1 to 1.14.*

Changes to the format of the questionnaire:

It was suggested that:

- The questionnaire should be split into different sections as mentioned above.
- The layout of the questionnaire should be changed to portrait rather than landscape as it has the potential to reduce space if the tables are adjusted accordingly in the portrait format.
- Question 1.5.2 should be followed by question 1.8, 1.7, 1.6 and then from the original 1.9 onwards the order of the questions should remain unchanged, thus the order in which the questions were arranged should be changed for purposes of logic and convenience to the participants.

Changes to the questionnaire which were not added to this list include corrections of spelling errors, grammar and sentence construction.

Appendix I: Permission letter to the Chiropractic Association of South Africa

Permission letter to the Chiropractic Association of South Africa

To whom it may concern

I am currently a Chiropractic master's student at the Durban University of Technology and I would like to conduct research on the Chiropractors practicing in the Greater Durban area. With this letter I kindly ask for permission to conduct a quantitative questionnaire based study on the members of CASA.

Please read the following information which will describe the nature of the study.

Title of the Research Study:

An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area.

Principle Investigator/s: Stefan Kleingeld

Co-Investigator/s: Supervisor: Dr. Grant David Matkovich (M.Tech Chiropractic)

Brief Introduction and Purpose of the Study:

This study will highlight and analyse management options between chiropractors and could therefore highlight tendencies to use certain management approaches. Investigations into such tendencies are needed for headache research in order to provide information for future development of headache management.

The diagnostic accuracy of the sample group will be determined which will provide an insight into the diagnostic skills of chiropractors when patients present with headaches.

There is a worldwide need for research into the field of headaches in order to improve and add onto the current model of literature to aid in the development of efficient management of headaches.

Outline of the Procedures:

Please complete the questionnaire according to the instructions given.

All answers are confidential thus you are requested to be honest and answer all questions. Mark the appropriate box with an X and specify answers where it is required.

Risks/Discomforts to the Subject:

All of the results will be used for research purposes and all personal data will remain **confidential**. **The results will be revealed in aggregate and no reference to individual performance will be released.**

Benefits:

Benefits to the subject: To keep up to date with what patient management protocols are being used by fellow colleagues in the greater Durban area.

Benefits to the researcher: The accolade of a Master's degree in Chiropractic.

Reason/s why the Subject May Withdraw from the Study:

At any time during the research process, the research participant may withdraw from the study, however once the questionnaire has been posted into the sealed container it may not be removed to protect the confidentiality of the other respondents.

Remuneration:

Participation is voluntary and there is no direct remuneration for participation in this study.

Confidentiality:

All information will be confidential and the results will be used for research purposes only. The results will be revealed in aggregate and no reference to individual performance will be released.

Research-related Injury: This is not applicable to this study, as there will be no physical interventions.

I would like to receive permission to conduct the research on the affiliated members of CASA before I continue the research.

A letter of permission via email would suffice

If you require any other information please contact one of the following personnel:

Principle investigator: Stefan Kleingeld

Cell: 083 612 0253 or email: Stefan.kgd@gmail.com

Supervisor: Dr. Grant David Matkovich

Telephone (practice): 031 201 8204

Thank you for your time and consideration

Principle research Investigator

Stefan Kleingeld

Appendix J: Pilot study corrections

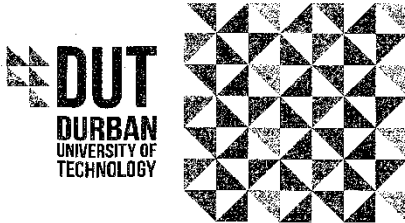
Pilot study corrections

Suggested changes from pilot study members	Researchers response
Numerous spelling, punctuation and grammar mistakes were noted as well as inappropriate order of selection options.	Changes made to the questionnaire involved correction of spelling mistakes and grammar as well as re arranging the selection options for question 1.1; 1.2; 2.1; 2.2; 3.1; 3.2; 4.1; 4.2; 5.1; 5.2; 6.1.7; 7.1.7 and 8.1.7 to alphabetical order. Question numbering errors were noticed and corrected throughout the questionnaire. Missing units of measurements were added throughout the questionnaire.
For question 1.1; 2.1; 3.1; 4.1 and 5.1 it should be specified to select only one option.	Instructions added to 1.1; 2.1; 3.1; 4.1 and 5.1
For question 1.2; 2.2; 3.2; 4.2 and 5.2 a range should be added to the amount of differentials to be selected as some participants might not feel that a maximum of three differentials are possible for the presented case scenario.	For question 1.2; 2.2; 3.2; 4.2 and 5.2 instructions were added to inform the participant that a minimum of one and a maximum of 3 differentials should be selected.
It was noted that some of the case scenarios contained sentences and/ or words which were misleading and vague.	The following sentences/ words were removed as it was found to be misleading and inaccurate: Case one: The word “stress” was removed. Case two: The last sentence of case 2 was removed, “The patient’s nasal mucosa appeared inflamed with presence of clear nasal discharge”. It was found to be ambiguous and misleading as the information will create a vague list of differentials.
It was noted that clearer instructions were required in the questionnaire prior to the start of the case scenarios and prior to the start of Section B.	Clearer instructions were added prior to the start of the case studies as well as prior to the start of section B. This was suggested to make the questionnaire

	more user friendly.
For question 6.1.1; 6.1.12; 7.1.1; 7.1.12; 8.1.1 and 8.1.12 the options “strongly agree” and “strongly disagree” should be removed as the difference of interpretation between “agree” and “strongly agree” as well as “disagree” and “strongly disagree” can be confusing for the research participant.	The options “strongly agree” and ‘strongly disagree” were removed from question 6.1.1; 6.1.12; 7.1.1; 7.1.12; 8.1.1 and 8.1.12.
It was noted that for question 6.1.10; 7.1.10 and 8.1.10 the word day/s should be changed to treatment/s as this would provide a more accurate description for the prognosis.	Question 6.1.10; 7.1.10 and 8.1.10 the words day/s were changed to treatment/s
Some of the pilot group members felt that the questionnaire was too long and that it should be shortened.	To maintain validity and accuracy no questions were removed. As described in the research methodology each participant will be given two weeks to complete the questionnaire thus adequate time will be allocated to each participant for the completion of the questionnaire.

Appendix K: IREC approval

IREC approval



Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate B, Risson Campus
Durban University of Technology
P O Box 1334, Durban, South Africa, 4001
Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishadi@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics
www.dut.ac.za

8 August 2014

IREC Reference Number: **REC 39/14**

Mr S Kleingeld
P O Box 6383
Secunda
2302

Dear Mr Kleingeld

An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area

Please be advised that your research proposal was reviewed, and the following decision was made:

Provisional approval subject to minor changes to the satisfaction of the IREC Chair

1. Section C: Ethics Section – incomplete, tick as appropriate.
2. Appendix A, Appendix B and Appendix E: consent must be on a separate page.
3. Ethics checklist:
 - No. 4: comments section – data should be stored for 5 years.
 - Ethics checklist No. 15: complete comment section.
 - Ethics checklist No. 33: 'yes' should be selected.

Please submit the amended proposal with a cover letter to the IREC administrator; this document must reach the IREC as soon as possible but not more than 6 months from 8 August 2014. Please note that research on the proposed project may not proceed until you receive Full Approval from the IREC.

Yours Sincerely



Prof J K Adam
Chairperson: IREC

Appendix L: permission to use fax line and email address



Dr. Korporaal

I am currently in the process of establishing my research methodology for my research into the diagnosis and management of selected headaches by chiropractors practicing in the greater Durban area. I require your assistance for a part of the email return method which is one of the options the research participants may use to return the letters of information and informed consent.

I require your permission to use your fax line (086 648 6360) and your assistance to please forward all the letters of information and consent which you receive via fax, please send it to Stefan.kgd@gmail.com as soon as you get these letters. In addition I require your permission for the research participants to email the research questionnaires to your email address (charmak@dut.ac.za) as well as permission to use the printing facilities for the emailed questionnaires. In my research budget I have made allowance for printing of questionnaires.

The research participants who chose to use the electronic return method will print the letter of information and consent, complete it in full, sign it and then fax it to 086 648 6360. Alternatively for those who have the facilities to electronically sign documentation are welcome to do so and email the completed letter of information and consent directly to Charmak@dut.ac.za. The questionnaire can then be completed on the computer. Those who chose to use the electronic return method will then complete the questionnaire electronically and email the questionnaire to charmak@dut.ac.za. The questionnaires should then be printed so that I do not have any personal information associated with the questionnaires. You will then be required to delete the email sent to you by the research participant after it has been printed. Each individual questionnaire should then be placed into an envelope which I will supply and then the envelope should be sealed.

Prior to the commencement of data collection I will require you to sign a code of conduct and confidentiality with the following conditions.

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: Research assistant

As an assistant to the research conducted by Stefan Kleingeld, I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed about the research will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. None of the information shall be communicated to any other individual or organisation.
3. Your role as a research assistant would be to forward all information sent to you by the research participants to the researcher.
4. The information gathered by the researcher will be made public in terms of a dissertation and journal publication.

Once this form has been read and agreed to, you will be required to sign a confidentiality statement and code of conduct with the above mentioned conditions prior to the data collection period. I (the researcher) will inform you in advance when the data collection period will begin.

If you agree to help with the research as mentioned above, please respond to this document via email to grant me permission for the use of your expertise and the facilities as mentioned above. If at any time you have any queries with regard to the above mentioned procedures you are most welcome to ask me.

Thank you for volunteering to assist in my research study. Your contribution is appreciated.

Principle investigator

Stefan Kleingeld

Appendix M: Research assistant confidentiality statement and code of conduct

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: Research assistant

As an assistant to the research conducted by Stefan Kleingeld, I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed about the research will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. None of the information shall be communicated to any other individual or organisation.
3. Your role as a research assistant would be to forward all information sent to you by the research participants to the researcher.
4. The information gathered by the researcher will be made public in terms of a dissertation and journal publication.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Full name of the Research assistant

Signature

Full name of the Witness

Signature

Full name of the Researcher

Signature

Appendix N: Pre-expert group Research Questionnaire

Pre-expert group Research Questionnaire

Principle investigator: Stefan Kleingeld

Supervisor: Dr. Grant David Matkovich

Research title:

An investigation into the diagnosis and management of patients presenting with selected headaches by chiropractors in the greater Durban area.

Instructions:

Please complete the consent letter before answering the questionnaire.

Refer to the consent letter for Instructions and confidentiality statements.

Please tick the appropriate box and specify answers where necessary.

Average time for completion of questionnaire.....

Key

I.F.C	Interferential current
T.E.N.S	Transcutaneous electrical nerve stimulation
U/S	Ultrasound

Demographic information									
Age (in years):									
Gender:		Male				Female			
From which institution did you receive your qualification?		Durban University of Technology (Technikon Natal)				University of Johannesburg (Technikon Witwatersrand)		Chiropractic degree obtained outside of South- Africa	
Do you have any other tertiary qualifications other than a degree in chiropractic		No		Yes (specify)					
How long have you been practising:		Years:				Months:			
Please indicate if you have attended any of the following health related short courses since you qualified.									
		Paediatrics	No	Yes	If <u>yes</u> , did it influence the way you practise?			Yes	No
		Geriatrics	No	Yes	If <u>yes</u> , did it influence the way you practise?			Yes	No
		Kinesiotaping	No	Yes	If <u>yes</u> , did it influence the way you practise?			Yes	No
		Graston technique	No	Yes	If <u>yes</u> , did it influence the way you practise?			Yes	No
Other (specify)		No	Yes	If <u>yes</u> , did it influence the way you practise?			Yes	No	
Do you subscribe to any chiropractic specific journals?			No	Yes	If <u>yes</u> , has it influenced the way you practise?			Yes	No
Have you attended any health related conferences since you qualified?			No	Yes	If <u>yes</u> , did it influence the way you practise?			Yes	No
Have you ever practiced outside of South Africa?		Yes (please specify the country and duration of practice outside of South-Africa)						No	
Which philosophy of chiropractic do you subscribe to?		Evidence based - Treatment options based on scientific literature.						Yes	No
		Mixer - The vertebral subluxation is an important but not the only cause of disease which should be addressed, different treatment approaches and modalities are used						Yes	No
		Straight - To induce healing by removing the vertebral subluxation and restoring innate intelligence of the nervous system. Defective innate intelligence and nervous function is the primary risk factor for most disease conditions.						Yes	No

Case 1

A 40-year-old Caucasian female kindergarten teacher presents with symptoms of neck pain and headache which started three years before with no known cause. The patient's main complaints were right-sided occipital and temporal headaches; the pain is dull aching in character and mild to moderate in severity. She had missed work due to the headaches. The pain is aggravated by stress and working at the low tables in a stooped posture for more than 30 minutes. Relieving factors include resting, change in position of the neck, supporting the head in a supine or reclined position, and taking over-the-counter anti-inflammatory medications. The headache and neck pain was occasionally present at night when at its worst. Change in position of the neck decreased the intensity of the pain.

Visual postural observation revealed a slight degree of forward head posture with protracted shoulders (right more noticeable than left), decreased curvatures of the thoracic and cervical spine and right scapular winging. Palpation revealed increased muscle tone and tenderness of the suboccipital, bilateral upper and lower trapezius, levator scapulae, and rhomboid muscles, most pronounced on the right side. Palpation of the right-sided C1- C2 and C2-C3 facet joints produced a pain response. Neurovascular assessment was unremarkable with normal upper-limb tension tests (ULTT) with median, ulnar, and radial nerve bias, deep tendon reflexes, and sharp and dull sensation tests of the upper extremities.

Diagnostic information: case 1										
1.1) What is your primary diagnosis	Cervicogenic Headache		Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour
	Hypertensive headache		Tension type headache	Cluster headache	Temporal cell arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke	
1.2) Please list your three most likely differential, excluding the primary diagnosis	Cervicogenic Headache		Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour
	Hypertensive headache		Tension type headache	Cluster headache	Temporal cell arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke	
1.3) Would you consider sending this patient for further	No	Yes (if yes, please tick the	x-ray	Diagnostic ultrasound	Refer for MRI	Refer for CT scan	Haematology (e.g. FBC, ESR etc.)	Liver function tests	Glucose metabolism	Cardiac enzymes

investigations?		investigations you would request)	Lipid profile	Urine dip stick	Thyroid screen	Autoimmune tests	Allergy testing	Tumour markers	Coagulation profile	Other (please specify)

1.4.1) Would you treat this patient as a chiropractor at this stage?	Yes	No (if no please answer question 1.4.2 below)				
		1.4.2) What sign or symptom in case 1 defers you from treating the patient?				
<p>If you answered <u>yes</u> to question 1.4.1 please continue to answer question <u>1.5.2</u></p> <p>If you answered <u>no</u> to question 1.4.1 please continue to answer question <u>1.5.1</u></p>						
1.5.1) Would you refer this patient to another health care professional for the patient's presenting condition?	No	Yes (if yes please tick the appropriate box)	General practitioner		Neurologist	
		Homeopath	Naturopath		Physiotherapist	
		Psychologist	Psychiatrist		Orthopaedic surgeon	
		Endocrinologist	Other (please specify):			
1.5.2) Would you refer this patient to another health care professional for treatment in conjunction with your own?	No	Yes (please indicate who you would refer this patient to by ticking the appropriate box)	Physiotherapist	Biokineticist	Massage therapist	Homeopath
		Reflexologist	General practitioner	Other (please specify)		

Only continue to answer the management for Case one if you answered yes to question 1.4.1 (only if you would treat this patient as a chiropractor).

Patient management part 1: case 1				
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1.5.1) Would you adjust this patient?		Yes (if yes, please answer 1.5.2)		No (if no, please skip 1.5.2)		1.6) Which of the following do you personally use if manual manipulation is contra-indicated ? (more than one option can be selected)				1.7) Which modalities do you use in conjunction with spinal-manipulation for the patient in case 1? (more than one option can be selected).									
1.5.2) Which adjustment/s , would you most commonly use in your treatment for the patient in case 1?						Advise NSAIDS	I.F.C	T.E.N.S	U/S	None	Activator gun	Impulse adjuster							
	Strongly agree	Agree	Neutral	disagree	Strongly disagree														
Attempt to adjust specific segments only (only those in which you suspect to be fixated).													Continued on next page			Continued on next page			
	Continued on next page												Continued on next page			Continued on next page			
Adjust the fixated segment on both sides													Cervical traction	Massage	Cryotherapy	Heat pack	T.E.N.S	I.F.C	U/S
Adjust multiple segments within the cervical spine including those which are not fixated.																	Cervical traction	Heat pack	Cryotherapy (ice pack)
Adjust multiple segments throughout the cervical spine and thoracic spine																	Massage	Contrast therapy	Other (specify):
Adjust the thoracic spine													Contrast therapy	Dry needling	Other (please specify)	Massage	Contrast therapy	Other (specify):	
Use Instrument adjustment methods (Activator)																			
Mobilizations rather than adjustments																			

Other (specify):																												
1.8) Would you regard spinal manipulation as your primary focus of your treatment of this patient? (more than one option can be selected)														1.9) If you find myofascial trigger points in this patient, will you treat it?														
Yes		No		Lack of positive results from personal experience.			Personal interpretation of current literature.			Lack of experience to adjust the cervical spine.						No		Yes		Ischaemic compression			Dry needling			I.F.C		
Lack of confidence.				Soft tissue therapy is the primary focus of your treatment for this condition.				Fear of injuring the patient						T.E.N.S		U/S		Proprioceptive neuromuscular facilitation (P.N.F)			Static stretching			Heat pack				
Other (specify):														Massage		Cryotherapy (Ice pack)		Contrast therapy			Other (specify)							
Patient management part 2: Patient education and advise for case 1																												
1.10) After how many days would you request a follow up appointment?														1.11) After how many treatments with no relief of symptoms would you consider further investigation necessary?														
No follow up		1	2	3	4	5	6	7	8	9	10	11	12+	No change in treatment plan		1	2	3	4	5	6	7	8	9	10	11	12+	
1.12) Would you suggest treatments after the patient experiences relief of the						Yes (please tick the amount of pain free treatments)												No										

primary complaint (maintenance care)?	1	2	3	4	5	6	7	8	9	10	11	12+
	Other (specify):											
1.13) What post treatment patient advice or education would you suggest for this patient?						1.14) If your patient isn't meeting the aims of your treatment protocol after your proposed prognostic period has been exceeded, what steps do you take?						
	Strongly agree	Agree	Neutral	disagree	Strongly disagree		Strongly agree	Agree	Neutral	disagree	Strongly disagree	
Home stretches only.						Assess the patient as a new patient.						
Home strengthening exercises focused on cervical spine and isometric exercises.						Reassess al previous positive findings.						
Adjunctive nutritional advice.						Refer to another health care practitioner.						
Advise on starting an exercise program under instruction.						Refer to another chiropractor.						
Postural or ergonomic advise (sleeping, sitting posture, standing posture etc.).						Change treatment methods						
Proprioceptive exercises.						Continue treating with original treatment protocol						
Stress management techniques.						Other (specify)						

Other (specify)												
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Case 2

An 18 year old female patient presents with headache episodes lasting for 12 to 48 hours and could initiate at any time of the day. The pain had a constrictive character and frontal bilateral localization. The patient also reported concomitant pain in the cervical region. The intensity of pain was moderate to severe and the patient mentioned no accompanying symptoms such as photophobia, vertigo, nausea, or vegetative symptoms. The frequency of these episodes was between two and four per month. Past medical history reveals no significant findings other than frequent seasonal hay fever. The patient does not smoke with use of alcohol socially. The patient denies any previous trauma. The paternal history reveals hypertension and heart disease and a maternal history of panic disorder.

The patient's vital signs reveal an axillary temperature of 36.9 degrees Celsius, blood pressure of 125/75 mmHg, pulse rate of 68 bpm, respiratory rate of 11, BMI of 19.7 and a GCS of 15.

During the physical examination the patient experiences moderate pain during forward neck flexion and tenderness to palpation of the sub-occipital muscles. The patient's nasal mucosa appears inflamed with presence of clear nasal discharge. The patient's eyes appear dry and red.

Diagnostic information: case 2										
2.1) What is your primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour	
	Hypertensive headache	Tension type headache	Cluster headache	Temporal arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke		
2.2) Please list your three most likely differential, excluding the primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour	
	Hypertensive headache	Tension type headache	Cluster headache	Temporal arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke		
2.3) Would you consider sending this patient for further investigations?	No	Yes (if yes, please tick the investigations you would request)	x-ray	Diagnostic ultrasound	Refer for MRI	Refer for CT scan	Haematology (e.g. FBC, ESR etc.)	Liver function tests	Glucose metabolism	Cardiac enzymes
			Lipid profile	Urine dip stick	Thyroid screen	Autoimmune tests	Allergy testing	Tumour markers	Coagulation profile	Other (please specify)
2.4.1) Would you treat	Yes			No (if no please answer question 2.4.2 below)						

this patient as a chiropractor at this stage?		2.4.2) What sign or symptom in case 1 defers you from treating the patient?

If you answered yes to question 2.4.1 please continue to answer question 2.5.2 If you answered no to question 2.4.1 please continue to answer question 2.5.1							
2.5.1) Would you refer this patient to another health care professional for the patient's presenting condition?	No	Yes (if yes please tick the appropriate box)	General practitioner		Neurologist		
		Homeopath	Naturopath		Physiotherapist		
		Psychologist	Psychiatrist		Orthopaedic surgeon		
		Endocrinologist	Other (please specify):				
2.5.2) Would you refer this patient to another health care professional for treatment in conjunction with your own?	No	Yes (please indicate who you would refer this patient to by ticking the appropriate box)	Physiotherapist	Biokineticist	Massage therapist	Homeopath	
		Reflexologist	General practitioner	Other (please specify)			

Only continue to answer the management for Case two if you answered yes to question 2.4.1 (only if you would treat this patient as a chiropractor)

Patient management part 1: case 2					
2.5.1) Would you adjust this patient?	Yes	No	2.6) Which of the following do you personally use if manual manipulation is contra-indicated? (more than one option can be	2.7) Which modalities do you use in conjunction with spinal- manipulation for the patient in case 1? (more than one	

2.5.2) Which adjustment/s , would you most commonly use in your treatment for the patient in case 1?						selected)				option can be selected).		
	Strongly agree	Agree	Neutral	disagree	Strongly disagree	Advise NSAIDS	I.F.C	T.E.N.S	U/S	None	Activator gun	Impulse adjuster
Attempt to adjust specific segments only (only those in which you suspect to be fixated).						Cervical traction	Massage	Cryotherapy	Heat pack	T.E.N.S	I.F.C	U/S
Adjust the fixated segment on both sides												
Adjust multiple segments within the cervical spine including those which are not fixated.												
Adjust multiple segments throughout the cervical spine and thoracic spine						Contrast therapy	Dry needling	Other (please specify)		Massage	Contrast therapy	Other (specify):
Adjust the thoracic spine												
Use Instrument adjustment methods (Activator)												
Mobilizations rather than adjustments												
Other (specify):												

2.8) Would you regard spinal manipulation as your primary focus of your treatment of this patient? (more than one option can be selected)	2.9) If you find myofascial trigger points in this patient, will you treat it?
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Yes	No	Lack of positive results from personal experience.	Personal interpretation of current literature.	Lack of experience to adjust the cervical spine.	No	Yes	Ischaemic compression	Dry needling	I.F.C
Lack of confidence.		Soft tissue therapy is the primary focus of your treatment for this condition.	Fear of injuring the patient		T.E.N.S	U/S	Proprioceptive neuromuscular facilitation (P.N.F)	Static stretching	Heat pack
Other (specify):					Massage	Cryotherapy (Ice pack)	Contrast therapy	Other (specify)	

Patient education and advise: case 2																									
2.10) After how many days would you request a follow up appointment?														2.11) After how many treatments with no relief of symptoms would you consider further investigation necessary?											
No follow up	1	2	3	4	5	6	7	8	9	10	11	12+	No change in treatment plan	1	2	3	4	5	6	7	8	9	10	11	12+
2.12) Would you suggest treatments after the patient experiences relief of the primary complaint (maintenance care)?				Yes (please tick the amount of pain free treatments)									No												
				1	2	3	4	5	6	7	8	9	10	11	12+										

		Other (specify):									
2.13) What post treatment patient advice or education would you suggest for this patient?						2.14) If your patient isn't meeting the aims of your treatment protocol after your proposed prognostic period has been exceeded, what steps do you take?					
	Strongly agree	Agree	Neutral	disagree	Strongly disagree		Strongly agree	Agree	Neutral	disagree	Strongly disagree
Home stretches only.						Assess the patient as a new patient.					
Home strengthening exercises focused on cervical spine and isometric exercises.						Reassess al previous positive findings.					
Adjunctive nutritional advice.						Refer to another health care practitioner.					
Advise on starting an exercise program under instruction.						Refer to another chiropractor.					
Postural or ergonomic advise (sleeping, sitting posture, standing posture etc.).						Change treatment methods					
Proprioceptive exercises.						Continue treating with original treatment protocol					
Stress management techniques.						Other (specify)					
Other (specify)											

Case 3

This 16-year-old male presents with unilateral pain in the right neck that spread to the postorbital region on the same side, the attacks occur six to 12 times per year and lasting as long as 24 h. At maximum the pain was pulsatile and accompanied by photophobia, phonophobia and occasional nausea. The pain can start at any time during the day. The patient uses over the counter medication which occasionally helps to lessen the severity of the headache but does not relieve the symptoms.

Diagnostic information: case 3										
3.1) What is your primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour	
	Hypertensive headache	Tension type headache	Cluster headache	Temporal cell arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke		
3.2) Please list your three most likely differential, excluding the primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour	
	Hypertensive headache	Tension type headache	Cluster headache	Temporal cell arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke		
3.3) Would you consider sending this patient for further investigations?	No	Yes (if yes, please tick the investigations you would request)	x-ray	Diagnostic ultrasound	Refer for MRI	Refer for CT scan	Haematology (e.g. FBC, ESR etc.)	Liver function tests	Glucose metabolism	Cardiac enzymes
			Lipid profile	Urine dip stick	Thyroid screen	Autoimmune tests	Allergy testing	Tumour markers	Coagulation profile	Other (please specify)
3.4.1) Would you treat this patient as a chiropractor at this stage?	Yes			No (if no please answer question 3.4.2 below)						
				3.4.2) What sign or symptom in case 1 defers you from treating the patient?						
If you answered <u>yes</u> to question 3.4.1 please continue to answer question <u>3.5.2</u> If you answered <u>no</u> to question 3.4.1 please continue to answer question <u>3.5.1</u>										
3.5.1) Would you refer this patient to another health care professional for the patient's presenting condition?	No	Yes (if yes please tick the appropriate box)		General practitioner			Neurologist			
		Homeopath		Naturopath			Physiotherapist			
		Psychologist		Psychiatrist			Orthopaedic surgeon			

		Endocrinologist	Other (please specify):			
3.5.2) Would you refer this patient to another health care professional for treatment in conjunction with your own?	No	Yes (please indicate who you would refer this patient to by ticking the appropriate box)	Physiotherapist	Biokineticist	Massage therapist	Homeopath
		Reflexologist	General practitioner	Other (please specify)		

Only continue to answer the management for Case three if you answered yes to question 3.4.2 (only if you would treat this patient as a chiropractor).

Patient management part 1: case 3												
3.5.1) Would you adjust this patient?			Yes		No	3.6) Which of the following do you personally use if manual manipulation is contra-indicated ? (more than one option can be selected)				3.7) Which modalities do you use in conjunction with spinal-manipulation for the patient in case 1? (more than one option can be selected).		
3.5.2) Which adjustment/s , would you most commonly use in your treatment for the patient in case 1?						Advise NSAIDS	I.F.C	T.E.N.S	U/S	None	Activator gun	Impulse adjuster
	Strongly agree	Agree	Neutral	disagree	Strongly disagree							
Attempt to adjust specific segments only (only those in which you suspect to be fixated).										T.E.N.S	I.F.C	U/S
Adjust the fixated segment on both sides												
Adjust multiple segments within the cervical spine including those which are not fixated.										Cervical traction	Heat pack	Cryotherapy (ice pack)
Adjust multiple segments throughout the cervical spine and thoracic spine										Massage	Contrast therapy	Other (specify):
						Cervical traction	Massage	Cryotherapy	Heat pack			
						Contrast therapy	Dry needling	Other (please specify)				

Adjust the thoracic spine											
Use Instrument adjustment methods (Activator)											
Mobilizations rather than adjustments											
Other (specify):											

3.8) Would you regard spinal manipulation as your primary focus of your treatment of this patient? (more than one option can be selected)					3.9) If you find myofascial trigger points in this patient, will you treat it?				
Yes	No	Lack of positive results from personal experience.	Personal interpretation of current literature.	Lack of experience to adjust the cervical spine.	No	Yes	Ischaemic compression	Dry needling	I.F.C
Lack of confidence.		Soft tissue therapy is the primary focus of your treatment for this condition.	Fear of injuring the patient		T.E.N.S	U/S	Proprioceptive neuromuscular facilitation (P.N.F)	Static stretching	Heat pack
Other (specify):					Massage	Cryotherapy (Ice pack)	Contrast therapy	Other (specify)	

Patient management part 2: Patient education and advise for case 3	
3.10) After how many days would you request a follow up appointment?	3.11) After how many treatments with no relief of symptoms would you consider further investigation necessary?

No follow up	1	2	3	4	5	6	7	8	9	10	11	12+	No change in treatment plan	1	2	3	4	5	6	7	8	9	10	11	12+		
3.12) Would you suggest treatments after the patient experiences relief of the primary complaint (maintenance care)?				Yes (please tick the amount of pain free treatments)									No														
				1	2	3	4	5	6	7	8	9	10	11	12+												
				Other (specify):																							
3.13) What post treatment patient advice or education would you suggest for this patient?													3.14) If your patient isn't meeting the aims of your treatment protocol after your proposed prognostic period has been exceeded, what steps do you take?														
	Strongly agree	Agree	Neutral	disagree	Strongly disagree		Strongly agree	Agree	Neutral	disagree	Strongly disagree																
Home stretches only.						Assess the patient as a new patient.																					
Home strengthening exercises focused on cervical spine and isometric exercises.						Reassess all previous positive findings.																					
Adjunctive nutritional advice.						Refer to another health care practitioner.																					
Advise on starting an exercise program under instruction.						Refer to another chiropractor.																					
Postural or ergonomic advise (sleeping, sitting posture, standing posture etc.).						Change treatment methods																					

Proprioceptive exercises.						Continue treating with original treatment protocol Other (specify)					
Stress management techniques.											
Other (specify)											

Case 4

A 39-year-old woman with advanced HIV disease diagnosed 3 years ago is evaluated in the clinic for confusion and headache. The patient has a current CD4 count of 22 cells/mm³ and HIV RNA of 210,000 copies/ml. Two weeks prior she was started on trimethoprim-sulfamethoxazole (Septra, Bactrim) and azithromycin (Zithromax), with plans to start antiretroviral therapy in the next several weeks. She has a 1 week history of headache, fever, and slight confusion. Her physical examination is normal except for a temperature of 38.4°C and a decreased performance on her mini-mental status examination.

Diagnostic information: case 4									
4.1) What is your primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour
	Hypertensive headache	Tension type headache	Cluster headache	Temporal cell arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke	
4.2) Please list your three most likely differential, excluding the primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour
	Hypertensive headache	Tension type headache	Cluster headache	Temporal cell arteritis	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke	

4.3) Would you consider sending this patient for further investigations?	No	Yes (if yes, please tick the investigations you would request)	x-ray	Diagnostic ultrasound	Refer for MRI	Refer for CT scan	Haematology (e.g. FBC, ESR etc.)	Liver function tests	Glucose metabolism	Cardiac enzymes
			Lipid profile	Urine dip stick	Thyroid screen	Autoimmune tests	Allergy testing	Tumour markers	Coagulation profile	Other (please specify)
4.4.1) Would you treat	Yes			No (if no please answer question 4.4.2 below)						

this patient as a chiropractor at this stage?		4.4.2) What sign or symptom in case 1 defers you from treating the patient?					
If you answered <u>yes</u> to question 4.4.1 please continue to answer question <u>4.5.2</u> If you answered <u>no</u> to question 4.4.1 please continue to answer question <u>4.5.1</u>							
4.5.1) Would you refer this patient to another health care professional for the patient's presenting condition?	No	Yes (if yes please tick the appropriate box)		General practitioner		Neurologist	
		Homeopath		Naturopath		Physiotherapist	
		Psychologist		Psychiatrist		Orthopaedic surgeon	
		Endocrinologist		Other (please specify):			
4.5.2) Would you refer this patient to another health care professional for treatment in conjunction with your own?	No	Yes (please indicate who you would refer this patient to by ticking the appropriate box)		Physiotherapist	Biokineticist	Massage therapist	
		Reflexologist		General practitioner	Other (please specify)		

Only continue to answer the management for Case four if you answered yes to question 4.4.1 (only if you would treat this patient as a chiropractor).

Patient management part 1: case 4																			
4.5.1) Would you adjust this patient?			Yes			No			4.6) Which of the following do you personally use if manual manipulation is contra-indicated ? (more than one option can be selected)				4.7) Which modalities do you use in conjunction with spinal-manipulation for the patient in case 1? (more than one option can be selected).						
4.5.2) Which adjustment/s , would you most commonly use in your treatment for the patient in case 1?						Advise NSAIDS		I.F.C		T.E.N.S		U/S		None		Activator gun		Impulse adjuster	
	Strongly agree	Agree	Neutral	disagree	Strongly disagree														
Attempt to adjust specific segments only (only those in which you suspect						Cervical traction		Massage		Cryotherapy		Heat pack		T.E.N.S		I.F.C		U/S	

to be fixated).														
Adjust the fixated segment on both sides														
Adjust multiple segments within the cervical spine including those which are not fixated.												Cervical traction	Heat pack	Cryotherapy (ice pack)
Adjust multiple segments throughout the cervical spine and thoracic spine						Contrast therapy	Dry needling	Other (please specify)	Massage	Contrast therapy	Other (specify):			
Adjust the thoracic spine														
Use Instrument adjustment methods (Activator)														
Mobilizations rather than adjustments														
Other (specify):														

4.8) Would you regard spinal manipulation as your primary focus of your treatment of this patient? (more than one option can be selected)					4.9) If you find myofascial trigger points in this patient, will you treat it?				
Yes	No	Lack of positive results from personal experience.	Personal interpretation of current literature.	Lack of experience to adjust the cervical spine.	No	Yes	Ischaemic compression	Dry needling	I.F.C
Lack of confidence.		Soft tissue therapy is the primary focus of your treatment for this condition.	Fear of injuring the patient		T.E.N.S	U/S	Proprioceptive neuromuscular facilitation (P.N.F)	Static stretching	Heat pack
					Massage	Cryotherapy	Contrast	Other (specify)	

Other (specify):		(Ice pack)	therapy	
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Patient management part 2: Patient education and advise for case 4																									
4.10) After how many days would you request a follow up appointment?														4.11) After how many treatments with no relief of symptoms would you consider further investigation necessary?											
No follow up	1	2	3	4	5	6	7	8	9	10	11	12+	No change in treatment plan	1	2	3	4	5	6	7	8	9	10	11	12+
4.12) Would you suggest treatments after the patient experiences relief of the primary complaint (maintenance care)?				Yes (please tick the amount of pain free treatments)									No												
				1	2	3	4	5	6	7	8	9	10	11	12+										
				Other (specify):																					
4.13) What post treatment patient advice or education would you suggest for this patient?														4.14) If your patient isn't meeting the aims of your treatment protocol after your proposed prognostic period has been exceeded, what steps do you take?											
	Strongly agree	Agree	Neutral	disagree	Strongly disagree		Strongly agree	Agree	Neutral	disagree	Strongly disagree														
Home stretches only.						Assess the patient as a new patient.																			
Home strengthening exercises focused on cervical spine and isometric						Reassess al previous positive																			

exercises.						findings.						
Adjunctive nutritional advice.						Refer to another health care practitioner.						
Advise on starting an exercise program under instruction.						Refer to another chiropractor.						
Postural or ergonomic advise (sleeping, sitting posture, standing posture etc.).						Change treatment methods						
Proprioceptive exercises.						Continue treating with original treatment protocol						
Stress management techniques.						Other (specify)						
Other (specify)												

Case 5

A 17-year-old boy sustained a head injury when engaging in gymnastics six days previously. The patient experienced transient loss of consciousness immediately after the injury, but he regained consciousness within a few minutes and did not seek medical attention. Two days later the patient presented to a local hospital with a complaint of intermittent headache. The patient has a prior medical history of idiopathic thrombocytopenic purpura (ITP), which has been in remission for several years and for which no medication was required. The platelet count has also been within the normal range. A brain CT scan was performed, but failed to show any intracranial lesions, and the patient was sent home.

His headache has continued over the past few days. He now presents to you with the headache which has worsened and is associated with vomiting. The patient's vitals show an axillary temperature of 36.9 degrees Celsius, blood pressure of 130/84 mmHg, pulse rate of 79, respiratory rate of 14, GCS of 15, BMI of 20.6. During physical examination you notice sluggish response of the pupils to follow your finger during the H-test with slight horizontal nystagmus bilaterally, the right pupil is slightly more dilated in comparison to the left. The patient shows resistance to neck flexion and mentions that his neck has been stiff since his gymnastic accident. No other significant findings are recorded.

Diagnostic information: case 5										
5.1) What is your primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour	
	Hypertensive headache	Tension type headache	Cluster headache	Temporal arteritis	cell	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke	
5.2) Please list your three most likely differential, excluding the primary diagnosis	Cervicogenic Headache	Glaucoma	Migraine	Temporomandibular joint syndrome	Post-concussive syndrome	Epidural haematoma	Sub-arachnoid haemorrhage	Meningitis	Brain tumour	
	Hypertensive headache	Tension type headache	Cluster headache	Temporal arteritis	cell	Trigeminal neuralgia	Subdural haematoma	Encephalitis	Stroke	
5.3) Would you consider sending this patient for further investigations?	No	Yes (if yes, please tick the investigations you would request)	x-ray	Diagnostic ultrasound	Refer for MRI	Refer for CT scan	Haematology (e.g. FBC, ESR etc.)	Liver function tests	Glucose metabolism	Cardiac enzymes
			Lipid profile	Urine dip stick	Thyroid screen	Autoimmune tests	Allergy testing	Tumour markers	Coagulation profile	Other (please specify)
5.4.1) Would you treat this patient as a chiropractor at this stage?	Yes			No (if no please answer question 5.4.2 below)						
				5.4.2) What sign or symptom in case 1 defers you from treating the patient?						
If you answered <u>yes</u> to question 5.4.1 please continue to answer question <u>5.5.2</u> If you answered <u>no</u> to question 5.4.1 please continue to answer question <u>5.5.1</u>										
5.5.1) Would you refer this patient to another health care professional for the patient's presenting condition?	No	Yes (if yes please tick the appropriate box)	General practitioner				Neurologist			
		Homeopath	Naturopath				Physiotherapist			
		Psychologist	Psychiatrist				Orthopaedic surgeon			
		Endocrinologist	Other (please specify):							

5.5.2) Would you refer this patient to another health care professional for treatment in conjunction with your own?	No	Yes (please indicate who you would refer this patient to by ticking the appropriate box)	Physiotherapist	Biokineticist	Massage therapist	Homeopath
		Reflexologist	General practitioner	Other (please specify)		

Only continue to answer the management for Case 5 if you answered yes to question 4.4.1 (only if you would treat this patient as a chiropractor treat this patient).

Patient management part 1: case 5																	
5.5.1) Would you adjust this patient?						Yes		No		5.6) Which of the following do you personally use if manual manipulation is contra-indicated ? (more than one option can be selected)				5.7) Which modalities do you use in conjunction with spinal-manipulation for the patient in case 1? (more than one option can be selected).			
5.5.2) Which adjustment/s , would you most commonly use in your treatment for the patient in case 1?						Advise NSAIDS	I.F.C	T.E.N.S	U/S	None	Activator gun	Impulse adjuster					
	Strongly agree	Agree	Neutral	disagree	Strongly disagree												
Attempt to adjust specific segments only (only those in which you suspect to be fixated).																	
Adjust the fixated segment on both sides																	
Adjust multiple segments within the cervical spine including those which are not fixated.																	
Adjust multiple																	
						Cervical traction	Massage	Cryotherapy	Heat pack	T.E.N.S	I.F.C	U/S					
										Cervical traction	Heat pack	Cryotherapy (ice pack)					

segments throughout the cervical spine and thoracic spine						Contrast therapy	Dry needling	Other (please specify)	Massage	Contrast therapy	Other (specify):
Adjust the thoracic spine											
Use Instrument adjustment methods (Activator)											
Mobilizations rather than adjustments											
Other (specify):											

5.8) Would you regard spinal manipulation as your primary focus of your treatment of this patient? (more than one option can be selected)					5.9) If you find myofascial trigger points in this patient, will you treat it?				
Yes	No	Lack of positive results from personal experience.	Personal interpretation of current literature.	Lack of experience to adjust the cervical spine.	No	Yes	Ischaemic compression	Dry needling	I.F.C
Lack of confidence.		Soft tissue therapy is the primary focus of your treatment for this condition.	Fear of injuring the patient		T.E.N.S	U/S	Proprioceptive neuromuscular facilitation (P.N.F)	Static stretching	Heat pack
Other (specify):					Massage	Cryotherapy (Ice pack)	Contrast therapy	Other (specify)	

Patient management part 2: Patient education and advise for case 5
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5.10) After how many days would you request a follow up appointment?														5.11) After how many treatments with no relief of symptoms would you consider further investigation necessary?													
No follow up	1	2	3	4	5	6	7	8	9	10	11	12+	No change in treatment plan	1	2	3	4	5	6	7	8	9	10	11	12+		
5.12) Would you suggest treatments after the patient experiences relief of the primary complaint (maintenance care)?				Yes (please tick the amount of pain free treatments)									No														
				1	2	3	4	5	6	7	8	9	10	11	12+												
				Other (specify):																							
5.13) What post treatment patient advice or education would you suggest for this patient?														5.14) If your patient isn't meeting the aims of your treatment protocol after your proposed prognostic period has been exceeded, what steps do you take?													
	Strongly agree	Agree	Neutral	disagree	Strongly disagree		Strongly agree	Agree	Neutral	disagree	Strongly disagree																
Home stretches only.						Assess the patient as a new patient.																					
Home strengthening exercises focused on cervical spine and isometric exercises.						Reassess all previous positive findings.																					
Adjunctive nutritional advice.						Refer to another health care practitioner.																					
Advise on starting an exercise program under instruction.						Refer to another chiropractor.																					

Postural or ergonomic advise (sleeping, sitting posture, standing posture etc.).						Change treatment methods						
Proprioceptive exercises.						Continue treating with original treatment protocol						
Stress management techniques.						Other (specify)						
Other (specify)												

Appendix O: Statistical workup

Correlation between duration of practice and diagnostic outcome.

			D) Duration of practice								
			< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years
Diagnosis and differential diagnosis case 1	accurate	Count	2	11	10	13	5	8	7	4	2
		Column N %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66.7%
	adequate	Count	0	0	0	0	0	0	0	0	1
		Column N %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%
Diagnosis and differential diagnosis case 2	accurate	Count	1	7	5	6	1	4	4	1	1
		Column N %	50.0%	63.6%	50.0%	46.2%	20.0%	50.0%	57.1%	25.0%	33.3%
	adequate	Count	1	4	5	5	3	3	3	3	1
		Column N %	50.0%	36.4%	50.0%	38.5%	60.0%	37.5%	42.9%	75.0%	33.3%
	inaccurate	Count	0	0	0	2	1	1	0	0	1
		Column N %	0.0%	0.0%	0.0%	15.4%	20.0%	12.5%	0.0%	0.0%	33.3%
Diagnosis and differential diagnosis case 3	accurate	Count	2	11	7	11	5	6	6	3	1
		Column N %	100.0%	100.0%	70.0%	84.6%	100.0%	75.0%	85.7%	75.0%	33.3%
	adequate	Count	0	0	3	1	0	1	1	1	0

	inaccurate	Column N %	0.0%	0.0%	30.0%	7.7%	0.0%	12.5%	14.3%	25.0%	0.0%
		Count	0	0	0	1	0	1	0	0	2
		Column N %	0.0%	0.0%	0.0%	7.7%	0.0%	12.5%	0.0%	0.0%	66.7%
Diagnosis and differential diagnosis case 4	accurate	Count	2	9	8	13	2	6	6	4	2
		Column N %	100.0%	81.8%	80.0%	100.0%	40.0%	75.0%	85.7%	100.0%	66.7%
	adequate	Count	0	2	1	0	3	2	1	0	1
		Column N %	0.0%	18.2%	10.0%	0.0%	60.0%	25.0%	14.3%	0.0%	33.3%
	inaccurate	Count	0	0	1	0	0	0	0	0	0
		Column N %	0.0%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Diagnosis and differential diagnosis case 5	accurate	Count	0	2	3	5	1	2	4	2	0
		Column N %	0.0%	18.2%	30.0%	38.5%	20.0%	25.0%	57.1%	50.0%	0.0%
	adequate	Count	2	6	6	6	4	6	3	2	2
		Column N %	100.0%	54.5%	60.0%	46.2%	80.0%	75.0%	42.9%	50.0%	66.7%
	inaccurate	Count	0	3	1	2	0	0	0	0	1
		Column N %	0.0%	27.3%	10.0%	15.4%	0.0%	0.0%	0.0%	0.0%	33.3%

NB: None of the comparisons were valid according to the chi square test due to too many categories with zero counts. Therefore no comparisons were possible.

Correlation between additional tertiary qualifications and diagnostic outcome.

			F) Additional tertiary qualifications								
			None	Masters of medical science (sports medicine)	Bachelors of science	Internationally Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICSSD)	Diploma in therapeutic aromatherapy	Bachelors of medical science	Diploma of chiropractic radiography (U.S.A)	Massage diploma	Not specified
Diagnosis and differential diagnosis case 1	accurate	Count	52	3	1	2	1	1	0	1	1
		Column N %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%
	adequate	Count	0	0	0	0	0	0	1	0	0
		Column N %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
Diagnosis and differential diagnosis case 2	accurate	Count	26	0	1	2	1	0	0	0	0
		Column N %	50.0%	0.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	adequate	Count	21	3	0	0	0	1	1	1	1
		Column N %	40.4%	100.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%
	inaccurate	Count	5	0	0	0	0	0	0	0	0
		Column N %	9.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Diagnosis and	accurate	Count	44	2	1	1	1	1	0	1	1
		Column	84.6%	66.7%	100.0%	50.0%	100.0%	100.0%	0.0%	100.0%	100.0%

differential diagnosis case 3	adequate	N %									
		Count	5	1	0	1	0	0	0	0	0
		Column N %	9.6%	33.3%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	inaccurate	Count	3	0	0	0	0	0	1	0	0
		Column N %	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
Diagnosis and differential diagnosis case 4	accurate	Count	43	3	1	1	1	1	0	1	1
		Column N %	82.7%	100.0%	100.0%	50.0%	100.0%	100.0%	0.0%	100.0%	100.0%
	adequate	Count	8	0	0	1	0	0	1	0	0
		Column N %	15.4%	0.0%	0.0%	50.0%	0.0%	0.0%	100.0%	0.0%	0.0%
	inaccurate	Count	1	0	0	0	0	0	0	0	0
		Column N %	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Diagnosis and differential diagnosis case 5	accurate	Count	15	1	0	2	0	1	0	0	0
		Column N %	28.8%	33.3%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%
	adequate	Count	31	2	1	0	1	0	0	1	1
		Column N %	59.6%	66.7%	100.0%	0.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	inaccurate	Count	6	0	0	0	0	0	1	0	0
		Column N %	11.5%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%

Correlation between international practice and diagnostic outcome.

		J) Practiced outside of South-Africa			
		no		yes	
		Count	Column N %	Count	Column N %
Diagnosis and differential diagnosis case 1	accurate	52	100.0%	10	90.9%
	adequate	0	0.0%	1	9.1%
Diagnosis and differential diagnosis case 2	accurate	27	51.9%	3	27.3%
	adequate	22	42.3%	6	54.5%
	inaccurate	3	5.8%	2	18.2%
Diagnosis and differential diagnosis case 3	accurate	44	84.6%	8	72.7%
	adequate	6	11.5%	1	9.1%
	inaccurate	2	3.8%	2	18.2%
Diagnosis and differential diagnosis case 4	accurate	44	84.6%	8	72.7%
	adequate	7	13.5%	3	27.3%
	inaccurate	1	1.9%	0	0.0%
Diagnosis and differential diagnosis case 5	accurate	14	26.9%	5	45.5%
	adequate	32	61.5%	5	45.5%
	inaccurate	6	11.5%	1	9.1%

Correlation between philosophy of chiropractic and diagnostic outcome.

			K) Philosophy of chiropractic				
			Evidence based	Mixer	Mixer and straight	Mixer and evidence based	Straight and evidence based
Diagnosis and differential diagnosis case 1	accurate	Count	11	18	3	30	0
		Column N %	100.0%	100.0%	100.0%	100.0%	0.0%
	inadequate	Count	0	0	0	0	1
		Column N %	0.0%	0.0%	0.0%	0.0%	100.0%
Diagnosis and differential diagnosis case 2	accurate	Count	5	10	1	14	0
		Column N %	45.5%	55.6%	33.3%	46.7%	0.0%
	inadequate	Count	3	7	1	16	1
		Column N %	27.3%	38.9%	33.3%	53.3%	100.0%
	inaccurate	Count	3	1	1	0	0
		Column N %	27.3%	5.6%	33.3%	0.0%	0.0%
Diagnosis and differential diagnosis case 3	accurate	Count	9	15	2	26	0
		Column N %	81.8%	83.3%	66.7%	86.7%	0.0%
	inadequate	Count	1	2	0	4	0
		Column N %	9.1%	11.1%	0.0%	13.3%	0.0%

	inaccurate	Count	1	1	1	0	1
		Column N %	9.1%	5.6%	33.3%	0.0%	100.0%
Diagnosis and differential diagnosis case 4	accurate	Count	9	15	3	25	0
		Column N %	81.8%	83.3%	100.0%	83.3%	0.0%
	inadequate	Count	2	3	0	4	1
		Column N %	18.2%	16.7%	0.0%	13.3%	100.0%
	inaccurate	Count	0	0	0	1	0
		Column N %	0.0%	0.0%	0.0%	3.3%	0.0%
Diagnosis and differential diagnosis case 5	accurate	Count	7	4	1	7	0
		Column N %	63.6%	22.2%	33.3%	23.3%	0.0%
	inadequate	Count	3	12	2	20	0
		Column N %	27.3%	66.7%	66.7%	66.7%	0.0%
	inaccurate	Count	1	2	0	3	1
		Column N %	9.1%	11.1%	0.0%	10.0%	100.0%

Correlations between demographic information and management information.

Correlation between age and combined response for question 6.1.2 A, D and E as well as 6.1.2 B, C and F; 6.1.13 A, B;C and D and 6.1.13 E, F.

		A) Age			ANOVA
		Mean	Standard Deviation	Valid N	P value
Question 6.1.2 A, D and E combined	predominantly agree	36.6	7.6	35	0.234
	predominantly disagreed	32.5	7.1	6	
	predominantly neutral	41.1	12.0	8	
	equally distributed	42.8	19.3	4	
Question 6.1.2 B, C and F combined	predominantly agree	36.5	4.4	4	0.626
	predominantly disagreed	36.1	6.9	39	
	predominantly neutral	37.5	10.7	17	
	equally distributed	43.0	24.2	3	
Question 6.1.13 A, B;C and D combined	predominantly agree	37.2	8.7	39	0.878
	predominantly neutral	38.6	14.1	8	
	equally distributed	36.0	9.4	6	
Question 6.1.13 E and F combined	predominantly agree	39.7	11.7	18	0.289
	predominantly disagreed	35.3	6.5	27	
	predominantly neutral	34.5	6.5	11	
	equally distributed	39.0	11.9	7	

Correlation between age and the combined response for question 6.1.4; 6.1.5 and 6.1.7

		A) Age		
		Mean	Standard Deviation	Valid N
\$q6.14q615q6.17_combined	auxiliary	36.3	9.0	25
	thermal therapy	36.4	9.1	26
	joint therapy	37.5	11.1	31
	supportive therapy	35.4	8.7	17
	soft tissue therapy	36.3	7.9	48
	muscle conditioning	36.2	8.1	58
	advise on NSAIDS	37.1	8.0	7
	dietary advice	40.3	3.5	3
	none	.	.	0
	neurological modality	38.5	2.1	2
	other	.	.	0

Correlation between age and the combined response for question 6.1.12

		A) Age		
		Mean	Standard Deviation	Valid N
\$q6.12_combined	exercise based conditioning	36.3	8.8	58
	advice on otc meds	38.1	8.2	15
	postural advice	36.2	8.3	56
	stress management	36.8	8.3	51
	dietary advice	.	.	0
	none	40.0	.	1

Correlation between age and the combined response for question 7.1.13 A, B; C and D as well as the correlation between age and the combined response for question 7.1.13 E and F

		A) Age			ANOVA
		Mean	Standard Deviation	Valid N	P value
Question 7.1.13 A, B, C and D combined	predominantly agree	38.3	10.4	39	0.436
	predominantly neutral	33.8	6.1	6	
	equally distributed	35.0	6.0	8	
Question 7.1.13 E and F combined	predominantly agree	37.9	9.1	17	0.109
	predominantly disagreed	37.0	8.3	22	
	predominantly neutral	31.9	5.5	13	
	equally distributed	40.5	11.8	11	

Correlation between age and the combined response for question 7.1.12

		A) Age		
		Mean	Standard Deviation	Valid N
\$q7.12_combined	exercise based conditioning	36.4	8.8	58
	advice on otc meds	37.1	5.5	16
	postural advice	36.1	8.3	55
	stress management	36.0	8.2	57
	none	40.0	.	1

Correlation between age and the combined response for question 8.1.12

		A) Age			ANOVA
		Mean	Standard	Valid N	P value

			Deviation		
Question 8.1.2 A, D and E combined	predominantly agree	35.8	7.2	34	0.160
	predominantly disagreed	34.6	7.6	5	
	predominantly neutral	43.6	11.8	8	
	equally distributed	39.7	16.3	6	
Question 8.1.2 B, C and F combined	predominantly agree	42.8	11.5	4	0.279
	predominantly disagreed	35.5	6.2	33	
	predominantly neutral	38.8	11.4	13	
	equally distributed	43.0	24.2	3	
Question 8.1.13 A, B, C and D combined	predominantly agree	36.7	8.6	34	0.809
	predominantly disagreed	33.5	7.8	2	
	predominantly neutral	38.9	12.4	10	
	equally distributed	39.1	11.0	7	
Question 8.1.13 E and F combined	predominantly agree	37.6	10.9	25	0.160
	predominantly disagreed	42.7	11.6	6	
	predominantly neutral	30.3	5.0	6	
	equally distributed	37.4	6.4	16	

Correlation between age and the combined response for question 8.1.4; 8.1.5 and 8.1.7

		A) Age		
		Mean	Standard Deviation	Valid N
\$q8.14q8.15q8.17_combined	Auxiliary	35.6	10.1	19
	thermal therapy	36.3	8.4	30
	joint therapy	36.4	10.6	32
	supportive therapy	32.2	5.7	11
	soft tissue therapy	37.9	9.5	49
	muscle conditioning	36.4	8.1	55
	advise on NSAIDS	41.5	10.1	15
	dietary advice	36.0	4.2	2
	none	40.0	.	1
	neurological modality	40.0	.	1

Correlation between age and the combined response for question 8.1.12

		A) Age		
		Mean	Standard Deviation	Valid N
\$q8.12_combined	exercise based conditioning	36.2	8.7	59
	advice on otc meds	36.4	7.8	23

	postural advice	36.7	9.3	59
	stress management	36.8	9.1	60
	dietary advice	45.0	.	1
	none	40.0	.	1

Correlation between duration of practice and the combined response for question 6.1.2 B, C and F. Correlation between duration of practice and the combined response for question 6.1.2 A, D and E. Correlation between duration of practice and the combined response for question 6.1.13 A, B; C and D. Correlation between duration of practice and the combined response for question 6.1.13 E and F.

			D) Duration of practice									
			< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years	not specified
Question 6.1.2 A, D and E combined	predominantly agree	Count	1	8	3	6	4	6	4	2	1	0
		Column N %	50.0%	72.7%	60.0%	66.7%	100.0%	75.0%	57.1%	50.0%	33.3%	0.0%
	predominantly disagreed	Count	1	1	1	1	0	1	0	1	0	0
		Column N %	50.0%	9.1%	20.0%	11.1%	0.0%	12.5%	0.0%	25.0%	0.0%	0.0%
	predominantly neutral	Count	0	1	1	1	0	1	2	1	1	0
		Column N %	0.0%	9.1%	20.0%	11.1%	0.0%	12.5%	28.6%	25.0%	33.3%	0.0%
	equally distributed	Count	0	1	0	1	0	0	1	0	1	0
		Column N %	0.0%	9.1%	0.0%	11.1%	0.0%	0.0%	14.3%	0.0%	33.3%	0.0%
Question 6.1.2 B, C and F combined	predominantly agree	Count	0	0	1	1	1	1	0	0	0	0
		Column N %	0.0%	0.0%	10.0%	7.7%	20.0%	12.5%	0.0%	0.0%	0.0%	0.0%
	predominantly disagreed	Count	1	8	5	8	3	6	5	3	0	0
		Column N %	50.0%	72.7%	50.0%	61.5%	60.0%	75.0%	71.4%	75.0%	0.0%	0.0%
	predominantly neutral	Count	1	1	4	4	1	1	2	1	2	0
		Column N %	50.0%	9.1%	40.0%	30.8%	20.0%	12.5%	28.6%	25.0%	66.7%	0.0%

	equally distributed	Count	0	2	0	0	0	0	0	0	1	0
		Column N %	0.0%	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%
Question 6.1.13 A, B, C and D combined	predominantly agree	Count	2	8	5	4	2	7	6	4	1	0
		Column N %	100.0%	72.7%	100.0%	44.4%	50.0%	87.5%	85.7%	100.0%	33.3%	0.0%
	predominantly disagreed	Count	0	0	0	0	0	0	0	0	0	0
		Column N %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	predominantly neutral	Count	0	2	0	2	2	0	1	0	1	0
		Column N %	0.0%	18.2%	0.0%	22.2%	50.0%	0.0%	14.3%	0.0%	33.3%	0.0%
	equally distributed	Count	0	1	0	3	0	1	0	0	1	0
		Column N %	0.0%	9.1%	0.0%	33.3%	0.0%	12.5%	0.0%	0.0%	33.3%	0.0%
Question 6.1.13 E and F combined	predominantly agree	Count	1	1	0	4	2	3	4	1	2	0
		Column N %	50.0%	9.1%	0.0%	30.8%	40.0%	37.5%	57.1%	25.0%	66.7%	0.0%
	predominantly disagreed	Count	0	5	7	7	2	3	0	2	1	0
		Column N %	0.0%	45.5%	70.0%	53.8%	40.0%	37.5%	0.0%	50.0%	33.3%	0.0%
	predominantly neutral	Count	1	2	2	0	1	2	2	1	0	0
		Column N %	50.0%	18.2%	20.0%	0.0%	20.0%	25.0%	28.6%	25.0%	0.0%	0.0%
	equally distributed	Count	0	3	1	2	0	0	1	0	0	0
		Column N %	0.0%	27.3%	10.0%	15.4%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%

Correlation between duration of practice and the combined response for question 6.1.4; 6.1.5 and 6.1.7. Correlation between duration of practice and the combined response for question 6.1.12.

		D) Duration of practice									
		< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years	Total
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
\$q6.14q615q6.17_combined	auxiliary	0	5	5	5	3	2	2	2	1	25
	thermal therapy	1	6	4	4	3	4	1	2	1	26
	joint therapy	0	5	6	7	4	2	3	1	3	31
	supportive therapy	1	5	2	2	0	3	2	2	0	17
	soft tissue therapy	1	10	8	10	3	6	5	3	2	48
	muscle conditioning	2	11	9	12	4	7	7	4	2	58
	advise on NSAIDS	1	1	3	0	1	0	1	0	0	7
	dietary advice	0	0	0	0	2	0	0	1	0	3
	neurological modality	0	0	0	0	0	1	1	0	0	2
	Total	2	11	10	13	5	8	7	4	3	63
\$q6.12_combined	exercise based conditioning	2	11	9	12	5	8	5	3	3	58
	advice on otc meds	0	3	2	2	2	2	3	1	0	15
	postural advice	2	11	9	11	4	8	5	4	2	56
	stress management	2	8	9	9	4	8	5	4	2	51
	none	0	0	0	1	0	0	0	0	0	1
	Total	2	11	10	13	5	8	6	4	3	62

Correlation between duration of practice and the combined response for question 7.1.2 A, D and E. Correlation between duration of practice and the combined response for question 7.1.2 B, C and F. Correlation between duration of practice and the combined response for question 7.1.13 A, B, C and D. Correlation between duration of practice and the combined response for question 7.1.13 E and F.

			D) Duration of practice									
			< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years	not specified
Question 7.1.2 A, D and E combined	predominantly agree	Count	1	10	3	5	4	7	4	2	1	0
		Column N %	50.0%	90.9%	60.0%	55.6%	100.0%	87.5%	57.1%	50.0%	33.3%	0.0%
	predominantly disagreed	Count	1	0	1	0	0	1	1	1	0	0
		Column N %	50.0%	0.0%	20.0%	0.0%	0.0%	12.5%	14.3%	25.0%	0.0%	0.0%
	predominantly neutral	Count	0	0	1	1	0	0	1	1	2	0
		Column N %	0.0%	0.0%	20.0%	11.1%	0.0%	0.0%	14.3%	25.0%	66.7%	0.0%
	equally distributed	Count	0	1	0	3	0	0	1	0	0	0
		Column N %	0.0%	9.1%	0.0%	33.3%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%
Question 7.1.2 B, C and F combined	predominantly agree	Count	0	0	0	1	1	1	0	0	0	0
		Column N %	0.0%	0.0%	0.0%	11.1%	25.0%	12.5%	0.0%	0.0%	0.0%	0.0%
	predominantly disagreed	Count	2	6	3	4	2	6	5	4	0	0
		Column N %	100.0%	54.5%	60.0%	44.4%	50.0%	75.0%	71.4%	100.0%	0.0%	0.0%
	predominantly neutral	Count	0	3	2	3	1	1	2	0	3	0
		Column N %	0.0%	27.3%	40.0%	33.3%	25.0%	12.5%	28.6%	0.0%	100.0%	0.0%

	equally distributed	N %										
		Count	0	2	0	1	0	0	0	0	0	0
		Column N %	0.0%	18.2%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Question 7.1.13 A, B, C and D combined	predominantly agree	Count	2	7	5	6	2	6	5	3	3	0
		Column N %	100.0%	63.6%	100.0%	66.7%	50.0%	75.0%	71.4%	75.0%	100.0%	0.0%
	predominantly neutral	Count	0	2	0	2	1	0	1	0	0	0
		Column N %	0.0%	18.2%	0.0%	22.2%	25.0%	0.0%	14.3%	0.0%	0.0%	0.0%
	equally distributed	Count	0	2	0	1	1	2	1	1	0	0
		Column N %	0.0%	18.2%	0.0%	11.1%	25.0%	25.0%	14.3%	25.0%	0.0%	0.0%
Question 7.1.13 E and F combined	predominantly agree	Count	1	1	0	5	1	4	3	1	1	0
		Column N %	50.0%	9.1%	0.0%	38.5%	20.0%	50.0%	42.9%	25.0%	33.3%	0.0%
	predominantly disagreed	Count	0	2	7	5	3	1	1	2	1	0
		Column N %	0.0%	18.2%	70.0%	38.5%	60.0%	12.5%	14.3%	50.0%	33.3%	0.0%
	predominantly neutral	Count	1	5	2	1	0	2	2	0	0	0
		Column N %	50.0%	45.5%	20.0%	7.7%	0.0%	25.0%	28.6%	0.0%	0.0%	0.0%
	equally distributed	Count	0	3	1	2	1	1	1	1	1	0
		Column N %	0.0%	27.3%	10.0%	15.4%	20.0%	12.5%	14.3%	25.0%	33.3%	0.0%

Correlation between duration of practice and the combined response for question 7.1.4; 7.1.5 and 7.1.7. Correlation between duration of practice and the combined response for question 7.1.12.

		D) Duration of practice									
		< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years	Total
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
\$q7.14q7.15q7.17_combined	auxiliary	1	4	6	4	2	1	3	2	1	24
	thermal therapy	1	6	4	3	3	3	0	2	1	23
	joint therapy	1	7	4	6	4	5	2	3	2	34
	supportive therapy	0	7	3	3	0	4	2	1	0	20
	soft tissue therapy	1	10	9	10	5	7	6	4	2	54
	muscle conditioning	2	11	9	11	4	8	7	3	3	58
	advise on NSAIDS	0	1	1	0	1	0	2	1	1	7
	dietary advice	0	0	0	1	1	0	0	0	0	2
	neurological modality	0	0	0	0	0	0	1	0	0	1
	Total	2	11	10	13	5	8	7	4	3	63
\$q7.12_combined	exercise based conditioning	2	10	10	11	5	7	6	4	3	58
	advice on otc meds	0	4	0	5	2	2	2	1	0	16
	postural advice	2	10	9	11	3	8	6	4	2	55
	stress management	2	11	10	10	4	8	6	4	2	57
	none	0	0	0	1	0	0	0	0	0	1
	Total	2	11	10	13	5	8	7	4	3	63

Correlation between duration of practice and the combined response for question 8.1.2 A; D and E. Correlation between duration of practice and the combined response for question 8.1.2 B, C and F. Correlation between duration of practice and the combined response for question 8.1.13 A, B; C and D. Correlation between duration of practice and the combined response for question 8.1.13 E and F

			D) Duration of practice									
			< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years	not specified
Question 8.1.2 A, D and E combined	predominantly agree	Count	1	9	3	6	4	5	4	2	0	0
		Column N %	50.0%	81.8%	60.0%	66.7%	100.0%	62.5%	57.1%	50.0%	0.0%	0.0%
	predominantly disagreed	Count	1	0	1	0	0	1	1	1	0	0
		Column N %	50.0%	0.0%	20.0%	0.0%	0.0%	12.5%	14.3%	25.0%	0.0%	0.0%
	predominantly neutral	Count	0	0	1	2	0	1	1	1	2	0
		Column N %	0.0%	0.0%	20.0%	22.2%	0.0%	12.5%	14.3%	25.0%	66.7%	0.0%
	equally distributed	Count	0	2	0	1	0	1	1	0	1	0
		Column N %	0.0%	18.2%	0.0%	11.1%	0.0%	12.5%	14.3%	0.0%	33.3%	0.0%
Question 8.1.2 B, C and F combined	predominantly agree	Count	0	0	0	2	0	1	1	0	0	0
		Column N %	0.0%	0.0%	0.0%	22.2%	0.0%	12.5%	14.3%	0.0%	0.0%	0.0%
	predominantly disagreed	Count	1	7	4	5	2	5	5	4	0	0
		Column N %	50.0%	63.6%	80.0%	55.6%	50.0%	62.5%	71.4%	100.0%	0.0%	0.0%
	predominantly	Count	1	2	1	2	2	2	1	0	2	0

	neutral	Column N %	50.0%	18.2%	20.0%	22.2%	50.0%	25.0%	14.3%	0.0%	66.7%	0.0%
	equally distributed	Count	0	2	0	0	0	0	0	0	1	0
		Column N %	0.0%	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%
Question 8.1.13 A, B, C and D combined	predominantly agree	Count	2	7	4	5	2	6	4	2	2	0
		Column N %	100.0%	63.6%	80.0%	55.6%	50.0%	75.0%	57.1%	50.0%	66.7%	0.0%
	predominantly disagreed	Count	0	1	0	0	0	0	1	0	0	0
		Column N %	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%
	predominantly neutral	Count	0	1	1	3	2	0	1	1	1	0
		Column N %	0.0%	9.1%	20.0%	33.3%	50.0%	0.0%	14.3%	25.0%	33.3%	0.0%
	equally distributed	Count	0	2	0	1	0	2	1	1	0	0
		Column N %	0.0%	18.2%	0.0%	11.1%	0.0%	25.0%	14.3%	25.0%	0.0%	0.0%
Question 8.1.13 E and F combined	predominantly agree	Count	1	4	1	5	3	3	4	2	2	0
		Column N %	50.0%	36.4%	20.0%	55.6%	75.0%	37.5%	57.1%	50.0%	66.7%	0.0%
	predominantly disagreed	Count	0	1	1	1	1	0	1	0	1	0
		Column N %	0.0%	9.1%	20.0%	11.1%	25.0%	0.0%	14.3%	0.0%	33.3%	0.0%
	predominantly neutral	Count	1	2	2	0	0	1	0	0	0	0
		Column N %	50.0%	18.2%	40.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%
	equally	Count	0	4	1	3	0	4	2	2	0	0

	distributed	Column N %	0.0%	36.4%	20.0%	33.3%	0.0%	50.0%	28.6%	50.0%	0.0%	0.0%
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Correlation between duration of practice and the combined response for question 8.1.4; 8.1.5 and 8.1.7. Correlation between duration of practice and the combined response for question 8.1.12

		D) Duration of practice									
		< 1 year	1-3 years	3-6 years	6-9 years	9-12 years	12-15 years	15-18 years	18-21 years	> 21 years	Total
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
\$q8.14q8.15q8.17_combined	auxiliary	1	4	4	3	1	2	2	1	1	19
	thermal therapy	0	7	5	5	3	5	1	3	1	30
	joint therapy	1	5	8	6	3	4	1	1	3	32
	supportive therapy	0	6	1	1	0	3	0	0	0	11
	soft tissue therapy	1	9	7	9	4	7	6	3	3	49
	muscle conditioning	2	10	7	11	5	8	7	3	2	55
	advise on NSAIDS	0	3	1	1	1	1	3	3	2	15
	dietary advice	0	0	0	1	0	0	1	0	0	2
	none	0	0	0	1	0	0	0	0	0	1
	neurological modality	0	0	0	0	0	0	1	0	0	1
	Total	2	11	10	13	5	8	7	4	3	63
\$q8.12_combined	exercise based conditioning	2	11	10	12	5	8	5	3	3	59
	advice on otc meds	1	5	1	5	3	3	3	2	0	23
	postural advice	2	11	9	11	4	8	7	4	3	59
	stress management	2	10	10	12	4	8	7	4	3	60
	dietary advice	0	0	0	0	0	0	0	1	0	1

	none	0	0	0	1	0	0	0	0	0	1
	Total	2	11	10	13	5	8	7	4	3	63

Correlation between additional tertiary qualification obtained and the combined response for question 6.1.2 A, D and E. Correlation between additional tertiary qualification obtained and the combined response for question 6.1.2 B; C and F. Correlation between additional tertiary qualification obtained and the combined response for question 6.1.13 A, B, C and D. Correlation between additional tertiary qualification obtained and the combined response for question 6.1.13 E and F.

			F) Additional tertiary qualifications								
			Non e	Masters of medical science (sports medicine)	Bachelor s of science	Internationally Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICSS D)	Diploma in therapeutic aromatherap y	Bachelor s of medical science	Diploma of chiropracti c radiograph y (U.S.A)	Massag e diploma	Not specifie d
Question 6.1.2 A, D and E combine d	predominantl y agree	Count	29	2	1	0	1	1	0	0	1
		Colum n N %	67.4 %	66.7%	100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%
	predominantl y disagreed	Count	5	1	0	0	0	0	0	0	0
		Colum n N %	11.6 %	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	predominantl y neutral	Count	6	0	0	0	0	0	1	1	0
		Colum n N %	14.0 %	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%
	equally distributed	Count	3	0	0	1	0	0	0	0	0
		Colum n N %	7.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Question 6.1.2 B, C and F combined	predominantly agree	Count	3	0	0	0	0	0	0	0	1
		Column N %	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	predominantly disagreed	Count	33	3	0	1	1	1	0	0	0
		Column N %	63.5%	100.0%	0.0%	50.0%	100.0%	100.0%	0.0%	0.0%	0.0%
	predominantly neutral	Count	13	0	1	1	0	0	1	1	0
		Column N %	25.0%	0.0%	100.0%	50.0%	0.0%	0.0%	100.0%	100.0%	0.0%
Question 6.1.13 A, B, C and D combined	equally distributed	Count	3	0	0	0	0	0	0	0	0
		Column N %	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	predominantly agree	Count	32	3	0	1	0	1	1	1	0
		Column N %	74.4%	100.0%	0.0%	100.0%	0.0%	100.0%	100.0%	100.0%	0.0%
	predominantly neutral	Count	6	0	0	0	1	0	0	0	1
		Column N %	14.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
Question 6.1.13 E and F combined	equally distributed	Count	5	0	1	0	0	0	0	0	0
		Column N %	11.6%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	predominantly agree	Count	15	0	0	0	1	0	1	1	0
		Column N %	28.8%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	100.0%	0.0%
	predominantly disagreed	Count	23	1	1	1	0	0	0	0	1
		Column N %	44.2%	33.3%	100.0%	50.0%	0.0%	0.0%	0.0%	0.0%	100.0%

	predominantly neutral	Count	9	1	0	1	0	0	0	0	0
		Column N %	17.3 %	33.3%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	equally distributed	Count	5	1	0	0	0	1	0	0	0
		Column N %	9.6%	33.3%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%

Correlation between additional tertiary qualification obtained and the combined response for question 6.1.4; 6.1.5 and 6.1.7. Correlation between additional tertiary qualification obtained and the combined response for question 6.1.12.

		F) Additional tertiary qualifications									
		None	Masters of medical science (sports medicine)	Bachelors of science	Internationally Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICSD)	Diploma in therapeutic aromatherapy	Bachelors of medical science	Diploma of chiropractic radiography (U.S.A)	Massage diploma	Not specified	Total
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
\$q6.14q615q6.17_combined	auxiliary	22	0	0	2	1	0	0	0	0	25
	thermal therapy	20	2	0	1	1	0	1	1	0	26
	joint therapy	26	0	1	0	0	1	1	1	1	31
	supportive therapy	15	1	0	0	0	1	0	0	0	17
	soft tissue therapy	39	3	1	2	1	0	1	0	1	48
	muscle conditioning	49	3	1	1	1	1	1	1	0	58

	advise on NSAIDS	6	1	0	0	0	0	0	0	0	7
	dietary advice	1	1	0	0	1	0	0	0	0	3
	neurological modality	2	0	0	0	0	0	0	0	0	2
	Total	52	3	1	2	1	1	1	1	1	63
\$q6.12_ combined	exercise based conditioning	50	3	1	1	1	0	1	1	0	58
	advice on otc meds	12	2	0	0	0	1	0	0	0	15
	postural advice	48	3	1	1	1	1	1	0	0	56
	stress management	42	3	1	1	1	1	1	1	0	51
	none	0	0	0	0	0	0	0	0	1	1
	Total	52	3	1	1	1	1	1	1	1	62

Correlation between additional tertiary qualification obtained and the combined response for question 7.1.2 A, D and E. Correlation between additional tertiary qualification obtained and the combined response for question 7.1.2 B, C and F. Correlation between additional tertiary qualification obtained and the combined response for question 7.1.13 A, B; C and D. Correlation between additional tertiary qualification obtained and the combined response for question 7.1.13 E and F.

	F) Additional tertiary qualifications								
	None	Masters of medical science (sports	Bachelors of science	Internationally Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICSS	Diploma in therapeutic aromatherapy	Bachelors of medical science	Diploma of chiropractic radiography (U.S.A)	Massage diploma	Not specified

				medicin e)		D)					
Question 7.1.2 A, D and E combine d	predominantly agree	Count	31	2	1	0	1	1	0	0	1
		Column N %	72.1 %	66.7%	100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%
	predominantly disagreed	Count	3	1	0	0	0	0	0	1	0
		Column N %	7.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	predominantly neutral	Count	5	0	0	0	0	0	1	0	0
		Column N %	11.6 %	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
	equally distributed	Count	4	0	0	1	0	0	0	0	0
		Column N %	9.3%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Question 7.1.2 B, C and F combine d	predominantly agree	Count	2	0	0	0	0	0	0	0	1
		Column N %	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	predominantly disagreed	Count	26	3	0	1	1	0	0	1	0
		Column N %	60.5 %	100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	0.0%
	predominantly neutral	Count	12	0	1	0	0	1	1	0	0
		Column N %	27.9 %	0.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%
	equally distributed	Count	3	0	0	0	0	0	0	0	0
		Column N %	7.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Question	predominantly	Count	32	2	1	1	0	1	1	1	0

7.1.13 A, B, C and D combined	agree	Column N %	74.4 %	66.7%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	0.0%
	predominantly neutral	Count	4	0	0	0	1	0	0	0	1
		Column N %	9.3%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
	equally distributed	Count	7	1	0	0	0	0	0	0	0
		Column N %	16.3 %	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Question 7.1.13 E and F combined	predominantly agree	Count	14	1	0	0	1	0	1	0	0
		Column N %	26.9 %	33.3%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
	predominantly disagreed	Count	17	1	1	1	0	1	0	0	1
		Column N %	32.7 %	33.3%	100.0%	50.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	predominantly neutral	Count	12	0	0	1	0	0	0	0	0
		Column N %	23.1 %	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	equally distributed	Count	9	1	0	0	0	0	0	1	0
		Column N %	17.3 %	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%

Correlation between additional tertiary qualification obtained and the combined response for question 7.1.4; 7.1.5 and 7.1.7. Correlation between additional tertiary qualification obtained and the combined response for question 7.1.12

		F) Additional tertiary qualifications									
		Non e	Masters of medical science (sports medicine)	Bachelors of science	Internationally Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICSD)	Diploma in therapeutic aromatherapy	Bachelors of medical science	Diploma of chiropractic radiography (U.S.A)	Massage diploma	Not specified	Total
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
\$q7.14q7.15q7.17_combined	auxiliary	21	0	0	2	0	1	0	0	0	24
	thermal therapy	18	2	0	1	1	0	1	0	0	23
	joint therapy	28	2	1	0	0	1	1	0	1	34
	supportive therapy	16	1	0	1	0	1	0	1	0	20
	soft tissue therapy	44	3	1	2	1	0	1	1	1	54
	muscle conditioning	49	3	1	1	1	1	1	1	0	58
	advise on NSAIDS	5	1	0	0	0	0	1	0	0	7
	dietary advice	1	0	0	0	1	0	0	0	0	2
	neurologic	1	0	0	0	0	0	0	0	0	1

	al modality										
	Total	52	3	1	2	1	1	1	1	1	63
\$q7.12_combined	exercise based conditionin g	49	3	1	2	1	0	1	1	0	58
	advice on otc meds	14	2	0	0	0	0	0	0	0	16
	postural advice	45	3	1	2	1	1	1	1	0	55
	stress managem ent	47	3	1	2	1	1	1	1	0	57
	none	0	0	0	0	0	0	0	0	1	1
	Total	52	3	1	2	1	1	1	1	1	63

Correlation between additional tertiary qualification obtained and the combined response for question 8.1.2 A, D and E. Correlation between additional tertiary qualification obtained and the combined response for question 8.1.2 B, C and F. Correlation between additional tertiary qualification obtained and the combined response for question 8.1.13 A, B, C and D. Correlation between additional tertiary qualification obtained and the combined response for question 8.1.13 E and F.

	F) Additional tertiary qualifications								
	Non	Masters	Bachelor	Internationally	Diploma in	Bachelor	Diploma of	Massag	Not

			e	of medical science (sports medicine)	s of science	Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICSS D)	therapeutic aromatherap y	s of medical science	chiropracti c radiograph y (U.S.A)	e diploma	specifie d
Question 8.1.2 A, D and E combine d	predominantl y agree	Count	29	2	0	0	1	1	0	0	1
		Colum n N %	67.4 %	66.7%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%
	predominantl y disagreed	Count	3	1	0	0	0	0	0	1	0
		Colum n N %	7.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	predominantl y neutral	Count	6	0	1	0	0	0	1	0	0
		Colum n N %	14.0 %	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
	equally distributed	Count	5	0	0	1	0	0	0	0	0
		Colum n N %	11.6 %	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Question 8.1.2 B, C and F combine d	predominantl y agree	Count	2	0	0	0	0	1	0	0	1
		Colum n N %	4.7%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	predominantl y disagreed	Count	27	3	0	1	1	0	0	1	0
		Colum n N %	62.8 %	100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	0.0%
	predominantl y neutral	Count	11	0	1	0	0	0	1	0	0
		Colum n N %	25.6 %	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%

	equally distributed	Count	3	0	0	0	0	0	0	0	0
		Column N %	7.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Question 8.1.13 A, B, C and D combined	predominantly agree	Count	30	1	1	0	0	0	1	1	0
		Column N %	69.8%	33.3%	100.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%
	predominantly disagreed	Count	1	0	0	1	0	0	0	0	0
		Column N %	2.3%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	predominantly neutral	Count	7	1	0	0	1	0	0	0	1
		Column N %	16.3%	33.3%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
	equally distributed	Count	5	1	0	0	0	1	0	0	0
		Column N %	11.6%	33.3%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Question 8.1.13 E and F combined	predominantly agree	Count	21	2	0	0	1	0	1	0	0
		Column N %	48.8%	66.7%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
	predominantly disagreed	Count	3	0	1	0	0	1	0	0	1
		Column N %	7.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
	predominantly neutral	Count	6	0	0	0	0	0	0	0	0
		Column N %	14.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	equally distributed	Count	13	1	0	1	0	0	0	1	0
		Column N %	30.2%	33.3%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%

Correlation between additional tertiary qualification obtained and the combined response for question 8.1.4; 8.1.5 and 8.1.7. Correlation between additional tertiary qualification obtained and the combined response for question 8.1.12.

		F) Additional tertiary qualifications									
		Non e	Masters of medical science (sports medicin e)	Bachelo rs of science	Internationally Certified Chiropractic Sports Practitioner (ICCSP/CCSP/ICS SD)	Diploma in therapeutic aromathera py	Bachelo rs of medical science	Diploma of chiropract ic radiograp hy (U.S.A)	Massa ge diplom a	Not specifi ed	Tota l
		Cou nt	Count	Count	Count	Count	Count	Count	Count	Count	Cou nt
\$q8.14q8.15q8.17_com bined	auxiliary	17	0	0	2	0	0	0	0	0	19
	thermal therapy	24	2	0	1	1	0	1	1	0	30
	joint therapy	27	1	1	1	0	0	1	0	1	32
	supportive therapy	10	0	0	1	0	0	0	0	0	11
	soft tissue therapy	40	3	1	1	1	1	1	0	1	49
	muscle conditionin g	46	3	1	1	1	1	1	1	0	55
	advise on NSAIDS	10	2	1	0	0	0	1	1	0	15

	dietary advice	1	0	0	1	0	0	0	0	0	2
	none	1	0	0	0	0	0	0	0	0	1
	neurological modality	1	0	0	0	0	0	0	0	0	1
	Total	52	3	1	2	1	1	1	1	1	63
\$q8.12_combined	exercise based conditioning	51	3	1	1	1	0	1	1	0	59
	advice on otc meds	19	2	0	1	0	1	0	0	0	23
	postural advice	49	3	1	2	1	1	1	1	0	59
	stress management	50	3	1	2	1	1	1	1	0	60
	dietary advice	0	1	0	0	0	0	0	0	0	1
	none	0	0	0	0	0	0	0	0	1	1
	Total	52	3	1	2	1	1	1	1	1	63

Correlation between international practice experience and the combined response for question 6.1.2 A, D and E. Correlation between international practice experience and the combined response for question 6.1.2 B, C and F. Correlation between international practice experience and the combined response for

question 6.1.13 A, B, C and D. Correlation between international practice experience and the combined response for question 6.1.13 E and F. Correlation between international practice experience and the combined response for question 7.1.2 A, D and E. Correlation between international practice experience and the combined response for question 7.1.2 B; C and F. Correlation between international practice experience and the combined response for question 7.1.13 A, B, C and D. Correlation between international practice experience and the combined response for question 7.1.13 E and F. Correlation between international practice experience and the combined response for question 8.1.2 A, D and E. Correlation between international practice experience and the combined response for question 8.1.2 B, C and F. Correlation between international practice experience and the combined response for question 8.1.13 A, B, C and D. Correlation between international practice experience and the combined response for question 8.1.13 E and F

		J) Practiced outside of South-Africa			
		no		yes	
		Count	Column N %	Count	Column N %
Question 6.1.2 A, D and E combined	predominantly agree	31	70.5%	4	44.4%
	predominantly disagreed	5	11.4%	1	11.1%
	predominantly neutral	6	13.6%	2	22.2%
	equally distributed	2	4.5%	2	22.2%
Question 6.1.2 B, C and F combined	predominantly agree	4	7.7%	0	0.0%
	predominantly disagreed	33	63.5%	6	54.5%
	predominantly neutral	13	25.0%	4	36.4%
	equally distributed	2	3.8%	1	9.1%
Question 6.1.13 A, B, C and D combined	predominantly agree	34	77.3%	5	55.6%
	predominantly neutral	6	13.6%	2	22.2%
	equally distributed	4	9.1%	2	22.2%
Question 6.1.13 E and F combined	predominantly agree	11	21.2%	7	63.6%
	predominantly disagreed	24	46.2%	3	27.3%
	predominantly neutral	11	21.2%	0	0.0%
	equally distributed	6	11.5%	1	9.1%
Question 7.1.2 A, D and E combined	predominantly agree	33	75.0%	4	44.4%
	predominantly disagreed	5	11.4%	0	0.0%

	predominantly neutral	3	6.8%	3	33.3%
	equally distributed	3	6.8%	2	22.2%
Question 7.1.2 B, C and F combined	predominantly agree	3	6.8%	0	0.0%
	predominantly disagreed	28	63.6%	4	44.4%
	predominantly neutral	11	25.0%	4	44.4%
	equally distributed	2	4.5%	1	11.1%
Question 7.1.13 A, B, C and D combined	predominantly agree	31	70.5%	8	88.9%
	predominantly neutral	5	11.4%	1	11.1%
	equally distributed	8	18.2%	0	0.0%
Question 7.1.13 E and F combined	predominantly agree	12	23.1%	5	45.5%
	predominantly disagreed	20	38.5%	2	18.2%
	predominantly neutral	12	23.1%	1	9.1%
	equally distributed	8	15.4%	3	27.3%
Question 8.1.2 A, D and E combined	predominantly agree	30	68.2%	4	44.4%
	predominantly disagreed	5	11.4%	0	0.0%
	predominantly neutral	5	11.4%	3	33.3%
	equally distributed	4	9.1%	2	22.2%
Question 8.1.2 B, C and F combined	predominantly agree	3	6.8%	1	11.1%
	predominantly disagreed	29	65.9%	4	44.4%
	predominantly neutral	10	22.7%	3	33.3%
	equally distributed	2	4.5%	1	11.1%
	dietary advice	1	16.7%	0	0.0%
Question 8.1.13 A, B, C and D combined	predominantly agree	29	65.9%	5	55.6%
	predominantly disagreed	2	4.5%	0	0.0%
	predominantly neutral	7	15.9%	3	33.3%
	equally distributed	6	13.6%	1	11.1%
Question 8.1.13 E and F	predominantly agree	17	38.6%	8	88.9%

combined	predominantly disagreed	6	13.6%	0	0.0%
	predominantly neutral	6	13.6%	0	0.0%
	equally distributed	15	34.1%	1	11.1%

Correlation between international practice experience and the combined response for question 6.1.4; 6.1.5 and 6.1.7. Correlation between international practice experience and the combined response for question 6.1.12. Correlation between international practice experience and the combined response for question 7.1.4; 7.1.5 and 7.1.7. Correlation between international practice experience and the combined response for question 7.1.12. Correlation between international practice experience and the combined response for question 8.1.4; 8.1.5 and 8.1.7. Correlation between international practice experience and the combined response for question 8.1.12

		J) Practiced outside of South-Africa		
		no	yes	Total
		Count	Count	Count
\$q6.14q615q6.17_combined	auxiliary	21	4	25
	thermal therapy	23	3	26
	joint therapy	25	6	31
	supportive therapy	16	1	17
	soft tissue therapy	39	9	48
	muscle conditioning	48	10	58
	advise on NSAIDS	7	0	7
	dietary advice	3	0	3
	neurological modality	1	1	2
	Total	52	11	63
\$q6.12_combined	exercise based conditioning	48	10	58
	advice on otc meds	12	3	15
	postural advice	48	8	56

	stress management	44	7	51
	none	1	0	1
	Total	51	11	62
\$q7.14q7.15q7.17_combined	auxiliary	21	3	24
	thermal therapy	20	3	23
	joint therapy	28	6	34
	supportive therapy	20	0	20
	soft tissue therapy	45	9	54
	muscle conditioning	47	11	58
	advise on NSAIDS	5	2	7
	dietary advice	2	0	2
	neurological modality	0	1	1
	Total	52	11	63
\$q7.12_combined	exercise based conditioning	47	11	58
	advice on otc meds	13	3	16
	postural advice	48	7	55
	stress management	49	8	57
	none	1	0	1
	Total	52	11	63
\$q8.14q8.15q8.17_combined	auxiliary	18	1	19
	thermal therapy	26	4	30
	joint therapy	26	6	32
	supportive therapy	11	0	11
	soft tissue therapy	40	9	49
	muscle conditioning	45	10	55
	advise on NSAIDS	11	4	15

	dietary advice	1	1	2
	none	1	0	1
	neurological modality	0	1	1
	Total	52	11	63
\$q8.12_combined	exercise based conditioning	49	10	59
	advice on otc meds	21	2	23
	postural advice	49	10	59
	stress management	49	11	60
	dietary advice	1	0	1
	none	1	0	1
	Total	52	11	63

Philosophy of chiropractic

Correlation between the philosophy of chiropractic and the combined response for question 6.1.2 A, D and E. Correlation between the philosophy of chiropractic and the combined response for question 6.1.2 B; C and F. Correlation between the philosophy of chiropractic and the combined response for question 6.1.13 A, B, C and D. Correlation between the philosophy of chiropractic and the combined response for question 6.1.13 E and F.

			K) Philosophy of chiropractic				
			1	2	4	5	6
Question 6.1.2 A, D and E combined	predominantly agree	Count	6	10	0	19	0
		Column N %	60.0%	71.4%	0.0%	76.0%	0.0%
	predominantly disagreed	Count	1	0	2	3	0
		Column N %	10.0%	0.0%	66.7%	12.0%	0.0%
	predominantly neutral	Count	2	2	0	3	1
		Column N %	20.0%	14.3%	0.0%	12.0%	100.0%
	equally distributed	Count	1	2	1	0	0
		Column N %	10.0%	14.3%	33.3%	0.0%	0.0%
Question 6.1.2 B, C and F combined	predominantly agree	Count	0	1	0	3	0
		Column N %	0.0%	5.6%	0.0%	10.0%	0.0%
	predominantly disagreed	Count	8	9	1	21	0
		Column N %	72.7%	50.0%	33.3%	70.0%	0.0%
	predominantly neutral	Count	3	7	1	5	1
		Column N %	27.3%	38.9%	33.3%	16.7%	100.0%
	equally distributed	Count	0	1	1	1	0
		Column N %	0.0%	5.6%	33.3%	3.3%	0.0%
Question 6.1.13 A, B, C and D combined	predominantly agree	Count	9	9	1	19	1
		Column N %	90.0%	64.3%	33.3%	76.0%	100.0%

	predominantly neutral	Count	1	3	1	3	0
		Column N %	10.0%	21.4%	33.3%	12.0%	0.0%
	equally distributed	Count	0	2	1	3	0
		Column N %	0.0%	14.3%	33.3%	12.0%	0.0%
Question 6.1.13 E and F combined	predominantly agree	Count	4	4	2	7	1
		Column N %	36.4%	22.2%	66.7%	23.3%	100.0%
	predominantly disagreed	Count	3	8	0	16	0
		Column N %	27.3%	44.4%	0.0%	53.3%	0.0%
	predominantly neutral	Count	3	4	0	4	0
		Column N %	27.3%	22.2%	0.0%	13.3%	0.0%
	equally distributed	Count	1	2	1	3	0
		Column N %	9.1%	11.1%	33.3%	10.0%	0.0%

Correlation between the philosophy of chiropractic and the combined response for question 6.1.2 A, D and E. Correlation between the philosophy of chiropractic and the combined response for question 6.1.2 B, C and F. Correlation between the philosophy of chiropractic and the combined response for question 6.1.13 A, B, C and D. Correlation between the philosophy of chiropractic and the combined response for question 6.1.13 E and F. Correlation between the philosophy of chiropractic and the combined response for question 7.1.2 A, D and E. Correlation between the philosophy of chiropractic and the combined response for question 7.1.2 B, C and F. Correlation between the philosophy of chiropractic and the combined response for question 7.1.13 A, B; C and D. Correlation between the philosophy of chiropractic and the combined response for question 7.1.13 E and F.

			K) Philosophy of chiropractic				
			1	2	4	5	6
Question 7.1.2 A, D and E combined	predominantly agree	Count	6	11	1	19	0
		Column N %	60.0%	78.6%	33.3%	76.0%	0.0%
	predominantly disagreed	Count	1	0	0	4	0
		Column N %	10.0%	0.0%	0.0%	16.0%	0.0%
	predominantly neutral	Count	1	1	1	2	1
		Column N %	10.0%	7.1%	33.3%	8.0%	100.0%
	equally distributed	Count	2	2	1	0	0
		Column N %	20.0%	14.3%	33.3%	0.0%	0.0%
Question 7.1.2 B, C and F combined	predominantly agree	Count	0	1	0	2	0
		Column N %	0.0%	7.1%	0.0%	8.0%	0.0%
	predominantly disagreed	Count	7	7	1	17	0
		Column N %	70.0%	50.0%	33.3%	68.0%	0.0%
	predominantly neutral	Count	3	5	1	5	1
		Column N %	30.0%	35.7%	33.3%	20.0%	100.0%
	equally distributed	Count	0	1	1	1	0
		Column N %	0.0%	7.1%	33.3%	4.0%	0.0%
Question 7.1.13 A, B, C and D combined	predominantly agree	Count	6	10	3	19	1
		Column N %	60.0%	71.4%	100.0%	76.0%	100.0%
	predominantly neutral	Count	1	2	0	3	0
		Column N %	10.0%	14.3%	0.0%	12.0%	0.0%

	equally distributed	N %					
		Count	3	2	0	3	0
Question 7.1.13 E and F combined	predominantly agree	Column N %	30.0%	14.3%	0.0%	12.0%	0.0%
		Count	5	3	2	6	1
	predominantly disagreed	Column N %	45.5%	16.7%	66.7%	20.0%	100.0%
		Count	2	6	0	14	0
	predominantly neutral	Column N %	18.2%	33.3%	0.0%	46.7%	0.0%
		Count	3	6	0	4	0
	equally distributed	Column N %	27.3%	33.3%	0.0%	13.3%	0.0%
		Count	1	3	1	6	0
		Column N %	9.1%	16.7%	33.3%	20.0%	0.0%
		Count					

Correlation between the philosophy of chiropractic and the combined response for question 8.1.2 A, D and E. Correlation between the philosophy of chiropractic and the combined response for question 8.1.2 B, C and F. Correlation between the philosophy of chiropractic and the combined response for question 8.1.13 A, B, C and D. Correlation between the philosophy of chiropractic and the combined response for question 8.1.13 E and F.

			K) Philosophy of chiropractic				
			1	2	4	5	6
Question 8.1.2 A, D and E combined	predominantly agree	Count	6	9	1	18	0
		Column N %	60.0%	64.3%	33.3%	72.0%	0.0%
	predominantly disagreed	Count	1	0	0	4	0
		Column N %	10.0%	0.0%	0.0%	16.0%	0.0%
	predominantly neutral	Count	1	3	0	3	1
		Column N %	10.0%	21.4%	0.0%	12.0%	100.0%
	equally distributed	Count	2	2	2	0	0
		Column N %	20.0%	14.3%	66.7%	0.0%	0.0%
Question 8.1.2 B, C and F combined	predominantly agree	Count	0	1	0	3	0
		Column N %	0.0%	7.1%	0.0%	12.0%	0.0%
	predominantly disagreed	Count	7	7	1	18	0
		Column N %	70.0%	50.0%	33.3%	72.0%	0.0%

		N %					
	predominantly neutral	Count	3	5	1	3	1
		Column N %	30.0%	35.7%	33.3%	12.0%	100.0%
	equally distributed	Count	0	1	1	1	0
		Column N %	0.0%	7.1%	33.3%	4.0%	0.0%
		Column N %	50.0%	71.4%	0.0%	72.0%	100.0%
	predominantly disagreed	Count	1	0	0	1	0
		Column N %	10.0%	0.0%	0.0%	4.0%	0.0%
	predominantly neutral	Count	1	3	2	4	0
		Column N %	10.0%	21.4%	66.7%	16.0%	0.0%
	equally distributed	Count	3	1	1	2	0
		Column N %	30.0%	7.1%	33.3%	8.0%	0.0%
Question 8.1.13 E and F combined	predominantly agree	Count	4	9	3	8	1
		Column N %	40.0%	64.3%	100.0%	32.0%	100.0%
	predominantly disagreed	Count	1	1	0	4	0
		Column N %	10.0%	7.1%	0.0%	16.0%	0.0%
	predominantly neutral	Count	1	1	0	4	0
		Column N %	10.0%	7.1%	0.0%	16.0%	0.0%
	equally distributed	Count	4	3	0	9	0
		Column N %	40.0%	21.4%	0.0%	36.0%	0.0%

Correlation between the philosophy of chiropractic and the combined response for question 6.1.4; 6.1.5 and 6.1.7. Correlation between the philosophy of chiropractic and the combined response for question 6.1.12. Correlation between the philosophy of chiropractic and the combined response for question 7.1.4; 7.1.5 and 7.1.7. Correlation between the philosophy of chiropractic and the combined response for question 7.1.12. Correlation between the philosophy of chiropractic and the combined response for question 8.1.4; 8.1.5 and 8.1.7. Correlation between the philosophy of chiropractic and the combined response for question 8.1.12.

	K) Philosophy of chiropractic					
	1	2	4	5	6	Total
	Count	Count	Count	Count	Count	Count

\$q6.14q6.15q6.17_combined	auxiliary	4	7	1	13	0	25
	thermal therapy	5	7	1	12	1	26
	joint therapy	5	7	3	15	1	31
	supportive therapy	4	7	0	6	0	17
	soft tissue therapy	6	15	2	24	1	48
	muscle conditioning	9	18	2	28	1	58
	advise on NSAIDS	0	3	0	4	0	7
	dietary advice	1	0	0	2	0	3
	neurological modality	1	1	0	0	0	2
	Total	11	18	3	30	1	63
\$q6.12_combined	exercise based conditioning	10	18	3	26	1	58
	advice on otc meds	4	3	1	7	0	15
	postural advice	10	16	2	27	1	56
	stress management	8	15	1	26	1	51
	none	0	0	0	1	0	1
	Total	10	18	3	30	1	62
\$q7.14q7.15q7.17_combined	auxiliary	4	6	1	13	0	24
	thermal therapy	4	7	2	9	1	23
	joint therapy	4	10	2	17	1	34
	supportive therapy	4	4	1	11	0	20
	soft tissue therapy	10	17	1	25	1	54
	muscle conditioning	9	18	3	27	1	58
	advise on NSAIDS	1	3	0	2	1	7
	dietary advice	0	0	0	2	0	2
	neurological modality	1	0	0	0	0	1
	Total	11	18	3	30	1	63
\$q7.12_combined	exercise based conditioning	9	17	3	28	1	58
	advice on otc	5	4	1	6	0	16

	meds						
	postural advice	9	16	2	27	1	55
	stress management	9	17	2	28	1	57
	none	0	0	0	1	0	1
	Total	11	18	3	30	1	63
\$q8.14q8.15q8.17_combined	auxiliary	2	6	1	10	0	19
	thermal therapy	3	7	2	17	1	30
	joint therapy	4	8	3	16	1	32
	supportive therapy	2	3	1	5	0	11
	soft tissue therapy	8	16	2	22	1	49
	muscle conditioning	10	18	2	24	1	55
	advise on NSAIDS	3	6	0	5	1	15
	dietary advice	1	0	1	0	0	2
	none	1	0	0	0	0	1
	neurological modality	1	0	0	0	0	1
	Total	11	18	3	30	1	63
\$q8.12_combined	exercise based conditioning	10	18	3	27	1	59
	advise on otc meds	6	5	0	12	0	23
	postural advice	10	17	3	28	1	59
	stress management	10	17	3	29	1	60
	dietary advice	1	0	0	0	0	1
	none	0	0	0	1	0	1
	Total	11	18	3	30	1	63