Chiropractors Can Do: Testing the feasibility of intervening to optimize chiropractic care for adults with neck pain disorders: A pilot cluster randomized controlled trial

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Abstract (English)

Background: Neck pain in adults is common and a leading cause of physical disability. Recently, a guideline was developed for the management of non-specific neck pain (NSNP) with the aim of improving the quality of the delivery of chiropractic care. One key guideline recommendation is to undertake multimodal care for patients with NSNP. The aim of this pilot study was to determine the feasibility of implementing a multifaceted knowledge translation intervention by promoting the use of multimodal care by chiropractors managing patients with NSNP.

Methods/Design: The design was a cluster randomized controlled pilot and feasibility trial. Chiropractors in private practice in Canada were approached to participate in the study. Invitation letters were send to 200 randomly selected chiropractors. Consenting chiropractors were randomized to receive either a theory-based educational intervention in the experimental group or simply a printed copy of the guideline in the control group. Each chiropractor was asked to recruit five neck pain patients (total of 150 patients) into the study. Development of the multifaceted intervention was informed by the results of a related qualitative study based on the Theoretical Domains Framework and consisted of a series of three webinars, two online case scenarios, a self-management video on Brief Action Planning (BAP) and a printed copy of the practice guideline. *Primary feasibility outcomes* for both chiropractors and patients included were rates of: 1) recruitment, 2) retention, and 3) adherence to the intervention. A checklist of proxy measures embedded within patient encounter forms was used to assess chiropractors' compliance with guideline recommendations (e.g., exercise and self-care prescriptions) at study onset. Secondary outcomes included were scores of behavioural constructs (level of knowledge and self-efficacy) for recommended multimodal care. *Clinical outcomes* were pain intensity and neck pain-specific disability. *Analyses* from this study focused on descriptive statistics relating to feasibility to estimate likely recruitment and retention rates, adherence to the intervention. We also estimated the potential efficacy of the intervention on adherence to the recommended multimodal approach for NSNP and on patient outcomes of pain and disability.

Results: Due to slow recruitment, a total of 400 chiropractors received a postal mailed invitation to participate. In total, 47 chiropractors were randomized to the intervention or the control group according to the random sequence allocation. Fifteen withdrew from the study, leaving a total of

32 participants. Eleven chiropractors in the intervention group completed the webinars and e-learning modules, two partially completed them and three did not register. Patient recruitment rate was lower than expected. Overall, nine chiropractors recruited a total of 29 patients (n=11, intervention group; n=18 control group). Only two chiropractors in the intervention group and control group managed to recruit all 5 neck pain patients. Sixty-three percent (n=7) of patients in the intervention group and 56% (n=10) in the control group completed all the outcome measures at baseline and at 3-month follow-up and attended follow-up visits and performed home exercises. There was no difference between baseline characteristics scores of the intervention and control groups for both chiropractors and patients. Over half (54%, n=6) of chiropractors in the intervention group reported being familiar with the guideline and the BAP compared with 71.1% (n=5) in the control group. Confidence in implementing BAP was lower in the intervention group (27.3%, n=3). Of those who completed the trial, 17 patients completed all the 3-month follow-up outcome measures and the end of study questionnaires (n=7; intervention group and n=10; control group). Patients in the intervention group reported significant reduction in pain (P= 0.027) and reduction in disability scores severity (P= 0.033) from baseline to 3-month follow-up. The majority of patients were satisfied with their care.

Conclusion: In this pilot cluster randomized controlled trial, patient recruitment, retention and adherence of both chiropractors and patients were challenging. To overcome these challenges, a thorough evaluation of potential barriers, outcomes and possible solutions must be considered prior to embarking in a larger trial.

Abstract (French)

Contexte: La cervicalgie est commune chez l'adulte et constitue une cause importante d'incapacité physique. Des lignes directrices ont récemment été développée sur la gestion des cervicalgies non spécifiques dans le but d'améliorer la qualité de la prestation des soins chiropratiques. L'une des principales recommandations de pratique est l'emploie de soins multimodaux chez ces patients. Le but de cette étude pilote était de déterminer la faisabilité de mettre en œuvre une intervention d'application des connaissances multi-facettes visant à encourager l'utilisation de soins multimodaux par les chiropraticiens qui prennent en charge des patients avec cervicalgie non spécifique.

Méthodologie: Cette étude pilote était un essai comparatif à répartition aléatoire par grappes avec mesures de faisabilité. Des chiropraticiens en pratique privée au Canada ont été sollicités pour participer à l'étude. Une lettre a été envoyée à 200 chiropraticiens sélectionnés de façon aléatoire. Les chiropraticiens consentant ont été randomisés pour recevoir, soit une intervention éducationnelle théorique dans le groupe expérimental, soit simplement une copie imprimée des lignes directrices dans le groupe contrôle. Chaque chiropraticien devait recruter cinq patients avec cervicalgie (150 patients au total) pour l'étude. Le développement de l'intervention à multi-facettes s'est appuyé sur le résultat d'une étude qualitative connexe basée sur le cadre conceptuel *Theoretical Domains Framework* et a consisté en une série de trois webinaires, deux mises en situation en ligne, un module d'apprentissage en ligne d'autogestion sur le *Brief Action Planning (BAP),* et une copie imprimée de la ligne directrice. Les principales mesures de faisabilité, tant pour les chiropraticiens que pour les patients, incluaient les taux de : 1) recrutement; 2) rétention; et 3) conformité à l'intervention. De plus, un questionnaire de mesures indirectes intégrées au formulaire de rencontre avec les patients évaluaient lors des rencontres cliniques la conformité du chiropraticien aux recommandations pratique (ex. : prescription d'exercices, conseils de prise en charge personnelle). Les résultats secondaires incluaient : les mesures des construits étaient le niveau de connaissances et l'efficacité personnelle face aux soins multimodaux. Les mesures cliniques comportaient l'intensité de la douleur et l'incapacité liée à la cervicalgie des patients. Les analyses de cette étude se sont concentrées sur les statistiques descriptives relatives à la faisabilité pour estimer les taux de recrutement et de rétention probables et la conformité à l'intervention. Nous avons aussi estimé l'efficacité potentielle de l'intervention sur l'adhésion à

l'approche multimodale des soins recommandée pour la cervicalgie non spécifique et sur les mesures d'intensité de la douleur et d'incapacité.

Résultats: En raison du lent processus de recrutement, 400 chiropraticiens ont reçu une invitation à participer par la poste. Au total, 47 chiropraticiens ont été assignés de façon aléatoire au groupe d'intervention ou au groupe contrôle selon une séquence d'attribution au hasard. Quinze se sont retirés de l'étude, laissant un total de 32 participants. Dans le groupe d'intervention, 11 chiropraticiens ont complété les webinaires et le module d'apprentissage en ligne, deux les ont complétés partiellement et trois ne se sont pas inscrits. Le taux de recrutement des patients a été plus bas que prévu. Au total, nine chiropraticiens ont recruté 29 patients (n=11, groupe d'intervention; n=18 groupe contrôle). Seulement deux chiropraticiens dans le groupe d'intervention et un dans le groupe contrôle ont pu recruter cinq patients avec cervicalgie. Soixante-trois pourcent (n=7) des patients du groupe d'intervention et 56% du groupe contrôle (n=10) ont complété toutes les mesures de base et le suivi à trois mois, ont pris part aux visites de suivi, et ont fait les exercices prescrits à la maison. Aucune différence n'a été notée dans les résultats sur les caractéristiques de base du groupe d'intervention et du groupe contrôle, tant pour les chiropraticiens que pour les patients. Plus de la moitié des chiropraticiens (54%, n= 6) du groupe d'intervention se sont dits familiers avec la ligne directrice et avec le *Brief Action Planning (BAP),* comparativement à 71.1% (n=5) dans le groupe contrôle. Le sentiment de confiance relativement à l'implantation du *BAP* était inférieur dans le groupe d'intervention (27.3%, n=3). De ceux qui ont complété l'étude, 17 patients ont retourné les mesures cliniques à trois mois ainsi que les questionnaires de fin d'étude (n=7; groupe d'intervention et n=10; groupe contrôle). Les patients du groupe d'intervention ont rapporté une diminution significative de la douleur (P = 0.027) et une réduction de la sévérité de l'incapacité (p= 0.033) à trois mois. La majorité des patients des deux groupes affirmaient être satisfait des soins reçus.

Conclusion: Dans cet essai pilote comparatif à répartition aléatoire par grappes, le recrutement des patients, la rétention et la conformité à l'intervention des chiropraticiens et des patients ont présenté des défis importants. Afin de surmonter ces défis, une évaluation minutieuse des obstacles potentiels, des résultats et des solutions à envisager doivent être considérés avant d'entreprendre une étude plus vaste.

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Preface

The research protocol of this study was submitted to the journal Pilot and Feasibility Studies and is in revision. The study received acceptance from the Graduate examination committee, School of Physical and Occupational Therapy, McGill University. Ethics approval was granted by the Institutional Review Board, Faculty of Medicine, McGill University. The study is also registered at https://clinicaltrials.gov/, NCT02483091. The protocol of the study was presented as a poster at the Knowledge Translation Annual Scientific Meeting in Halifax, NS in May 2015 and the CCA National Convention and Tradeshow in September 2015.

The study was performed between October 2014 and March 2016.

This thesis contains 5 chapters.

Chapter 1 outlines the introduction and rationale of study of implementing a knowledge translation intervention among Canadian Chiropractors managing neck pain patients. The chapter covers information on the research gap, knowledge translation, developing the knowledge translation intervention, study objectives and main research question.

Chapter 2 explains the complete methodology of the study, including the study design, the eligibility criteria, recruitment stages, and randomization process.

Chapter 3 describes the key feasibility outcome measures of the study, namely recruitment, retention and adherence to the protocol.

Chapter 4 Summarizes the results of the study. This chapter explains the findings in a clear format along with tables for all outcome measures.

Chapter 5 Discusses the overall findings of the study and identifies the potential challenges encountered during the study.

Contribution of Authors

The study was conducted by Prakash Dhopte under the guidance and supervision of Dr. André Bussières. The study received protocol acceptance from the Graduate examination committee, School of Physical and Occupational Therapy, McGill University. Ethics approval was obtained from Institutional Review board, Faculty of Medicine, McGill University. Prakash Dhopte, Dr. André Bussières, Dr. Sara Ahmed, Dr. Simon French and Dr. Jeffrey Quon conceptualized the study design and drafted the protocol. Dr. Nancy Mayo provided the expert input into the objectives, methodology and analysis plan for the study. Prakash has initiated the study by inviting the chiropractors across Canada to participate in the study. The work included during the study was follow-up with the participants, sending the questionnaire to the chiropractors and patients, collecting data, and analysing and interpreting study results and producing the final report. The study progress was discussed at the CCGI clinician's subgroup meeting each month. Recommendations from Dr. Simon French and Dr. Jeffrey Quon were implemented as required over the course of the study.

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List of Abbreviations

Abbreviation	Meaning
BAP	Brief Action Planning
CAM	Complementary and Alternative Medicine
CCA	Canadian Chiropractic Association
CCGI	Canadian Chiropractic Guideline Initiative
CE	Continuing Education
CIHR	Canadian Institutes of Health Research
CMCC	Canadian Memorial Chiropractic College
CPGs	Clinical practice guidelines
C-RCT	Cluster Randomized Controlled Trial
DC	Doctor of Chiropractic
EBP	Evidence-Based Practice
EIP	Evidence-Informed Practice
IRB	Institutional Review Board
KT	Knowledge Translation
KTA	Knowledge-To-Action
MCID	Minimal Clinically Important Difference
MI	Motivational Interviewing
MRC	Medical Research Council
MSK	Musculoskeletal
NDI	Neck Disability Index
NSNP	Non-Specific Neck Pain
SMS	Self-management strategies
TDF	Theoretical Domain Framework
VAS	Visual Analogue Scale
WAD	Whiplash Associated Disorders

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Chapter 1

Introduction

Translating evidence into clinical practice is challenging. As a result, patients often fail to receive optimal care and may be exposed to unnecessary harm [1]. The Medical Research Council (MRC) guidelines on complex intervention evaluation recommends conducting feasibility and/or pilot studies with an aim to improve the effectiveness and efficiency of interventions and to address the challenges in translating research into real-world settings [2, 3]. One example where these recommendations apply is within clinical sites that deliver interventions for individuals with musculoskeletal conditions. Musculoskeletal (MSK) pain comprises a major public health problem worldwide owing to high prevalence rates and considerable burdens in terms of medical costs, work disability, and reduced quality of life [4, 5]. Both general population and working population studies report a higher prevalence of musculoskeletal pain in women than in men [6]. Among MSK conditions, neck and back pain were recently identified as leading causes for years lived with disability [7].

1.1 Epidemiology of neck pain

Neck pain results in an enormous social, psychological, and economic burden to society, and is a leading cause of physical disability [8]. Neck pain is a common problem that affects a large proportion of the population. The estimated annual incidence of neck pain ranges between 10.4% and 21.3% with a higher incidence noted in office and computer workers [9]. Neck pain has an episodic course [10, 11]. Risk factors for neck pain include being female, being between the ages of 35-49 and having had a previous episode [12, 13].

Opinions vary widely on what causes neck pain and how best to manage it [14]. The vast majority of patients with neck pain have symptoms that are “non-specific” in nature and that cannot be attributed to a specific disease process or anatomical structure [15]. As there is no “gold-standard” assessment for non-specific neck pain (NSNP), its diagnosis is mainly based on clinical grounds, provided there are no features suggestive of specific or more serious conditions [16]. The symptoms of NSNP are similar to those of whiplash associated disorders (WAD) grade I and II, but there is no traumatic event involved [14].

Risk of developing chronic neck pain is high in neck-injured patients [17, 18]. Additional factors includes age, history of musculoskeletal pain, high quantitative job demands, low social support at work, job insecurity, low physical capacity, poor computer workstation design, awkward neck posture, sedentary work position and repetitive work [19]. Chronic neck pain results in weak neck muscles and consequently, there is a substantial need for managing chronic neck pain [20]. To some extent, neck-strengthening exercises may decrease pain and increase the range of motion and performance of weaker neck muscles [21]; however, uncertainty still exists regarding the efficacy of spinal exercises for chronic neck pain [22].

1.2 Evidence on management of neck pain

There are many diverse treatment approaches for NSNP because direct treatment is not available for unidentified pathological causes. Perhaps as a result, relatively few treatments have been shown to achieve meaningful and sustained improvements in pain, physical function, and disability despite the associated high costs of neck pain [23]. Current evidence suggests a multimodal approach including manual therapy, self-management support to patients, and physical activity, including exercise, may be an effective treatment strategy for acute and chronic neck pain [24]. The promotion of physical activity, including exercise, is a first-line treatment considered important in the prevention and treatment of musculoskeletal pain and its related co-morbidities [25]. For a minority of patients, clinician-delivered interventions and pharmacological treatments are appropriate; and, in fewer cases, multidisciplinary pain management and/or surgery may be prescribed [26]. In addition, multi- and/or inter-disciplinary multimodal therapy, as well as cross-sectorial integrated medical care, appear to be cost-effective strategies for managing chronic pain [27].

1.3 Clinical practice guidelines

Clinical practice guidelines (CPGs) are defined as "systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances" [28]. CPGs can improve the quality of patient care and health care outcomes [29]. These tools serve several purposes. They aim to summarize research findings and make clinical decisions more transparent, reduce inappropriate variations in practice, promote efficient use of resources, identify knowledge gaps and prioritize research activities, provide guidance for consumers and inform and

empower patients, inform public policy, and support quality control including audits of clinicians' or hospitals' practice [30, 31].

Numerous CPGs exist to inform clinical decision-making of primary care providers managing neck and back pain disorders [32, 33]. The chiropractic profession in Canada has been proactive in developing CPGs over the past two decades [34-36]. The Canadian Chiropractic Guideline Initiative (CCGI) has incorporated recent advances in methods to conduct knowledge synthesis, derive evidence-based recommendations, adapt high quality guidelines, and increase the uptake of CPGs to produce, disseminate and implement guidelines [37].

1.3.1 Guideline recommendation on multimodal care and self-management

Recently, a CPG on the management of NSNP was updated with the aim of improving the quality of delivery of chiropractic care [38]. One of the key recommendations involves offering multimodal care for patients with acute and chronic NSNP. Specifically, the guideline recommends providing advice about self-management, physical activity including exercise, along with manual therapy for acute and chronic neck pain [39].

1.4. Self-management strategies

Self-management strategies (SMS) increase the active participation of patients in managing their own health conditions [40] by helping individuals identify what they are ready to undertake to improve their well-being and also identify actionable steps they are willing to take towards meeting their goals [41]. SMS typically focus on self-monitoring and adherence to the prescribed exercise or medications [42]. SMS include patient's knowledge acquisition behaviours, self-efficacy and overall health status [43, 44]. However, many patients encounter difficulties when following SMS. This is frequently observed in patients with low health literacy and poor understanding of their conditions [45]. Ineffective self-management may also occur if clinicians fail to provide clear information on the SMS, have poor communication skills or lack consultation time with their patients [46]. Several SMS have been proposed [47]. One example is Brief Action Planning, which is a highly structured, stepped-care, self-management support technique [48].

1.5 Brief Action Planning

Brief Action Planning (BAP) can be used to facilitate goal setting and action planning to build self-efficacy in chronic illness management and disease prevention [48]. The overall goal of BAP is to assist individuals in creating an action plan for a self-management behavior that they feel confident they can achieve. BAP has been used in diverse care settings including primary care, home health care, rehabilitation, and mental and public health. BAP can assist and empower patients to self-manage chronic illnesses and disabilities including diabetes, depression, spinal cord injury, and arthritis. BAP is increasingly being integrated into health delivery systems across the United States and Canada. A set of guidelines designed to ensure fidelity in BAP research has also been developed (source: www.centreecmi.com). The BAP is composed of a series of 3 questions and 5 skills;

Summary of questions and skills:

Question 1: Eliciting a Behavioral Focus or Goal

Question 2: Scaling for Confidence

Question 3: Arranging Accountability

Skill 1: Offering a Behavioral Menu

Skill 2: SMART Planning

Skill 3: Elicit a Commitment Statement

Skill 4: Problem Solving for Low Confidence

Skill 5: Follow-up

1.5.1 Underlying Principles of BAP

BAP is grounded in the principles and practice of Motivational Interviewing (MI) and the psychology of behavior change that focuses primarily on self-efficacy and action planning theory and research. “MI spirit” is an important overarching tenet of BAP which encompasses four key concepts: Compassion, Acceptance, Partnership and Evocation. Compassionately supporting self-management with MI spirit involves a partnership with the patient rather than a prescription for change and the assurance that the clinician has the patient’s best interest always in mind (Compassion) [49]. Exemplifying MI spirit accepts that the ultimate choice to change is the patient’s alone (Acceptance) and acknowledges that individuals bring expertise about themselves and their lives to the conversation (Evocation). Adherence to MI spirit itself has been associated

with positive behavior change outcomes in patients [50-54]. Demonstrating MI spirit throughout the change conversation is an essential foundational principle of BAP.

1.5.2 Action Planning and Self-Efficacy

In addition to MI spirit, BAP integrates two evidence-based constructs from the behavior change literature: action planning and self-efficacy [55-58]. Action planning requires that individuals specify when, where and how to enact a goal-directed behavior (e.g. self-management behaviors). Action planning has been shown to mediate the intention-behavior relationship thereby increasing the likelihood that an individual's intentions will lead to behavior change [59, 60]. Given the demonstrated potential of action planning for ensuring individuals achieve their health goals, the BAP framework aspires to assist patients in the creation of an action plan. BAP also build patients' self-efficacy to enact the goals outlined in their action plans. Self-efficacy refers to a patient's confidence in their ability to enact a behavior [55]. Evidence supports a strong relationship between self-efficacy and adoption of healthy behaviors such as smoking cessation, weight control, contraception, alcohol abuse and physical activity [61-63]. Furthermore, the process of action planning itself contributes to enhanced self-efficacy. The main aim of BAP is to build self-efficacy and ultimately change patients' behaviors by helping patients to set an action plan that they feel confident in their ability to achieve [57].

1.6 Evidence-Practice Gaps

The gap between evidence and clinical practice is widespread across different health conditions, health professions, contexts (primary vs. specialized care) and settings (developed vs. underdeveloped countries) [1]. Important knowledge-practice gaps that have significant adverse effects on population health, social welfare, and the economic productivity, have been reported across multiple care providers globally [64]. Despite growing evidence from high quality research to guide practice, many patients continue to receive ineffective, harmful or unproven treatments [65-69]. Such gaps between research evidence and clinical practice can lead to wide geographic variations in the use and quality of healthcare services [65-69]. Better incorporation of existing evidence into healthcare practice has the potential to significantly improve health care quality and safety in Canada and internationally [70, 71]. One example of a persistent evidence-practice gap is the management of NSNP.

Despite available evidence to support the management of NSNP, suboptimal care has been observed across health-care disciplines, including chiropractic [72-78]. For instance, a survey of Canadian chiropractors found that only 41% of respondents provided advice to patients on SMS [39]. Another survey of patients with chronic neck and back pain indicated that less than half of attending physicians, chiropractors, and physical therapists prescribed exercises [79]. Uninformative diagnostic testing, narcotics, and modalities tend to be over-utilized, while therapeutic exercise and activation tend to be under-utilized [27, 80]. For people with chronic NSNP, therapeutic exercise has a positive effect on pain and disability in the short (< 1 month) and intermediate (1-6 months) term [81]. However, when home exercises for neck or low back pain are prescribed, patient adherence is often poor, with published adherence rates converging at about 50% [82-84].

1.7 Challenges to evidence-based practice research uptake

Research among chiropractors in Australia, USA, Germany and the UK reported favorable attitudes towards evidence-based practice (EBP) [85-88] with 40% of respondents indicating that research is important in establishing chiropractic as a legitimate profession [85, 87]. However, in spite of their favorable inclination towards EBP, many respondents did not use CPGs or research evidence to guide clinical decision-making [86, 89].

A number of potential barriers have consistently inhibited the development of EBP among chiropractors. Notable barriers include: 1) limited research capacity; [90] 2) lack of consensus between practising chiropractors, chiropractic researchers, and regulatory bodies over scope and paradigm of practice; [91] 3) high percentage (50%) of chiropractors in solo practice [92] and 4) perceived minimal attention from professional associations, regulatory boards and chiropractic teaching institutions regarding the implementation of evidence into practice [93].

Furthermore, chiropractors and other complementary and alternative medicine (CAM) providers reported difficulties in accessing research, and insufficient skills for locating, interpreting, critically appraising, and applying research findings to clinical practice [94, 95]. However, given the small and specialized samples in these studies, the generalizability of these findings is somewhat limited. Consequently, the factors associated with the uptake of EBP by the chiropractic

profession in Canada still remain poorly understood. Barriers and facilitators to knowledge use is a necessary precursor and should be addressed before designing and implementing a novel intervention [96].

1.8 Challenges to guideline uptake

By themselves, CPGs cannot overcome the multitude of barriers to clinician adherence [97]. To date, strategies to improve the use of CPGs have had limited and varied effects [98]. Successful implementation is more likely when evidence is scientifically robust; clinically relevant; the context is receptive to change within sympathetic cultures; and appropriate monitoring, feedback systems and strong leadership are in place [99]. To date, very few studies have attempted to understand challenges to implementing research in chiropractic knowledge and even fewer have evaluated the success of knowledge translation strategies to increase guideline uptake in the chiropractic setting. These shortcomings highlight the need for rigorous research to promote the uptake of EBP and CPGs among chiropractors [100].

1.9 Knowledge Translation

Knowledge Translation (KT) has emerged as a scientific study to promote EBP and the determinants, processes and outcomes of dissemination and implementation [101]. Closing the research-practice gap involves changing clinical practice, a complex and challenging endeavor of KT [102] . The concept of KT encompasses all steps between the creations of new knowledge to its application in practice in order to yield beneficial outcomes for society [103]. The Canadian Institutes of Health Research (CIHR) definition of KT is: ‘A dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system’ [104]. This definition has been adapted by others organizations, including the United States National Center for Dissemination of Disability Research (NCDDR) and the World Health Organization (WHO).

Though KT research has gained momentum in recent years, much remains to be done to effectively translate research activities targeting healthcare professionals [1]. Specifically, research is needed to: 1) address the complex process of bridging research and practice in a variety of real-world

settings, and 2) conduct research that balances rigor with relevance and employs study designs and methods appropriate for KT research. In order to change practice behaviours in healthcare professions, various KT strategies must be designed, implemented and evaluated [105]. The knowledge users for KT include various stakeholders such as clients, health-care providers and policy-makers [102]. Definitions of terms commonly used in KT are presented in Table 1.

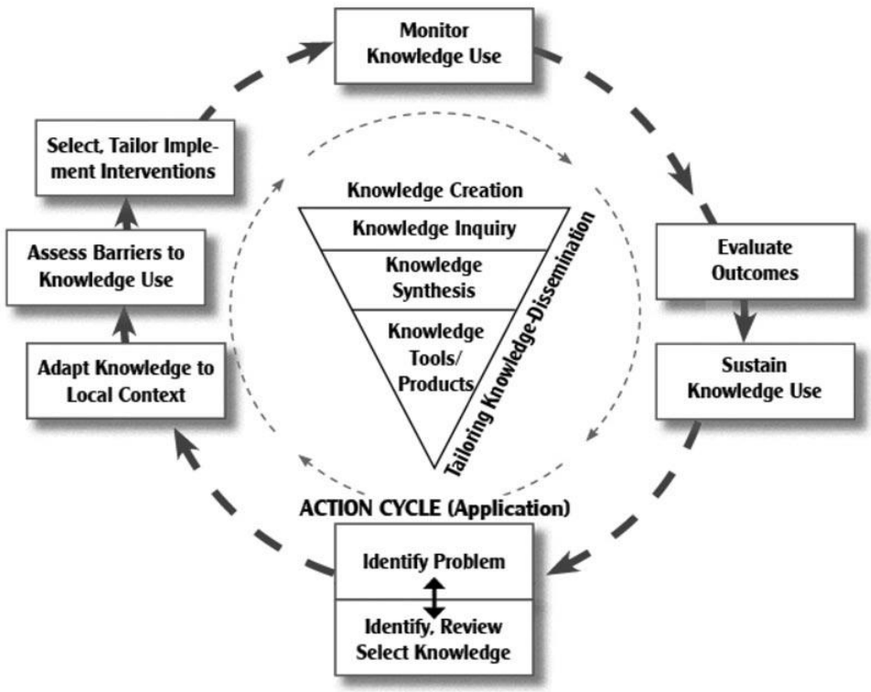
Table 1. Definition of terminology

Knowledge Translation	"The exchange, synthesis and ethically-sound application of knowledge - within a complex system of interactions among researches and users - to accelerate the capture of the benefits of Canadians through improved health, more effective services and products, and a strengthened health care system." Canadian Institutes of Health Research (http://www.cihr-irsc.gc.ca/e/26574.html; access January 27th, 2016).
Dissemination	"Dissemination involves identifying the appropriate audience and tailoring the message and medium to the audience. Dissemination activities can include such things as summaries for / briefings to stakeholders, educational sessions with patients, practitioners and/or policy makers, engaging knowledge users in developing and executing dissemination/implementation plan, tools creation, and media engagement." Canadian Institutes of Health Research (http://www.cihr-irsc.gc.ca/e/34190.html; access January 27th, 2016).
Diffusion	"The process of communicating research, innovations and/or knowledge to individuals, groups or organizations." [106].
Evidence-based Practice	"An approach to decision-making in which the clinician uses the best evidence available, in consultation with the patient, to decide upon the option which suits that patient best." [107].
Implementation	"The use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings." National Institute of Health (http://grants.nih.gov/grants/guide/pa-files/PAR-13-055.html; access January 27th, 2016)
Knowledge-to-Action Process	"The Knowledge to Action Process conceptualizes the relationship between knowledge creation and action, with each concept comprised of ideal phases or categories. A knowledge creation "funnel" conveys the idea that knowledge needs to be increasingly distilled before it is ready for application. The action part of the process can be thought of as a cycle leading to implementation or application of knowledge. In contrast to the knowledge funnel, the action cycle represents the activities that may be needed for knowledge application." Canadian Institutes of Health Research (http:// http://www.cihr-irsc.gc.ca/e/29418.html; access January 27th, 2016)

1.9.1. The Knowledge-to-Action Framework

The science of KT research draws from a variety of behavioural and social science disciplines and employs new approaches and methods [108]. A conceptual framework developed by Graham and colleagues [109], termed the knowledge-to-action (KTA) framework, provides an approach that builds on the commonalities found in a review that is based on concept analysis of 31 planned action theories [110]. It has been adopted by the CIHR as the accepted model for promoting the application of research and for the process of knowledge translation. The model helps conceptualize pathways to changing professional behaviour to improve health (Figure 1). The KTA Process includes two components: the knowledge creation funnel and the action cycle [100]. The knowledge creation funnel represents the refinement of knowledge to create more useful knowledge for the stakeholders. The KTA cycle consists of seven stages, which may or may not be followed in sequence, to optimize the use or application of knowledge across various fields of practice. The KTA process can support the application of KT strategies in clinical practice, by providing a sequence of actions for researchers and clinicians to follow in order to optimize the uptake of EBP and guideline across various fields of practice [111]. In this model, the process of translating knowledge to action is an iterative, dynamic and complex process.

Figure 1. Knowledge-to-Action process



1.9.2 Need for effective KT strategies and theory-based complex interventions

KT strategies are used to disseminate new information to health care providers. It includes linkage and exchange, communication and education, policy and program change, and practice improvement initiatives [112]. The health-care system fails to use the evidence optimally; the traditional way of presenting the evidence from clinical research, i.e. through publication in journals, is not enough for the provision of optimal care [104]. A recent systematic review concluded that multifaceted KT interventions were no more effective than single-component KT interventions [113].

Multifaceted interventions involve "a combination of methods including two or more interventions" [114]. The effect size of more components in a multifaceted intervention does not seem to increase along with the number of components [115, 98]. It is however theoretically plausible that a multifaceted KT strategy designed in response to a thorough barriers assessment would be more effective than a single intervention [1].

A systematic review (without meta-analysis) examining the benefits of multifaceted KT strategies amongst physiotherapists and occupational therapists concluded that active multifaceted KT strategies may lead to improved self-reported knowledge and EBP behaviour [116]. Improving

knowledge acquisition and attitudes towards EBP can create a strong foundation to change best practice behaviors, all of which may ultimately lead to enhanced patient outcomes [117].

1.9.3 Development of the complex KT intervention

Current evidence suggests that the impact of interventions to change professional behaviour is variable and, on average, the effect size is no more than 10% on selected outcomes [118]. Despite the apparent advantages of applying theory to interventions [119, 120], a substantial portion of studies fail to explicitly apply or test theories [121]. Given this absence of a theoretical underpinning of interventions to improve care, it is difficult to interpret why chosen strategies were effective or ineffective. Furthermore, as the effectiveness of interventions appears to vary across different clinical problems, contexts and settings, the choice of strategies (i.e., interventions) to improve practice and patient outcomes should be closely linked to the reasons why practice variations exist and to barriers to knowledge uptake [122-126]. Designs and evaluations of theory-based complex interventions (i.e., interventions involving several interacting components) are increasingly recommended for studies aiming to implement evidence into practice [127, 128].

It is particularly useful to know how complex interventions work [129]. Complex interventions are described as interventions that contains several interacting components [3]. They also attempt to change the dynamics of social systems, by influencing the behaviours of agents related to those systems [130]. Complex interventions also relate to the implementation of the intervention and its interaction with its context. Key dimensions of complexity identified by the MRC framework [119] include the following;

- The number and difficulty (e.g. skill requirements) of behaviours required by those delivering the intervention;
- The number of groups or organizational levels targeted by the intervention;
- The number and variability of outcomes;
- The degree of flexibility or tailoring of the intervention permitted.

Nonetheless, there is growing evidence that implementing active, multi-component strategies—such as interactive education that involves face-to-face interaction [131] and printed educational

material (*e.g.*, guidelines, lectures and publications) [70]—is more effective in changing professional behavior [132-134]. Strategies for knowledge translation may vary according to the target audience (e.g., researchers, clinicians, policy-makers, the public) and the type of knowledge being translated (i.e., clinical, biomedical or policy-related) [135]. In addition, a recent Cochrane review concluded that a tailored implementation intervention is more likely to improve professional practice than no intervention or dissemination of guidelines [136].

The proposed KT educational intervention was developed to facilitate the uptake of a recently developed guideline for the management of NSNP among chiropractors [39]. To design the KT intervention, an expert panel used a systematic, theoretically-informed approach guided by the following four key questions [137]. Table 2 explains the four step approach to consider developing a complex KT intervention.

1) Who needs to do what, differently*?*

Consistent with one key guideline recommendation for managing neck pain patients [138], the target specified behaviour is chiropractors' adherence to recommended care, i.e., *Undertaking or recommending multimodal care for patients with acute and chronic NSNP*.

2) Using a theoretical framework, which barriers and enablers need to be addressed?

Tailored KT interventions are defined as interventions that are developed following investigation into current practices and factors that may be blocking a new innovation [136]. A recent meta-analysis of 26 studies suggested that interventions tailored to prospectively identified barriers of change are more likely to improve professional practice compared to no intervention or dissemination of guidelines [136]. Although optimal methods for conducting barrier- assessments and designing interventions remain unclear, tailoring interventions to overcome known barriers is increasingly considered to be an integral first step in a KT strategy [139].

Preliminary work completed by the CCGI included a comprehensive assessment of professional barriers to inform the design of a KT strategy to implement the neck pain guideline [137]. Twenty five chiropractors were invited to take part in telephone interviews guided by the Theoretical Domains Framework (TDF) [140] to specify modifiable barriers and facilitators to managing neck

pain. The first 13 respondents from six Canadian provinces completed a 60-minute interview. Transcripts were coded deductively by two independent assessors and reviewed by investigators. Results highlighted a number of potential barriers and facilitators to implementing a newly developed neck pain guideline targeting this professional group. Specifically, adherence to prescribing multimodal care was felt to be potentially influenced by nine key theoretical domains: 1) *Social Influence;* 2) *Environmental Context;* 3) *Reinforcement;* 4) *Skills;* 5) *Behavioural Regulation;* 6) *Knowledge;* 7) *Memory, Attention, and Decision;* 8) *Social Professional Role; and Identity; and* 9) *Beliefs about Consequences*.

3) Which intervention components could overcome the modifiable barriers and enhance the enablers?

An expert panel mapped behaviour change techniques to barriers and enablers within key theoretical domains, and identified relevant KT strategies and modes of delivery to increase the use of multimodal care among chiropractors [141]. The multifaceted KT intervention included dissemination of the CPG on the management of neck pain, a series of three webinars, two online case scenarios portraying patients with recent onset and persistent neck pain, and an online module on the BAP [39].

4) How can behavior change be measured and understood?

The focus of this thesis is this fourth step; selecting appropriate outcome measures for both chiropractors and patients and determining the feasibility of measuring these outcomes. The professional behaviour change measure was designed to reflect whether or not appropriate treatment was performed. Specifically, the rate of multimodal care treatment performed per patient visit was measured.

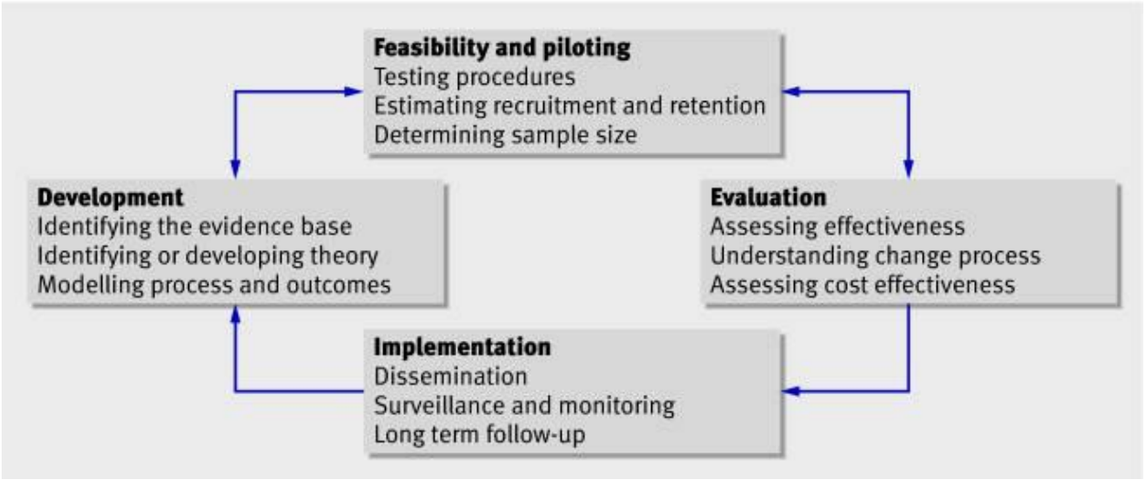
Table 2. Steps for developing a theory-informed implementation intervention

Step	Task
STEP 1: Who needs to do what, differently?	• Identify the evidence-practice gap • Specify the behaviour change needed to reduce the evidence-practice gap • Specify the health professional group whose behaviour needs changing
STEP 2: Using a theoretical framework, which barriers and enablers need to be addressed?	• From the literature, and experience of the development team, select which theory(ies), or theoretical framework(s), are likely to inform the pathways of change • Use the chosen theory(ies), or framework, to identify the pathway(s) of change and the possible barriers and enablers to that pathway • Use qualitative and/or quantitative methods to identify barriers and enablers to behaviour change
STEP 3: Which intervention components (behaviour change techniques and mode(s) of delivery) could overcome the modifiable barriers and enhance the enablers?	• Use the chosen theory, or framework, to identify potential behaviour change techniques to overcome the barriers and enhance the enablers • Identify evidence to inform the selection of potential behaviour change techniques and modes of delivery • Identify what is likely to be feasible, locally relevant, and acceptable and combine identified components into an acceptable intervention that can be delivered
STEP 4: How can behaviour change be measured and understood?	• Identify mediators of change to investigate the proposed pathways of change • Select appropriate outcome measures • Determine feasibility of outcomes to be measured

1.10 Evaluating complex KT interventions

The main focus aligns with the MRC guidelines recommendation to conduct feasibility and/or pilot studies to improve the effectiveness and efficiency of complex KT interventions [2, 3]. According to Arain (2010), 'Feasibility studies are elements of research conducted before a main study, and are used to estimate important parameters that are needed to design the main study, and a pilot study is a version of the main study that is run in miniature to test whether the components of the main study can all work together'. It is focused on the processes of the main study to ensure, for example, that recruitment, randomization, treatment, and follow-up assessments all run smoothly [142]. Figure 2 highlights the key elements of the development and evaluation process.

Figure 2. Key elements of the development and evaluation process



1.10.1 Rationale for feasibility measures of recruitment, retention and adherence

In the case of insufficient or inadequate feasibility testing, the evaluation of effectiveness will fail to determine whether the intervention, structure and design are sufficiently robust for the subsequent evaluation stage. Exploring the key issues during the feasibility testing stage will ideally ensure that no major changes to the intervention components or implementation structures will be necessary during any subsequent evaluation of effectiveness [143].

The concept of EBP in healthcare necessitates the completion of robust research to answer questions that are clinically important. However, many studies are unable to recruit a sufficient number of participants to adequately answer their research question in the allocated time-period, raising issues of resource usage and delaying changes to practice [144]. A successful recruitment strategy provides an adequate pool of qualified participants in case participants withdraw from the study [145]. Although various strategies are currently used to recruit participants, there are no universally adopted recruitment strategies [146]. Once a healthcare professional agrees to participate in an RCT study, the next step of recruiting their patients to the study is often more challenging [147, 146]. This becomes even more problematic in a cluster RCT (C-RCT) in which individual clinics rather than discrete practitioners are the unit of randomization [148].

In addition, retention of participants also presents challenges for a clinical trial study [145]. To ensure the accurate findings of internal and external validity, retention is very important in a trial [149]. It can result in a biased study when participants are not lost randomly but have certain characteristics that are systematically associated with either better or worse outcomes [150, 151].

If losses are fewer than 5%, this may lead to minimal bias. In contrast, a 20% loss can threaten trial validity [152]. In a pilot study, retention rates are useful for planning the length of the enrollment period, the number of clinical trial sites, and the budget source [153].

Key issues related to lack of recruitment and retention among clinicians include lack of knowledge about the study design; lack of time, resources and accessibility; geographical relocation away from the area originally recruited in; concerns that patients may ask questions outside the clinician's knowledge; being randomized into a control group; and lack of confidence to implement the newly designed strategy [147, 154, 155]. Similarly, key issues identified in the recruitment and retention of patients by clinicians include time constraints, doctor-patient relations, few eligible patients and forgetting to recruit [156, 157]. Patients also often show lack of interest in participating in research studies. The most common reasons given by patients include dislike for the idea of being allocated to the control group, concerns about being a guinea pig, no compensation for travel to the clinic, and additional time required for participation [154, 158]. Additional retention barriers in patients include personal economic stress, job stress, and insufficient caregiving resources; lack of family and social support; and not readily seeing any personal benefits to participating in the study [159, 160].

A proper evaluation of therapeutic effectiveness depends in part on the valid measurement of adherence to the intervention [161]. Adherence has been defined as "An active, voluntary collaborative involvement of the participants in a mutually acceptable course of behavior to produce a desired preventative or therapeutic effect" [162]. Other terminology used for adherence is "The degree to which patients and research subjects act in accordance with the advice or instructions of their health care provider or researchers" [163]. Successful adherence rates depend upon tailoring interventions to the unique characteristics of health care providers, patients, disease conditions and treatment regimens [164].

The principal aim of an outcome evaluation is to test the theory of the intervention, in terms of whether the selected course of action led to the desired change [143]. To our knowledge, this study is the first to explore the strategies of recruitment, retention and adherence among chiropractor's, and to pilot test the effectiveness of a multifaceted KT intervention.

1.11 Context and purpose of the study

1.11.1 Context 1. Chiropractors in Canada

Chiropractic is a regulated health profession currently serving approximately 10% of the Canadian population annually [165] with the aim of improving the health and wellbeing of Canadians, primarily those with musculoskeletal disorders. There are more than 8,400 licensed chiropractors practicing in Canada. The chiropractic profession in Canada today is described as a primary health-care profession with expertise in the care of the articulations of both the spine and extremities. The actual practice of chiropractic consists of providing the assessment, diagnosis, treatment and preventative care of biomechanical disorders originating from the muscular, skeletal and nervous systems. To become a licensed Doctor of Chiropractic (DC), individuals must complete a rigorous academic and practical education, fulfill nationally standardized educational requirements, and then pass a licencing examination in each province that they choose to practice [166].

In chiropractic practice, neck pain accounts for approximately 25% of all initial consultations [167]. Treatment modalities typically used by DCs to care for patients with neck pain include spinal manipulation, mobilization, mechanical device-assisted spinal manipulation, education about modifiable lifestyle factors, physical therapy modalities, heat/ice, massage, soft tissue therapies such as trigger point therapy, and strengthening and stretching exercises [168].

1.11.2 Context 2. Purpose

To facilitate the uptake of key recommendations of the recently updated CPG for neck pain and associated disorders, the CCGI developed and disseminated a multifaceted KT intervention (webinar series, online clinical vignettes and a learning module on self-care) [39]. To date however, very few studies have evaluated the impact of KT interventions in the chiropractic setting [169]. Thus, the proposed overall aim of this thesis is to inform the design of a C-RCT about the feasibility of implementing multimodal care in chiropractic practice.

1.12 Research question for the main study

The primary research question of interest is: Among chiropractors in Canada providing care for people with NSNP, to what extent does the provision of a neck pain CPG as part of a multifaceted theory-based complex educational KT intervention of three months duration, enhance behavioural

change and compliance with a multimodal care program when compared to the provision of the neck pain CPG alone?

The overall aim of this pilot phase is to contribute evidence for the feasibility and efficacy potential of a clustered RCT targeting this primary research question.

1.12.1 Specific objectives

The specific objectives target two groups of participants: chiropractors and patients. For each group, both feasibility and efficacy potential will be estimated.

1. For chiropractors, the feasibility objectives are to estimate the proportions of clinicians who:

a. Are eligible to participate and are therefore willing to be randomized;

b. Comply to all study procedures, including completing the KT intervention component and implementing the CPG recommendations; and

c. Complete the 3-month follow-up evaluation.

2. For patients, the feasibility objectives are to estimate the proportion of individuals who:

a. Are eligible to participate and are therefore also willing to be randomized,

b. Adhere to all study procedures; and

c. Complete the 3-month follow-up visit, and complete all questionnaires.

3. For chiropractors, the efficacy potential objectives are:

a. To estimate the extent to which knowledge and self-efficacy changes after engaging in the KT intervention and CPG

b. To estimate the extent to which knowledge and self-efficacy changes after engaging in CPG.

4. For patients, the efficacy potential objectives are:

a. To estimate the extent to which the chiropractor-targeted KT intervention and CPG implementation is associated with changes in patients' pain, disability and satisfaction with care (at the initial phase and after three-months of follow-up).

5. Other pilot objectives include:

a. To ascertain chiropractors' perceptions about the overall quality of the webinar portions of the KT intervention;

b. To identify specific, yet previously unanticipated, impediments to the successful initiation of the main study protocol after randomization; and

c. To identify specific challenges that participating clinicians encountered after study initiation (e.g. while implementing multimodal care, and completing initial and follow-up questionnaires).

Chapter 2

Methods

To evaluate feasibility, we ascertained how closely participating chiropractors and patients adhered to the study protocol and solicited feedback from them about the overall usefulness of the content and format of the KT intervention. The results of this pilot trial will be used to design a full-scale cluster-randomized trial.

2.1 Design

This was a pilot cluster randomized, parallel-group, two-arm controlled trial with a 1:1 allocation ratio. A cluster randomized design was chosen for this study based on its feasibility to prevent contamination across the intervention and control arms by individual patients served by the same chiropractor and/or clinic. In addition, cluster randomized controlled trials offer logistical convenience when implementing certain interventions such as training, feedback, and supervision programs at a group level [170].

The study tested the feasibility and impact on protocol adherence and patient outcomes of two methods of delivering an educational intervention: 1) a complex, theory-based KT intervention (including three webinars, two case scenarios followed by a quiz, and a brief action plan) plus dissemination of practice guidelines for the experimental intervention group; and 2) passive dissemination of a clinical practice guideline alone for the control group.

2.1.1 Study setting and location

Private practices of licensed chiropractors in Canada.

2.2 Ethics

Ethics approval was obtained from Institutional Review Board (IRB), Faculty of Medicine, McGill University (Study number A04-B09-15B, IRB Assurance Number: FWA 00004545). The study was also registered at https://clinicaltrials.gov/, NCT02483091, on 17th June 2015.

2.3 Study participants

2.3.1 Recruitment of chiropractors

A sampling frame of 8,200 chiropractic practices within 10 provinces in Canada was obtained from the Canadian Chiropractic Association (CCA) and the provincial licensing board. From this, a random sample of 200 chiropractors was selected and approached for participation in this study [171, 172]. A sample of 200 chiropractors was chosen as we were expecting that 20% of eligible chiropractors would agree to participate (recruitment rate), and from these, 80% would complete the study at three months (retention rate). We were unable to recruit the required sample of 30 from the first wave of 200 chiropractors, and therefore an additional sample of 200 chiropractors was randomly selected and invited to participate in the study. Chiropractors who agreed to participate and met the eligibility criteria were randomized.

2.3.1.1 Inclusion criteria

a. Current registration with a provincial licensing boards and in active private practice in Canada;
b. Graduation at least one year ago;
c. Provision of chiropractic treatment to a minimum of two adults (age 18-65) with neck pain per week;
d. Fluent in spoken English or French; and
e. Access to the internet.

2.3.1.2 Exclusion criteria

Chiropractors were **excluded** from the study if they had already attended the webinar series or the self-management learning module during the course of any previous continuing education activities. To date, over 500 Canadian chiropractors have registered for the webinars and the module, of which over 300 have completed it or are in progress of doing so. Prior registration provides the mechanism for confirming study ineligibility.

2.4 Procedures of recruitment of chiropractors

The CCA and provincial chiropractic associations were asked to promote the study via their newsletters to chiropractors informing their members of the study purpose and encouraging them to participate in this study. The first recruitment began in June 2015 through email invitations to the first sample of 200 chiropractors. Most of the chiropractors email addresses were not available on the provincial board or CCA website. We then decided to invite the participants by regular mail.

The invitations were sent on McGill University letterhead, with a consent form, demographics questionnaire, and a prepaid return-addressed envelope (Appendix 1). Chiropractors who expressed their interest to participate in the study received a follow-up letter written in a standardized format that provided detailed information about the study project. A follow-up invitation (Appendix 2) and a reminder to respond to an unanswered invitation (Appendix 3) were sent to the remaining sample members as we did not achieve the required sample size from the first wave of mail outs. Both invitations were sent in July and August 2015 respectively.

As the target of recruiting 30 participants was not achieved from the first sample of 200 chiropractors, we resampled another 200 chiropractors, following the same procedure. A first invitation and follow-up were sent to this group in August and September 2015 respectively. A total of 47 chiropractors were eventually recruited to the study and participants were then randomized to the intervention and control groups.

As an incentive to participate, chiropractors who completed all aspects of the study were entered into a draw to win one of four $250 gift cards. In addition, most provincial chiropractic regulatory boards had pre-approved the KT intervention for four hours of continuing education (CE). Certificates of completion were produced once the KT intervention was completed by chiropractors and all quizzes had been successfully answered.

In order to determine the eligibility of the participating chiropractors, a questionnaire was included in the invitation package to inquire about their age, sex, years in practice, practice location (rural versus urban), chiropractic school attended, type of practice (solo versus multidisciplinary clinic), main chiropractic technique/approaches used (e.g., Diversified, Gonstead, BCP) and professional membership status.

2.5 Recruitment of patients

Each participating chiropractor was asked to recruit up to five consecutive new neck pain patients. A recruitment advertisement and a poster were posted in each participating chiropractor's waiting room (Appendix 4). The expected recruitment of 5 patients within three months was reasonable

assuming an average of 85 patient-visits per week per chiropractor, of whom 25% were expected to have neck pain [167].

2.5.1 Inclusion criteria

a. Aged between 18 and 65 years, with a primary complaint of acute (<3 months) or chronic (>3 months) neck pain presenting as a new condition for treatment at the participating clinic;
b. A diagnosis of NSNP (of any duration);
c. Able to understand and speak English fluently in order to be able to complete all study questionnaires. (This was assessed by the staff member of chiropractor's team at the time of screening.)

2.5.2 Exclusion criteria

a. Previous neck surgery;
b. Presence of 'Red flags' (indicating the possible presence of serious underlying conditions such as malignancy, infection, fracture, inflammatory arthropathies including rheumatoid arthritis, or vascular disease of the neck);
c. Pregnancy; and
d. Previous chiropractic care for a complaint of neck pain within the last 3 months prior to study enrolment.

2.6 Consent

A consent form was completed by chiropractors. Also, participating chiropractors explained the study to patients (Appendix 5) and obtained informed consent and baseline demographics from interested patients (Appendix 6). If at any time, patients decided to withdraw, they were be able do so without any consequences to their management. Patients were assured that participation in the study was not associated with any additional medical risks, and that any of their identifying personal information would be kept confidential.

2.7 Randomization methods (Generation of a random sequence)

Chiropractors within recruited practices meeting the inclusion criteria were randomly allocated to receive either the KT strategies plus practice guidelines for the intervention group, or the practice

guideline alone for the control group. Randomization was done in a one-to-one ratio to the intervention and control groups using Stat Trek's Random Number Generator. A research assistant independent from the study implemented the randomization.

2.8 Concealment of the allocation sequence

The independent research assistant withheld the allocation sequence from the study recruitment personnel. Thus, strict separation was maintained between the code sequence and the study coordination recruitment team.

2.9 Blinding

Investigators (not involved in the delivery of the intervention), patients, and the study statistician were blinded to group allocation until the statistical analysis had been completed. Participating chiropractors were necessarily aware of the KT interventions they were receiving, however, participating chiropractors were kept blind to all study hypotheses. Participating chiropractors were also instructed not to tell their patients about their KT interventions in order to maintain a degree of patient blinding.

2.10 Knowledge translation intervention group

The KT intervention group received a KT strategy that included

a. A series of three webinars:
    - Webinar 1: Evidence-Informed Practice & Clinical Practice Guidelines
    - Webinar 2: Neck Pain: Clinical Practice Guidelines
    - Webinar 3: Simple ways to effectively implement self-management strategies
b. Two online case scenario on neck pain management
c. Video on the BAP
d. Clinical practice guideline on neck pain

2.10.1 Specific learning objectives of the intervention components

2.10.1.1 Webinar series:

Webinar 1: Evidence-Informed Practice & Clinical Practice Guidelines

Webinar 1 involved an introduction to evidence-informed practice. The specific learning objectives for this webinar were as follows:

- Understand the importance of 'Evidence-Informed Practice'
- Report barriers and potential solutions to applying 'Evidence-Informed Practice' in day-to-day practice
- Discuss the characteristics, strengths and limitations of 'Clinical Practice Guidelines'
- Review the evolution of the Canadian Chiropractic Guideline Initiative and recognize its implications for chiropractors, patients and the chiropractic profession
- Review the methodological approach utilized to create the new Neck Pain Guidelines
- Understand the conditions the Neck Pain Guidelines apply to and become familiar with resources for staying up to date, including the new Canadian Chiropractic Guideline Initiative website.

Webinar 2: Neck Pain: Clinical Practice Guidelines

Webinar 2 introduced participating chiropractors a recently published neck pain clinical practice guideline. The specific learning objectives for Webinar 2 were the following:

- Describe the diagnostic triage necessary for determining high risk and low risk patients and determining appropriate strategies for care;
- Describe key findings of the Neck Pain Guidelines and their implications for clinical practice;
- Describe the advantages of multimodal care;
- Complete two clinical vignettes designed to assist clinicians in applying specific Neck Pain Guideline recommendations for imaging and multimodal care.

Webinar 3: Simple ways to effectively implement self-management strategies

Webinar 3 consisted of an introduction to practical self-management implementation strategies for clinicians. The specific objectives of this webinar were as follows:

- Learn the process and the attitudes of self-management strategies;
- Become familiar with the process of Brief Action Planning;
- Become familiar with the attitudes to adopt when using it with a patient;

2.10.1.2 Video on the BAP

A 15-minute learning module with segmented video was used to teach clinicians how to implement self-management and BAP methods in practice. Accordingly, the specific objectives of this video session were:

- To become familiar with the process of Brief Action Planning.
- To become familiar with the attitudes to adopt when using BAP with a patient

2.10.2 Components of the intervention

Table 3 describes the components of the intervention package. Four key elements were designed to capture key theoretical domains, behaviour change techniques, and modes of delivering 3 webinars through online Canadian Memorial Chiropractic College (CMCC) website, two clinical vignettes that is accessible through fluid survey and self-management video available on CCGI website

Table 3. Intervention components and modes of delivery

Key elements and topics	**Delivery**
(1) Three 50-60 minutes webinars containing didactic information on the following topics:	
§Webinar 1. Overview of what evidence-informed practice is and why CPGs are useful.	CMCC continuing education (online)
Webinar 2. Key recommendation of the new guideline on the management of non-specific neck pain.	CMCC continuing education (online)
Webinar 3. Introduction to self-management strategies and to the Brief Action Planning (BAP) model in particular.	CMCC continuing education (online)
(2) Two online case scenarios each with care options to help apply recommendations as a proxy for daily practice with quizzes.	Accessible on Fluid Survey after completion of the webinar 2 (Neck pain guideline) at: http://fluidsurveys.com/s/ClinicalVignette1 http://fluidsurveys.com/s/ClinicalVignette2
(3) A self-management video underpinned by the BAP model to demonstrate how clinicians can facilitate patient decisions about self-management strategies. The video portrays a clinician discussing active planning strategies	Accessible online after completion of the webinar 3 (BAP) on the LMS of the CMCC through a link from the CCGI website at: http://www.chiropractic.ca/guidelines-best-

with a chronic neck pain patient who chooses to increase his/her level of physical activity.	practice/Chiropractors/resources/physical-activity-ergonomics-public-health/

§ Before watching webinar 1 on Evidence-Informed Practice (EIP), clinicians will be encouraged to complete three online modules *(Evidence Informed Practice, Summary Research, and Assessing Summary Research) at: http://www.csh.umn.edu/evidenceinformedpracticemodules/index.htm*

* All three webinars were recorded between October 29th and November 26th, 2014 for future diffusion to participants in the intervention group.

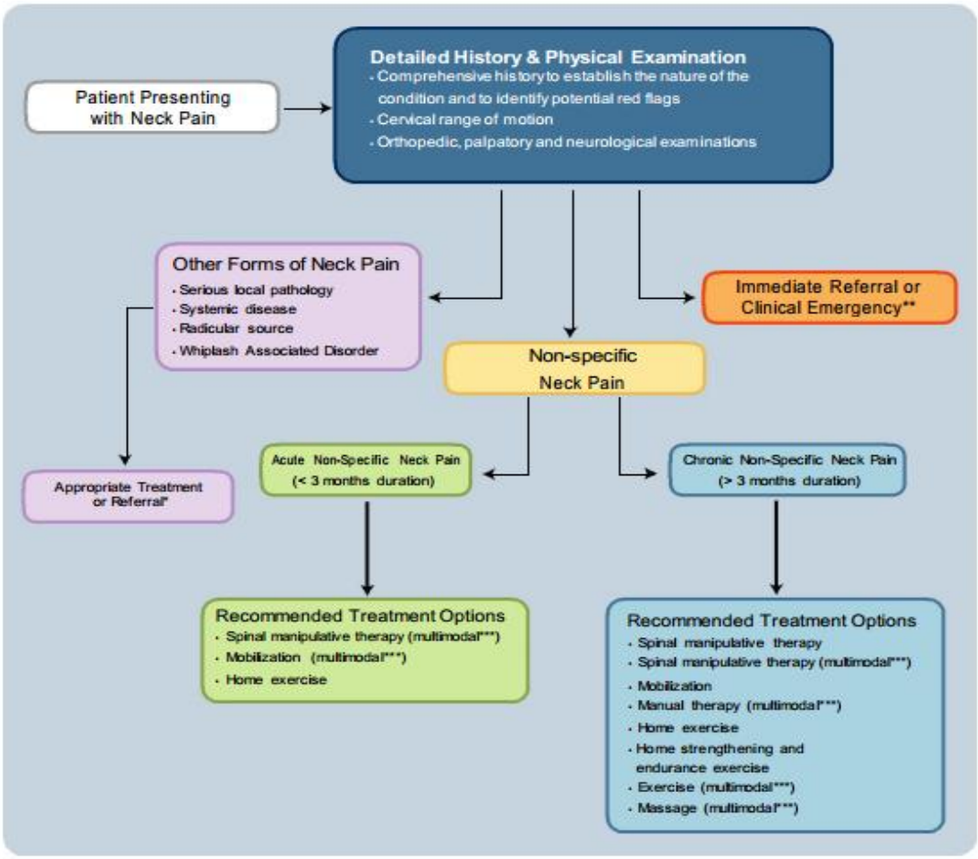
2.11 Control Group

The control group received a printed copy of the neck pain clinical practice guideline. They were asked to follow the recommended guideline while treating their neck pain patients. However, to minimize co-intervention and contamination bias, they were informed that they would have access to the webinars and BAP modules (experimental interventions) only at the end of the study or after they had at least finished treating the patients they had recruited for the study.

Key points for the clinicians while using CPGs are described in neck pain algorithm (Figure 3).

Figure 3. Neck pain algorithm

Neck Pain Algorithm



*Treatment recommendations for patients with whiplash associated disorder (WAD) can be found in a guide developed specifically for this condition.[28]

**Should a patient show signs or symptoms of neurovascular impairment e.g. unilateral facial paraesthesia, objective cerebellar signs (ataxia, dysdiadokokinesia), lateral medullary signs (dysphagia, dysarthria) and/or visual defects (diplopia) they should be referred for immediate emergency care.

***Multimodal: a combination of two or more treatment modalities.

2.12 Delivery of the intervention

Chiropractors consenting to participate were allocated to receive either the KT strategies plus practice guidelines for the intervention group, or practice guidelines alone for the control group. All participants received a package with an acknowledgement that we had received their consent form along with information on the next steps in the study. For the intervention group this included a letter of thanks for participation in the study, a link to follow the webinars, and a printed copy of CPGs (Appendix 7). For the control group this included a letter of thanks and information on recruiting neck pain patients and a printed copy of CPGs (Appendix 8).

Upon the completion of all the online training modules, participants in the intervention group were directed to the next step of recruiting neck pain patients (Appendix 9). The information material on recruiting neck pain patients included an information sheet for patients, consent form, VAS, NDI and a prepaid return envelope (Appendix 10). A follow-up call (both by email and telephone) was made by a research assistant to those participants who had not completed the training modules or were in progress, reminding them about the online module and the timeline to complete the study. Follow-up calls were scheduled every three weeks to encourage them to view the modules and try to complete at their earliest convenience.

2.12.1 Acceptability of the intervention to participants

Acceptability was assessed directly. However, adherence to multimodal care and initial rates of willingness to participate were used as proxy measures of acceptability of the intervention to chiropractors and patients. It may be that the intervention and the trial processes were acceptable to some participants (those who participated and adhered to the protocols) but not to others (those who chose not to take part, perhaps due to being concerned about the intervention or the associated trial processes, or by competing commitments). Post-randomization withdrawals in the control group potentially indicated that control participants were dissatisfied with their allocation. Therefore, reasons for dropouts and withdrawals were solicited from all affected participants using a pre-defined checklist.

Chapter 3

Measures

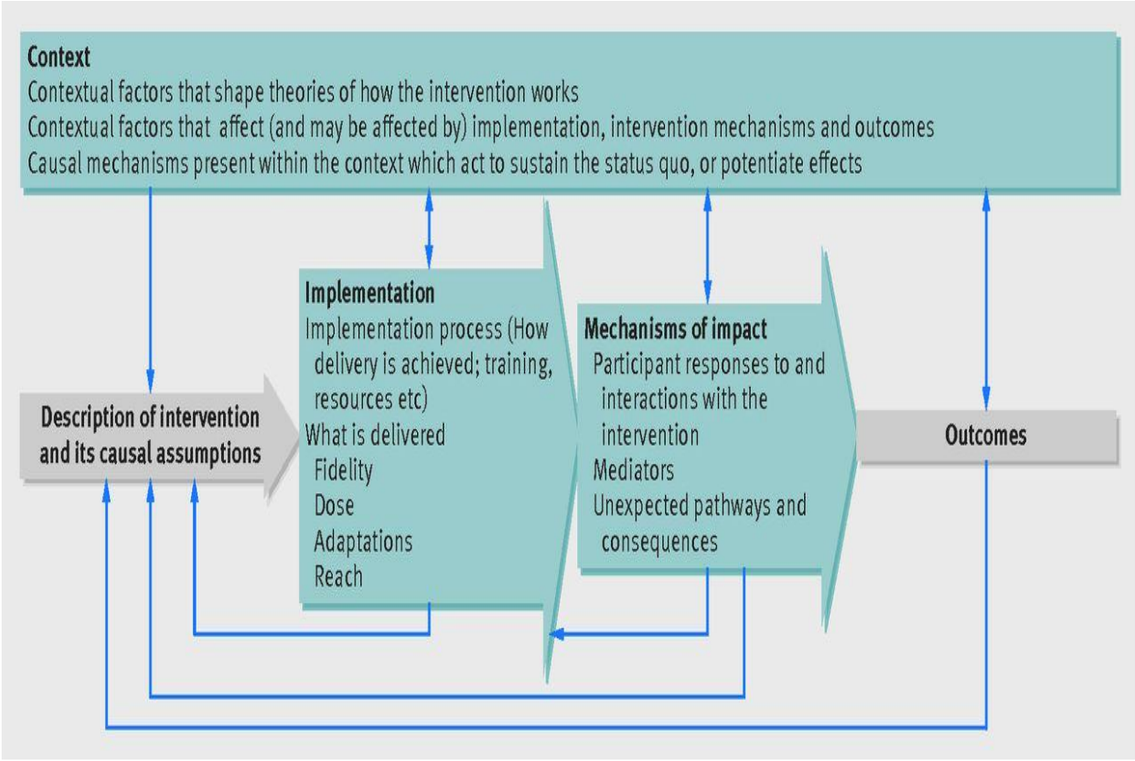
3.1 Measurement in implement research

Implementation research is defined as the scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice and, hence, to improve the quality and effectiveness of health care [173]. It examines strategies to use knowledge (to implement change) and upscale innovations into sustainable programs to solve health problems for larger populations [173]. It includes the study of influences on health care professionals and organizational behavior enabling them to use research findings more effectively [109].

Existing frameworks and taxonomies can help conceptualize measures designed to assess constructs that predict the implementation of evidence-based health innovations [174]. Multi-level framework predicting implementation outcomes include causal factors (structural, organizational, patient, provider, and innovation-level constructs) that are hypothesized to cause or predict implementation outcomes. Specific innovation (e.g., CPG recommendations) is implemented by providers to patients who are nested within an organization (e.g., clinical practice), which is nested within a broader structural context (e.g., healthcare system, social climate, professional norms). Implementation outcomes (adoption, fidelity, implementation cost, penetration, and sustainability) are affected by the causal factors [174]. Together, these factors illustrate a hypothesized causal effect wherein constructs lead to implementation outcomes.

The MRC guidance for evaluating complex interventions recognises the value of process evaluation within trials, stating that it "can be used to assess fidelity and quality of implementation, clarify causal mechanisms and identify contextual factors associated with variation in outcomes." [2, 3]. The focus of process evaluation varies according to the stage at which it is conducted (Figure 4).

Figure 4. Key functions of process evaluation and relations among them[1] [143].



[1] Blue boxes are the key components of a process evaluation. Investigation of these components is shaped by a clear intervention description and informs interpretation of outcomes

3.1.1 Feasibility and piloting phase: Can this study be done?

The MRC framework recommends a feasibility and piloting phase after an intervention has been developed [2, 3]. At this stage, process evaluation can have an important role in understanding the feasibility of the intervention and optimising its design and evaluation [143]. Feasibility and piloting can help estimate important parameters that are needed to design the main study, such as: the variability of the outcome measure, which may be needed to estimate sample size; willingness of participants to be randomised; willingness of clinicians to recruit participants; feasibility of implementing the intervention in the study settings; number of eligible patients; follow-up rates, response rates to questionnaires, adherence/compliance rates, ICCs for cluster trials, etc. [175].

The key feasibility outcomes of interest for the current study included: 1) study recruitment rate, 2) study retention rate, 3) adherence to the intervention and 4) KT intervention effectiveness potential. Table 4 summarizes the feasibility outcomes, sources of measurement, and timing of administration. Table 5 provides the different criteria for defining successful feasibility.

3.2 Feasibility measures

The rationale for feasibility measures (recruitment, retention and adherence) used in this work is outlined in Chapter 1.

3.2.1 Recruitment

Measured as a proportion of chiropractors and patients potentially eligible for participating divided by the number of chiropractors and patients agreed to participate.

3.2.2 Retention

Measured as the number of chiropractors or patients who completed follow-up of all outcome measures at 3 month divided by the number of chiropractors or patients who completed follow-up of all outcome measures at the initial involvement.

3.2.3 Adherence

Guideline recommendations at the patient level was measured using a checklist such as the use of exercise and self-care prescriptions, as well as levels of compliance with recommended exercises. The questionnaire consisted of a series of questions modified for each group and was measured on a five-point Likert scale ranging from 1= strongly agree to 5= strongly disagree.

Compliance to protocol for chiropractors was measured directly from computer generated contact information and follow-up from the research assistant. Three levels of compliance were discernable: 1) completed all components (three webinars, vignettes, online module), 2) completed some, or 3) did not start. Also elicited were indicators of challenges encountered while trying to comply with the components of the intervention and guideline recommendations. Drop-outs were defined as participants who quit the study and were lost to follow-up.

3.3 Professional behaviour change measures

Confirmation of multimodal care being prescribed to neck pain patients was assessed at the study onset (Appendix 11, Question-13). Then, to confirm that patients indeed received multimodal care, patient were also asked to complete an encounter form (Appendix 12, Question-7).

Behavioural changes related to administering the BAP were measured at the level of both chiropractors and patients who were assigned to the intervention group, and for chiropractors who had completed all the training modules. For chiropractors in the intervention group, a BAP skills survey questionnaire was completed at the end of the study. The questionnaire inquired about the skills learned and their experience with BAP training. Responses were measured from left to right on a five-point ordinal scale anchored by 1 = "not having an opportunity to learn more about BAP" and 5 = "confident using the skills in BAP" (Appendix 13). Another questionnaire was sent to gather additional information about chiropractors' experiences with using BAP tools in their regular practice. The questionnaire was designed to assess the importance of and their confidence in using BAP skills. Responses were measured on a ten-point ordinal scale anchored from either 1 = "not at all important" to 10 = "extremely important" or from 1= "not at all confident" to 10= "very confident" (Appendix 14).

For patients, a BAP survey was used to inquire about their confidence in controlling and managing their own health problems through self-care. Responses were coded on a four-point scale with 1 = "not very confident", 2 = "somewhat confident", 3 = "very confident", and 4 = "I do not have any health problems". Another questionnaire was included about the type of health care they received from their chiropractor. The questionnaire was designed to evaluate how well their chiropractor assisted them in planning health-related goals, ideas for achieving those goals, and contacting them after the initial visit. Responses were coded on a five point scale with 1 = "none of the time", 2 = "A little of the time", 3 = "some of the time", 4 = "most of the time" and 5 = "always" (Appendix 15).

3.4 Chiropractor's process of care

To measure levels of knowledge and self-efficacy at the end of the study, [176], a short questionnaire was developed on knowledge and self-efficacy for chiropractors. To measure behaviour change and awareness about the interventions, these questionnaires were found to be useful.

3.4.1 Knowledge

Knowledge is one of the essential elements involved in behaviour change in practitioners. In KT, knowledge is defined as "properties of the pre-existing knowledge/evidence about the problem or the generation of new knowledge/evidence" [177]. Knowledge was evaluated based on extent of expressed agreement with the statement, "I am following the recommendations regarding the use of CPGs and multimodal care approach for management of neck pain patients." Chiropractors rated their extent of agreement with this statement on a five-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree".

3.4.2 Self-efficacy

Self-efficacy relates to person's perception of their capabilities and performance to reach a goal to produce a positive outcome [55]. Self-efficacy was evaluated by measuring how much each chiropractor agreed (on a scale from 1 to 5) with the statement, "I am confident about implementing the recommended care on BAP and CPGs" [55, 169, 178].

3.5 Clinical outcome

Patient-related health outcomes were collected through the use of questionnaires to measure symptoms, impairment, activity interference at home and at work, general quality of life, and satisfaction with care.

3.5.1 Visual Analogue Scale

A Visual Analogue Scale (VAS) is an instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured [179]. The pain VAS is a single item, unidimensional measure of pain intensity [180], which has been widely used in diverse adult populations, including those with rheumatic disease. VAS is a continuous scale comprised of a horizontal (HVAS) or vertical (VVAS) line, usually 10 centimeters (100 mm) in length, anchored by 2 verbal descriptors, one for each symptom extreme [181, 182]. The pain VAS is self-completed by the respondent [182-184]. The patient marks on the line the point that they feel represents their perception of the intensity of their current state. The VAS score is determined by measuring in centimetres/millimetres from the left hand end of

the line to the point that the patient marks. The score is determined by measuring the distance in cm or mm on the scale from ‘no pain’, ‘moderate pain’ to ‘severe pain’.

The minimal clinically important difference (MCID) in VAS pain score is the mean difference between current and preceding scores amongst patients who simultaneous report being “a little worse” or “a little better” on verbal rating scales of improvement. Generally, VAS differences of 10% represent minimal change while differences of 30% represent substantial changes that are clinically important [185].

3.5.2 Neck Disability Index

The Neck Disability Index **(**NDI) is a condition-specific self-report questionnaire that is used to assess disability in patients with acute to chronic neck pain. It is a 10-item self-administered questionnaire, scored from 0 to 50 with a higher scores representing more disability [186-189]. A score of 0 to 4 represents no disability, a score > 35 represents complete disability and a score > 25 severe disability. In our study, an absolute change of 10 points or a relative change of 20% in baseline score was considered clinically important [190].

The association between severity and disability of neck pain has been established by numerous studies [191-193]. Other commonly measured constructs in patients with neck pain are fear avoidance, satisfaction, global rating of change and pain catastrophizing [194-196]. Such concepts are often measured in addition to disability when evaluating specific consequences of neck pain through the use of patient self-reporting measures.

3.6 Patient satisfaction with health care

Patient satisfaction with health care was measured on a short patient satisfaction question. Patients rated their satisfaction on a 5-point Likert scale ranging from 1 = “very satisfied” to 5 = “very dissatisfied.” Patients were also asked if they had another episode of neck pain, how likely they would be to choose chiropractic care again. Such responses were rated on a 4-point Likert scale ranging from 1 = “Definitely would” to 4 = “Not likely.”

Table 4: Outcome measures

Outcome	**Source**	**Description of measures**	**Data collection for Intervention period and follow-up**	
Feasibility				
Recruitment	Chiropractors and Patients	Measured as a proportion of chiropractors and patients potentially eligible for participating. Eligibility rate = number of eligible chiropractors and patients divided by the number of invited chiropractors or patients. Participation rate = number of chiropractors and patients agreeing to participate divided by number of eligible chiropractors and patients.	Initial Stage	
Retention	Chiropractors and patients	Retention rate = number of chiropractors or patients who completed follow-up of all outcome measures at 3 month divided by number of chiropractors or patients who were randomized.	Baseline	3 months
	Chiropractors	Rate of completion of patient encounter forms and questionnaires including levels of knowledge and self-efficacy.	Baseline	3 months
	Patients	Rate of completion of patient encounter forms and questionnaires including Visual Analogue Scale	Baseline	3 months

		(VAS), Neck Disability Index (NDI) and satisfaction with care		
Compliance to protocol	Chiropractors	For those randomized to intervention arm, measured through the rates of attendance of all 3 webinars, associated quizzes, completion of 2 clinical vignettes and the self-management learning module.	Within 6 weeks of assignment	
	Patients	Rate of adherence to follow-up visits, prescribed home exercise and physical activity	Baseline	3 months
Adherence perception (knowledge and self-efficacy)	Chiropractors and patients	Completion of questionnaires		3 months

Table 5: Criteria to assess feasibility

Construct	Parameter
Chiropractors	**Eligibility proportion**
Recruitment	Trial acceptance rate: ≥20% agree to participate within four weeks. Target population = 40 (assuming an 80% retention rate)
Retention	80% of participants will complete three months of patient follow-up
Adherence to protocol	>90% of participants will complete all 3 webinars, associated quizzes, 2 clinical vignettes, and a self- management learning module.
Patients	
Recruitment	Trial acceptance rate: 5 patients within 6 weeks of recruitment notice Target population = 150
Retention	≥ 80% will complete patient encounter forms (VAS, NDI, and PSQ-18) and follow-up at 3-months
Adherence to protocol	95% will attend regular treatment sessions twice/week. > 80% will comply with prescribed home exercise and physical activity.

3.7 Statistical Analysis

The main analysis was focused on descriptive statistics relating to feasibility and estimated rates of recruitment, study retention, and adherence to the intervention. Also, key parameters such as effect sizes to inform the selection of a primary outcome and to calculate the sample size for a future full scale study were estimated. We also estimated the potential efficacy of the intervention on adherence to the recommended multimodal approach for NSNP and on patient outcomes of pain and disability. Instead of calculating an average response on each measure for each group and comparing means between groups, this study identified the proportion of people in each group making a treatment response and comparing proportions between groups. Each person was classified as having made a response, a deterioration, or no change on each measure based on a change equal to or greater than the MCID published or recommended for that measure.

For the efficacy potential analysis, we estimated the proportion of chiropractors who endorsed a higher knowledge level post-intervention in the control group, and then used this as the basis for calculating the probability of achieving a more extreme response in the intervention group, using the normal approximation to the binomial distribution. For example, if 2 of 15 participants in the control group endorse a higher knowledge level, this yields an expected "success" probability of 0.13. Based on an expected success probability of 0.13, if we were to observe that 5 or more of the 16 chiropractors in the intervention group endorsed a higher knowledge response, the probability of this occurring by chance would be 0.047. This approach was used for each of the single indicator variables, knowledge and self-efficacy, in our study. All other data collected on barriers and experience was analysed descriptively.

Chapter 4

Results

4.1 Subjects and recruitment

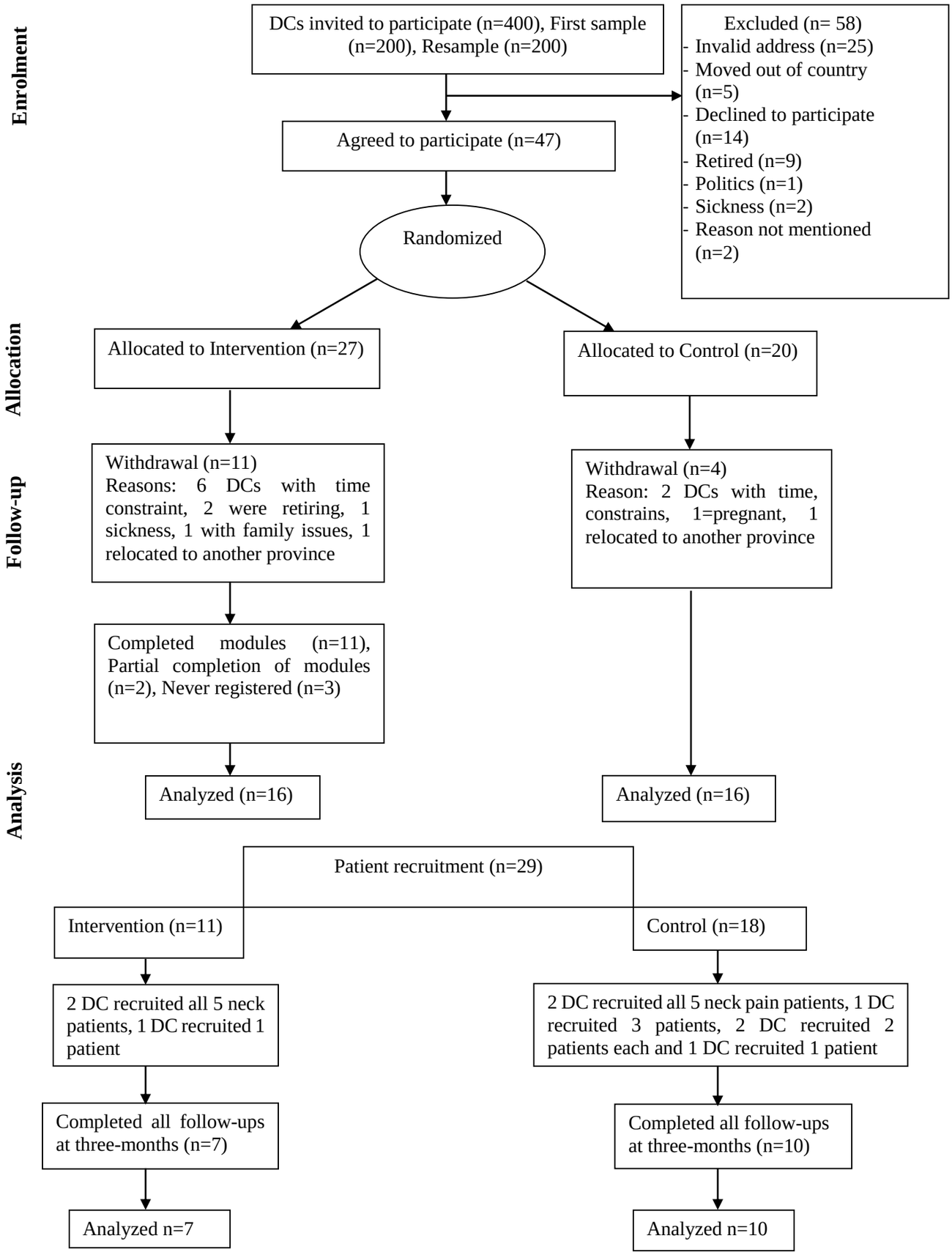
The participant flow chart (CONSORT) is shown in Figure 5.

4.1.1 Chiropractors

4.1.1.1 Recruitment

Postal invitations were sent in June 2015 to 200 randomly selected Canadian chiropractors. After 3 weeks, 11 chiropractors had agreed to participate. Two reminders were sent three weeks apart and an additional 12 chiropractors returned a signed consent form. An advertisement informing Canadian chiropractors of the study was posted in the CCA newsletter in August 2015. We elected to send new postal invitations to an additional 200 randomly selected chiropractors that month, followed by one reminder in September 2015. An additional 24 chiropractors returned a signed consent form. The recruitment phase was stopped at that point having exceeded the recommended sample size of 30 for pilot studies, a figure considered adequate to estimate the key parameters [197]. A total of 58 names were excluded from the list due to invalid address (n=25), no longer lived in Canada (n=5), retired (n=9) or declined to participate (n=14). In total, 47 chiropractors were randomized to the intervention or the control group according to the random sequence allocation. Fifteen withdrew from the study, leaving a total of 32 participants (Figure 5).

Figure 5 Flow of participants



Baseline characteristics of chiropractors

The baseline characteristics of participating chiropractors were not significantly different between groups (Table 6). The majority of participants were male (intervention: 75% vs. controls: 62.3%) in their mid-forties (intervention: 44.6±9.4 vs. controls: 43.2±12 years old), were in practice for over 16 years, practiced full-time (87.5%), in an urban setting (over 81%), in either a group or multidisciplinary practice (75%), and reported seeing on average between 21-50 neck pain patients (i.e. case load) each week (intervention: 62.5 vs. controls: 75%).

Table 6 Baseline characteristics of Chiropractors

Variable	**Intervention group**	**Control group**	***P*-value***
	n=16	**n=16**	
Gender n (%)			0.44
Female	4 (25)	6 (37.5)	
Male	12 (75)	10 (62.5)	
Mean age (SD), years	44.6 (9.4)	43.2 (12)	0.84
Years in practice Mean (SD)	16.8 (9.6)	16.4 (12.5)	0.91
Education n (%)			0.37
Diploma	-	2 (12.5)	
BSc	5 (31.3)	4 (25)	
DC	10 (62.5)	8 (50)	
Masters	1 (6.2)	-	
PhD	-	1 (6.3)	
Other	-	1 (6.3)	
Practice Location n (%)			0.62
Urban	14 (87.5)	13 (81.3)	
Rural	2 (12.5)	3 (18.7)	
Practice n (%)			1.00
Full-time	14 (87.5)	14 (87.5)	
Part-time	2 (12.5)	2 (12.5)	
Type of practice n (%)			1.00
Solo	4 (25)	4 (25)	
Group or multidisciplinary	12 (75)	12 (75)	
Case load n (%)			0.14
<5	-	-	
5-20	5 (31.3)	1 (6.3)	
21-50	10 (62.5)	12 (75)	
>50	1 (6.2)	3 (18.7)	

**P* value calculated with chi-squared test (binary data) and independent t-test (continuous data). *P*-value was set at $p \leq 0.05$.

SD: Standard Deviation, %: Percentage, n: Number; Case load: Proportion of neck pain patients per week.

4.1.1.2 Retention rate

Forty-seven enrolled participants meeting the eligibility criteria were randomized to the intervention (n=27) and control (n=20) groups. However, 11 participants withdrew from the intervention group. Reasons mentioned included time constraint (n=6), illness (n=1), family issues (n=1), focusing on academics (n=1) or relocation to another province (n=2). Four participants in the control group withdrew because of time constraint (n=2), relocation to another province (n=1) and pregnancy (n=1). Of the 32 remaining participants, three participants in the intervention group completed the 3-month follow-up for all the outcome measures, including the completion of the patient encounter form and a final-follow-up questionnaire with knowledge and self-efficacy questions. The retention rate was slightly greater in the control group with seven participants completing all outcome measures (baseline and 3-month follow-up).

4.1.1.3 Compliance

Out of 16 participants in the intervention group, 11 completed all three webinars and the e-learning module on the BAP, two were in the process of completing the webinars, and three had not register at three months.

4.1.2 Patients

4.1.2.1 Recruitment

A total of 29 patients (11 in the intervention group and 18 in the control group) were recruited by nine participating chiropractors. Among those, only two chiropractors in both the intervention and control group successfully recruited all five neck pain patients and returned completed patient's questionnaires within the allocated time. In control, one chiropractor recruited three patients, two chiropractors recruited two neck patients each, and one chiropractor recruited one patient. All 29 patients returned a signed consent form and completed the baseline questionnaires.

Baseline characteristics of patients

The baseline characteristics of participating patients were not significantly different between the two groups (Table 7). The mean age was 48.6±15.2 in the intervention group and 43.08±13.9 in the control group. The proportion of female patients was greater in both groups (81% in intervention group and 72 % in control group). The duration of neck pain of more than three

months was 73% in the intervention group. In the control group the duration of neck pain with less than three months was 56%. Number of days with neck pain in the preceding 0-3 months was high in the control group (67%).

Table 7 Baseline characteristics of Patients

Variable	**Intervention group**	**Control group**	***P*-value***
	n=11	**n=18**	
Gender, n (%)			0.56
Female	9 (81.8)	13 (72.2)	
Male	2 (18.2)	5 (27.8)	
Age, Mean (SD), years	48.6 (15.2)	43.08 (13.9)	0.39
Education, n (%)			0.42
High-school	5 (45.4)	4 (22.2)	
Post-secondary	5 (45.4)	12 (66.7)	
Graduate	1 (9.2)	2 (11.1)	
Duration of neck pain, n (%)			0.14
> 3 months	8 (72.7)	8 (44.4)	
< 3 months	3 (27.3)	10 (55.6)	
History of trauma, n (%)			0.20
No	4 (36.4)	11 (61.1)	
Yes	7 (63.6)	7 (38.9)	
Disease of neck pain, n (%)			0.061
No	9 (81.82)	18 (100)	
Yes	2 (18.18)	-	
Previous neck surgery, n (%)			-
No	11 (100)	18 (94.4)	
Yes	-	-	
Pregnant, n (%)			0.43
No	11 (100)	17 (94.4)	
Yes	-	1 (5.6)	
Medication used for neck pain, n (%)			0.35
No	6 (54.6)	13 (72.2)	
Yes	4 (36.4)	5 (27.8)	
Sometimes	1 (9.09)	-	
Number of days with neck pain in preceding month(s), n (%)			0.07
<30	3 (27.3)	12 (66.7)	
30-60	2 (18.2)	-	
> 60	5 (45.5)**	6 (33.3)	

**P* value calculated with chi-squared test (binary data) and independent t-test (continuous data). *P*-value was set at $p \leq 0.05$. SD: Standard Deviation, %: Percentage, n=Number.

**One participant in the intervention group did not indicate the number of days with neck pain in the preceding month(s).

4.1.2.2 Retention rate

In total, seven participants in the intervention group and 10 in the control group completed all outcome measures (patient encounter form, pain, disability and satisfaction with care questionnaires) at baseline and at 3-month follow-up. Three participants in the control group withdrew before the onset of the study because of disability compensation (n=2) and potential side effects from care (n=1).

4.1.2.3 Adherence

18 of the 29 participants completed follow-up care recommended by the treating chiropractor and reported performing the prescribed home exercises at 3 months. They also returned the completed three-month follow-up questionnaires regarding change in health outcomes. In the control group, 10 out of 18 respondents completed multimodal care, yielding an expected success proportion of 0.55. In the intervention group, 7 out of 11 respondents completed multimodal care (observed success probability of 0.63), in which case, the probability of observing 7 or more successes by chance alone was 0.072.

4.1.2.4 Clinical outcome

Table 8 provides the clinical outcome for each group at baseline and at 3 months' follow-up. Baseline pain scores between groups were not significantly different. Patients in the intervention group (n=6) reported a significant reduction in pain severity from baseline to 3-month follow-up (P=0.027), while those in the control group (n=10) showed no difference (P=0.91). One patient in the intervention group did not provided the pain score.

Baseline NDI scores between groups were not significantly different. Similarly, patients in the intervention group (n=7) reported a significant reduction in disability scores from baseline to 3 months (P=0.033), whereas those in the control group (n=10) showed no difference (P=0.14).

Table 8 Clinical outcome

	Intervention (n=7)			**Control (n=10)**		
	Baseline	3 months	*P*-value	Baseline	3 months	*P*-value**
VAS*	3.9 (2)	2.3 (1.4)	0.027	3.2 (2.2)	2.8 (1.8)	0.91
NDI	23.5 (8.8)	13.7 (6.7)	0.033	17.2 (12.8)	12.4 (10.1)	0.14

* One participant in intervention group did complete the VAS at 3 months' follow-up.
***P*-value was set at $p \leq 0.05$.

4.1.2.5 Quality improvement measures

17 patients completed the satisfaction questionnaire at baseline and at three-month follow-up. Patients were very satisfied with the care received from their chiropractor and the level of satisfaction did not appear to change for both groups between the baseline and the end of the study. 12 patients said that they would return to see the same chiropractor should they have another episode of neck pain in future.

4.1.2.6 Baseline measures on the use of multimodal care

Information about the use of multimodal care by chiropractors was collected after the intervention group completed the webinars and e-learning modules and recruited neck pain patients (Table 9). Nine chiropractors (n=3; Intervention and n=6; Control) recruited 29 patients and completed this questionnaire. All three chiropractors in the intervention group reported providing multimodal care (a combination of two or more therapies) to their neck pain patients, compared to six in the control group. One chiropractor in the control group did not provide any information about the use of multimodal care.

In total, 28/29 (97%) participating patients (intervention group, n=11; control group, n=18) reported at the study onset that their chiropractor used multimodal care to manage their neck pain complaint (Table 8). Further, all patients reported in the end of study questionnaire that their treating chiropractor was using two or more treatment strategies, with a majority delivering manual therapy (92%) followed by manipulation (52%). In addition, chiropractors gave advice about home exercise (64%) and printed material (44%).

Table 9 Multimodal care and other modalities used by chiropractors for neck pain patients

Treatment approach	**Chiropractors (n= 9)**	**Patients (n=29)**
Therapies	**n (%)**	**n (%)**
	7 (87)	24 (96)
Manual therapy§	5 (63)	23 (92)
Spinal manipulation	4 (50)	13 (52)
Spinal adjustment	5 (63)	11 (44)
Spinal mobilisation	5 (63)	11 (44)
Advice to stay physically active	6 (75)	20 (80)
Home exercises	6 (75)	16 (64)
Massage	4 (50)	7 (28)
Ergonomics advice	1 (12)	3 (12)
Printed information	6 (75)	11 (44)
Referral to another healthcare provider	1 (12)	2 (8)
Multimodal care (2 or more therapies)*	6 (75)	22 (88)

§Manual therapies may include manipulation, mobilisation, massage.

**Multimodal care excludes Printed information and Referral to another health care provider.*

4.2 End of study questionnaires (participating chiropractors)

4.2.1 Chiropractor's knowledge and self-efficacy regarding recommended care

Out of 47 chiropractors who had initially consented to participate (including the withdrawals), 40.7% (11/27) in the intervention group and 35% (7/20) in the control group returned completed end of study questionnaires (Tables 9 and 10 respectively). Questions about recommended care addressed chiropractors' levels of knowledge (awareness about the guideline and the BAP) and self-efficacy (extent or strength of one's belief in one's own ability to complete tasks and reach goals) [198]. Six of 11 respondents in the intervention group (54%) compared with 5/7 (71.1%) in the control group indicated that they were familiar with the BAP and the guideline respectively.

3/11 of the respondents in the intervention group (37%) indicated that they were confident in implementing the BAP in their practice. In contrast, 4/7 of respondents in the control group (57%) indicated that they "Strongly agreed" or "Agreed" with the statement "I am confident about implementing the recommended care in the guideline".

Efficacy potential for knowledge and self-efficacy:

The level of knowledge and self-efficacy for both the group in terms of efficacy potential was as follows:

Five out of 7 participants in the control group endorsed a higher knowledge level, which yielded an expected "success" probability of 0.71. We ended up observing that 7 out of 11 chiropractors (observed probability of 0.63) in the intervention group endorsed a response of having acquired higher knowledge, in which case, the probability of observing 7 or less successes by chance alone was 0.40.

Furthermore, 4 out of 7 participants in the control group endorsed a higher self-efficacy level, which yielded an expected "success" probability of 0.57. We ended up observing that 3 out of 11 chiropractors (observed probability of 0.27) in the intervention group endorsed a higher self-efficacy response, in which case, the probability of observing 3 or less successes by chance was 0.046.

4.2.2.1 Potential Challenges encountered during study (clinician interviews)

Despite frequent e-mail follow-ups with chiropractors and their staff to discuss patient recruitment strategies and summary sheets to ease the process, recruitment of patients proved very challenging. Several potential barriers were highlighted during telephone interviews by 22 participating chiropractors. Detailed responses are provided in Table 10. In summary, barriers encountered were: 1) follow up with the participants, 2) insufficient numbers of neck pain patients, 3) lack of time, 4) patients were not willing to be involved in a research study, 5) the paper work was found to be challenging as the study material was perceived to be difficult to understand, 6) too much information in the study package, 7) concern that asking patients to participate might affect the clinician-patient relationship and be perceived as 'hounding' them, 8) confusion about study procedures, 9) lack of assistance from office staff.

Table 10 Challenges encountered by chiropractors (telephone interviews)

Intervention group (n=13)
DC 1: Has many people with multiple complaints so it was difficult to recruit only neck pain patients. It is very difficult to recruit brand new patients who already had to fill in a ton of paperwork and go through the diagnosis and initial session. They would not be interested in a research study which required extra paperwork.
DC 2: Doesn't have many new patients. Only recruited one patient. Patients don't want to do all the paperwork. They already have a lot of questionnaires to fill in at the first appointment. They find the questionnaires confusing. They don't want to receive anything other than the normal treatment (which is multimodal). As they are new patients, they already have a lot of information at the first meeting. Patients prefer to be recruited after diagnosis and first treatment by DC. This would not be an appropriate role for office staff.
DC 3: Not started as was not able to log on to CMCC. She now has the information on how to get a username and password. She will watch the webinars this weekend and start to recruit. She said she has a lot of neck pain patients in her practice and it should not be difficult to recruit. There was too much information to read in the initial bundle and busy clinicians may find it too much.
DC 4: Hasn't had any new neck pain patients but has completed the webinars and will try to recruit.
DC 5: Very busy as office staff member was off sick.
DC 6: Not yet started (new staff and end of year rush) but will try to watch the webinar series and see what can be done. Not possible to have time to recruit any patients.
DC 7: Family has become busy
DC 8: Struggling to recruit and doesn't want to hound the patients, as this will affect relationship with them. Patients didn’t bring back the questionnaires. Not possible able to recruit anyone else.
DC 9: Difficulty in recruiting patients for the study. Recently have been very slow, however things are trending in a better direction and was hopeful that to recruit some patients before the extended deadline.
DC 10: Has been too busy. Hasn't started yet. Lost the study material we sent.
DC 11: Started recruiting patients after 2 months.

DC 12: Unable to find patients to participate in the study. The poster generated some interest and was hopeful to get some people to join the study.
DC 13: Lack of time. Withdrawal: I'm sorry but I will not have to do this properly. Seems like a very interesting study.
Control group (n=9)
DC 14: Had issues with staffing.
DC 15: She recruited 2 patients but they dropped out after one appointment. Was confused as to when patients should complete the questionnaires, especially as there are questions about number of treatments and extent of relief at the beginning. Thought that questionnaire was for the end of the study. Doesn't always work like that and it's not possible to recruit consecutive patients. Not clear about whether the questionnaire was at the beginning and the end. This was not specified in the letter. Was expecting new package to start study again.
DC 16: Didn’t responded after calls. We left multiple message to the office staff but still unable to contact the chiropractor. We were able to reach after 2 months and the chiropractor then assured to recruit patients. Lost the study material and therefore expecting another study material.
DC 17: Recruited only one patient. Doesn't have very many new neck pain patients, and most of the patients were neck and shoulder, or neck and low back pain. Patients didn't want to fill in the questionnaire.
DC 18: Has been off on disability and has just returned to work part-time. Will start to recruit and ask office staff to help. Wasn't sure about the timeframe of the study. This wasn't given.
DC 19: Has been busy with family illness and will not be able to take part in the study. But was willing to participate in future studies.
DC 20: Has been busy with renovations. Was using cooling and heating simultaneously and wonders if this would be another modality for treating back pain? 'Spinal solution' ice back and gel back. Muscles are warm and joints are cool. Works well for neck and lower back.
DC 21: has been sick.
DC 22: Not started recruiting patients: We've yet to recruit a patient for the study. Handed out several intro sheets, possibly expecting positive response from one by next week. Time of year,

slowed down a lot in January, and most just don't want to bother with the paper work. We're still working on it.

4.3 Challenges encountered during the study (end of study follow-up questionnaire)

The end of study follow-up questionnaire also asked participating chiropractors questions about challenges encountered during the study. Domains covered concerned: recommended care, recruitment of patients, measurements, and clinic environment. Additional questions pertained to components of the KT strategy (webinars and online module) for the intervention group (Table 11) and the clinical practice guideline on the management of neck pain for the control group (Table 12).

Table 11 Chiropractor's follow-up questionnaire in intervention group

Item		**Response n (%)**			
		Agree*	**Neutral**	**Disagree****	**NA**
		(n=11)			
Recommended care					
I am familiar with the guideline recommendations on managing neck pain using the Brief Action Planning (BAP)		6 (54.5)	1 (9.1)	1 (9.1)	3 (27.3)
I am confident about implementing the recommended care on the BAP		3 (27.3)	3 (27.3)	2 (18.2)	3 (27.3)
I am worried that it could take longer to complete care if I use the BAP with patients		3 (27.3)	4 (36.4)		4 (36.4)
The BAP was too difficult to implement		1 (9.1)	4 (36.4)	1 (9.1)	5 (45.4)
I had little time to implement the BAP on my patients		1 (9.1)	2 (18.2)	3 (27.3)	5 (45.4)
Webinars and e-module					
I had difficulty registering for the webinars and/or online-modules		3 (27.3)	-	3 (27.3)	5 (45.4)
The webinars were too time consuming		4 (36.4)	1 (9.1)	3 (27.3)	3 (27.3)
The online module was too time consuming		3 (27.3)	2 (18.2)	2 (18.2)	3 (27.3)
I feel the webinars need improvement in structure and design		1 (9.1)	1 (9.1)	4 (36.4)	5 (45.4)
I feel the module need improvement in structure and design		1 (9.1)	1 (9.1)	4 (36.4)	5 (45.4)
The webinars lacked specific information (too basic)		1 (9.1)	-	6 (54.5)	4 (36.4)
The online module lacked specific information (too basic)		1 (9.1)		6 (54.5)	4 (36.4)

Recruitment of patients					
I see very few neck patients in my practice		2 (18.2)	1 (9.1)	5 (45.4)	3 (27.3)
My patients do not see me often (low number of visits per patients)		4 (36.4)	1 (9.1)	4 (36.4)	2 (18.2)
Patients were not willing to participate in this study		3 (27.3)	-	2 (18.2)	6 (54.5)
Patients are expecting to be compensated financially to take part in studies		1 (9.1)	3 (27.3)	2 (18.2)	5 (45.4)
I feel the study may have affected my patient's trust in me		1 (9.1)	1 (9.1)	4 (36.4)	5 (45.4)
I feel that patients may be concerned about the potential side effects of the BAP		1 (9.1)	-	5 (45.4)	5 (45.4)
I am concerned that my patients may not adhere to the recommended care (i.e., BAP)		1 (9.1)	3 (27.3)	2 (18.2)	5 (45.4)
Measurements					
The paperwork was too complex for me and my staff to understand		3 (27.3)	2 (18.2)	3 (27.3)	3 (27.3)
The paperwork was too complex for my patients to understand		2 (18.2)	4 (36.4)	2 (18.2)	3 (27.3)
I normally don't administer patients questionnaires such as the VAS and/or NDI in my daily practice		4 (36.4)	3 (27.3)	2 (18.2)	2 (18.2)
Clinic environment					
I lacked support/cooperation from my staff to be involved in this study		1 (9.1)	1 (9.1)	5 (45.4)	4 (36.4)
My staff are not well trained to explain the study procedures to patients		3 (27.3)	1 (9.1)	4 (36.4)	3 (27.3)

**Response categories of "Strongly agree" and "Agree" were combined*

***Response categories of "Strongly disagree" and "Disagree" were combined*

Table 12 Chiropractor's follow-up questionnaire in control group

Item		**Response n (%)**			
		Agree*	**Neutral**	**Disagree****	**Neutral**
		(n=7)			
Recommended care					
I am familiar with the guideline recommendations on managing neck pain using the guideline		5 (71.4)	-	2 (28.6)	-
I am confident about implementing the recommended care in the guideline		4 (57.1)	-	2 (28.6)	1 (14.3)
I am worried that it could take longer to complete the treatment if I used care recommended in the guideline with patients		2 (28.6)	1 (14.3)	3 (42.8)	1 (14.3)
The guideline was too difficult to implement		-	2 (28.6)	4 (57.1)	1 (14.3)
I have little time to implement this guideline with my patients		2 (28.6)	1 (14.3)	4 (57.1)	-
Clinical practice guideline on the management of neck pain					
I had difficulty following the guideline		1 (14.3)	1 (14.3)	4 (57.1)	1 (14.3)
The guideline was too time consuming		1 (14.3)	1 (14.3)	4 (57.1)	1 (14.3)
I feel the guideline needs improvement in structure and design		1 (14.3)	1 (14.3)	4 (57.1)	1 (14.3)
The guideline lacked specific information (too basic)		-	1 (14.3)	5 (71.4)	1 (14.3)
Recruitment of patients					
I see very few neck patients in my practice		1 (14.3)	1 (14.3)	5 (71.4)	-
My patients do not see me often (low number of visits per patient)		4 (57.1)	1 (14.3)	2 (28.6)	
Patients were not willing to participate in studies		-	3 (42.9)	4 (57.1)	-
Patients are expecting to be compensated financially to take part in studies		-	-	7 (100)	-
I feel this study may have affected my patient's trust in me		-	2 (28.6)	5 (71.4)	-
I feel that patients may be concerned about the potential side effects of the guideline recommendations		-	2 (28.6)	5 (71.4)	-
I am concerned that my patients may not adhere to the recommended care		1 (14.3)	2 (28.6)	4 (57.1)	-
Measurements					
The paperwork was too complex for me and my staff to understand		2 (28.6)	1 (14.3)	4 (57.1)	-
The paperwork was too complex for my patients to understand		3 (42.9)	-	4 (57.1)	-
I normally don't administer patients questionnaires such as the VAS and/or NDI in my daily practice		2 (28.6)	2 (28.6)	3 (42.9)	-
Clinic environment					
I lacked support/cooperation from my staff to be involved in this study		4 (57.1)	1 (14.3)	2 (28.6)	-
My staff are not well trained to explain the study procedures to patients		2 (28.6)	1 (14.3)	4 (57.1)	

**Response categories of "Strongly agree" and "Agree" were combined*

***Response categories of "Strongly disagree" and "Disagree" were combined*

4.4 BAP skills survey questionnaire (intervention group only)

Six out of 11 chiropractors in the intervention group who had viewed all three webinars and the online-learning module on the BAP returned a completed BAP skills questionnaire (Table 13). Four participants indicated that they felt confident about their "skills in routinely using the Spirit of Motivational interviewing" in practice while two tried to practice during their training. Four participants admitted being unaware of the "Teach-back for health literacy" and "Using a confidence scale or ruler" skills. Regarding the question about "Helping patients to talk about change", respondents either "Used this skill in their work (n=3)" or "felt confident using this skill routinely in their work". Only one respondent felt confident in "Collaborative problem solving" and "Developing strategies for working with challenging situations and people".

Table 13. BAP Skills survey

	Intervention group (n=6/11 respondents)			
Skills	I don't know much about this	I tried to practice this during my training	I use this skill in my work	I am confident using this skill routinely in my work
The spirit of Motivational Interviewing	-	2 (33.3)	-	4 (66.6)
Teach-back for health literacy	4 (66.6)	1 (16.6)	1 (16.6)	-
Using reflections to emphasize hope and encourage change	1 (16.6)	1 (16.6)	4 (66.6)	-
Helping patients create action plans	-	3 (50)	2 (33.3)	1 (16.6)
Collaborative problem solving		2 (33.3)	3 (50)	1 (16.6)
Checking in on action plans	1 (16.6)	2 (33.3)	3 (50)	-
Using a confidence scale or ruler	4 (66.6)	2 (33.3)	-	-
Helping patients to talk about change			3 (50)	3 (50)
Developing strategies for working with challenging situations and people	2 (33.3)	2 (33.3)	1 (16.6)	1 (16.6)
Using Ask-Tell-Ask when giving information or advice	2 (33.3)	2 (33.3)	2 (33.3)	-

4.4.1 BAP Feedback (intervention group only)

Chiropractors in the intervention group were also asked to provide feedback about the importance of and self-confidence in delivering various dimensions of the BAP approach (Table 14). Six out of 11 participants returned the completed questionnaire. Responses to the seven paired questions on a Likert scale from 1 (Not at all important/confident) to 10 (Extremely important/confident) ranged from 5.8±2.3 to 10±0. Respondents indicated that to **"**explain things in a way that their patients can understand" was extremely important (10±0) and that they felt very confident (8.6±0.5) in doing so. Similarly, "working with their patients to facilitate behavior changes that will make their health better" was also extremely important 9±1.09. The rating was higher regarding the importance of *collaborating* with their patients to set goals in helping them to improve their health and well-being 9.5±1.22. Confidence level was also higher in addressing the barriers that their patients' face in setting or reaching their goals 9.2±1.32. However, there was a variation between chiropractors in discussing with patients about including family or other supporters in a care plan 5.8±23.

Table 14. BAP Feedback

	Intervention group (n=6/11 respondents)	
Serial number	**BAP Questions**	**Mean (SD)**
1	How important is it for you to explain things in a way your patients can understand?	10 (0)
1A	How confident are you that you can explain things in a way that your patients can understand?	8.6 (0.51)
2A	How important is it for you to elicit your patients' preferences and cultural traditions when planning their care?	8.1 (1.32)
2B	How confident are you that you can elicit your patients' preferences and cultural traditions when planning their care?	7.2 (1.72)
3A	How important is it for you to work *collaboratively* with your patients to set goals to help them to improve their health and well-being?	9.5 (1.22)
3B	How confident are you that you can work *collaboratively* with your patients to set goals to help them to improve their health and well-being?	7.7 (1.63)
4A	How important is it for you to address the barriers that your patients' face in setting or reaching their goals?	9.2 (1.32)

4B	How confident are you that you can address the barriers that your patients' face in setting or reaching their goals?	6.8 (1.94)
5A	How important is it for you to arrange or provide follow up with your patients regarding their goals?	8.8 (0.98)
5B	How confident are you that you can arrange or provide follow up with your patients regarding their goals?	7.5 (2.07)
6A	How important is it for you to talk with your patients about including family or other supporters in a care plan?	7 (2.09)
6B	How confident are you that you can talk with your patients about including family or other supporters in a care plan?	5.83 (2.31)
7A	How important is it for you to work with your patients to facilitate behavior changes that will make their health better?	9 (1.09)
7B	How confident are you that you can work with your patients to facilitate behavior changes that will make their health better?	7.16 (2.13)

4.5 BAP skills survey for patients

Seven out of 11 patients in the intervention group returned the BAP skill survey questionnaire. The questions were designed to know how confident (sure) they were to control and manage most of their health problems. 5/8 (60%) indicated that they were very confident in managing their own health problems and the remaining 3/8 (40%) indicated that they were somewhat confident in managing their own health.

The questions was also followed with the type of help they were receiving from their chiropractors over the past 3 month. 4/7 (57%) indicated that their chiropractors always discussed about the goals for their health, ideas to made a plan for their health, setting a specific goals to improve health and helped in planning to carry out in their daily life. Only one patient indicated that their chiropractor never planned a specific goal to carry out in their daily life. Four patients mentioned that they were contacted by their chiropractor to know how the things were going after their visit to clinic.

Table 15 Patient skill survey

Items	**None of the time**	**A Little of the Time**	**Some of the Time**	**Most of the Time**	**Always**
	n (%), Total n=7				
1. Asked to talk about my goals for my health.	-	-	2 (29)	1 (14)	4 (57)
2. Asked for my ideas when we made a plan for my health.	-	1 (14)	1 (14)	1 (14)	4 (57)
3. Helped to set specific plans to improve my health, such as eating or exercise.			1 (14)	2 (29)	4 (57)
4. Helped to make a plan that I could carry out in my daily life.	1 (14)	-	-	2 (29)	4 (57)
5. Contacted me after a visit to see how things were going.	4 (57)	-	-	-	3 (43)

Chapter 5

Discussion

This thesis proposed to determine the feasibility of evaluating a KT intervention in chiropractic clinical practice designed to improve the management of NSNP. The primary purposes of a feasibility study are to ensure that study implementation is practical and to reduce threats to the validity of a larger fully powered study [199]. This study was primarily a feasibility study with feasibility objectives. As a "small scale" version of a planned main study, this study also constitutes a pilot study aimed at testing whether the components of the main study can all work together [200]. The study estimated the: (i) recruitment and retention rates, and adherence to the study protocol both by chiropractors and patients, (ii) improvement in health status of neck pain patients, (iii) effect size needed for future larger trial, (iv) strength and weakness of the protocol and its adherence, (v) challenges and lessons to be learned for future studies and (vi) modifications in the design of the study.

Our study was a pilot cluster randomized controlled trial designed to implement a multifaceted KT intervention among chiropractors in Canada who are managing neck pain patients. Due to a slower recruitment process, the small sample of patients recruited, low retention rate and low adherence to the protocol, the study took longer than expected to conduct and was halted after 8 months.

We were successful in recruiting the required number of chiropractors. However, very few participating chiropractors were able to recruit all five neck pain patients within the given time frame. Only 29 patients were recruited by 9 of the 36 participating chiropractors (three quarters of chiropractors did not recruit any patient for the study). Compliance was also poor, with 40% of the chiropractors randomized to the intervention group failing to complete the training modules. Further, only 44% completed the 3-month follow-up and all study questionnaires. Adherence among patients was higher, with 62% (18 out of 29) of participants completing follow-up at 3-months. The study results were compared with a previous pilot cluster randomized controlled on registered nurses, where similar challenges was faced in recruiting participants [201]. Another previous study on a complex KT intervention experienced challenges and in this instance was aborted due to inadequate primary care physician and patient recruitment [202].

Our pilot C-RCT investigated whether a KT intervention strategy implemented among chiropractors would lead to a change in practice behaviour and reduced neck pain and disability and satisfaction with care in patients with NSNP. The study compared the implementation of a KT strategy, consisting of webinars, clinical vignettes, BAP and CPG in the intervention group with a copy of the guideline only in the control group. We found some significant changes in their practice behaviour. A previous study on the feasibility of delivering a multimodal KT intervention on the management of acute post stroke by occupational therapists had similar findings related to behaviour change (knowledge and self-efficacy) [203]. In that study, the intervention was tested on 20 occupational therapists and the results indicated a significant improvement in knowledge ($p<0.001$) and self-efficacy ($p<0.045$). The study had no control group however. In our study, we measured behavioural change in both intervention and control groups but the questionnaire was sent only on post-intervention and we did not compare with baseline and post-intervention.

The intervention was designed to improve the uptake of a recently updated CPG for neck pain management [39] by developing a series of webinars and BAP. All chiropractors in the intervention group who completed all interactive webinars and the online module indicated that they liked the use of BAP and they would definitely implement it in their future practice.

There is an increasing demand by patients to demonstrate the therapeutic effectiveness of interventions and improve the transparency of the clinical decision-making process by health care professionals such as chiropractors. However, many chiropractors often wonder how often they need to monitor patients, and what functional impairments or limitations in terms of activities or participation should be assessed [204]. Our efforts to get participating clinicians to complete questionnaires and to administer patient health outcome measures were partially successful. We found a significant clinical change in pain and neck disability compared with those in the control arm. However, these changes were marginal and barely reached meaningful clinically important differences [185, 190, 205]. None of the recruited patients mentioned that they were dissatisfied with their chiropractic care. The results were consistent with the previous studies on chiropractic care for patients with musculoskeletal disorders. Greater satisfaction was due to the amount of information provided by chiropractors to their patients, perception of provider's concern and level of comfort and confidence in dealing with the health care issues [206, 207].

5. 1 Study strengths and weaknesses

5.1.1 Strength of the study

To our knowledge, this is the first study to evaluate the feasibility of implementing a theory-based complex intervention to improve the management of NSNP in chiropractic practice in Canada prior to testing in a cluster randomized controlled trial. The study is registered (https://clinicaltrials.gov/, NCT02483091, registered on 17th June 2015) and the study protocol was submitted to the journal Pilot and Feasibility Studies (In revision). The study protocol was also presented as a poster at two scientific meeting, KT Canada Annual Scientific meeting in Halifax, 2015 and the CCA National Convention and Tradeshow in September 2015.

Significant efforts were made to recruit chiropractors for their participation in the study. An advertisement was placed in the CCA Newsletter in August 2015. An incentive to enter a draw and win a gift coupon of $250 was offered for chiropractors who completed all the study protocol. All letters were mailed to chiropractors and patients with prepaid return envelopes; regular monthly follow-up was done by a research assistant to collect progress reports from participants and to answer their questions. Follow-up calls to chiropractors designed to discuss the importance of the study, safety and efficacy of the intervention, encouraging them to recruit patients and reassuring them that their personal information would be kept confidential were made. Technical support was provided to chiropractors in the intervention group who experienced difficulty in registering for the webinar. A printed poster was provided to all chiropractors to be placed as an advertisement in the clinic to ease patient recruitment.

5.1.2 Study limitation/weakness

Although we have highlighted the strengths of the study, the study has several limitations. Given the nature of the study, we were unable to determine which individual components of the intervention were more effective (or ineffective). In addition, we were unable to quantify the number of therapeutic modalities administered to individual patients. Recruitment is always a concern in clinical studies [208] and researchers commonly overestimate the number of available participants that meets the eligibility criteria for clinical trials [209]. While we anticipated having some difficulties recruiting from community-based private chiropractors, we succeeded in having a sufficient number of participants after two rounds of postal reminders and resampling, and an advertisement placed in the newsletter of the CCA in August 2015.

Recruitment of patients however proved much more challenging. We incorrectly assumed that a 3-month period would be a sufficient for each chiropractor to recruit five neck pain patients for the pilot study. However, chiropractors experienced significant difficulties and requested more simple instructions. Hence, there is a need to establish the feasibility of conducting the current study within private chiropractic practices in Canada before progressing to the full scale study.

Chiropractors were not blinded regarding the groups to which they were assigned. We assumed that this would result in more withdrawals in the control group because they may have felt disappointed with the allocated group [210]. Interestingly, we found that only 4 chiropractors in the control group withdrew from the study, whereas 11 chiropractors withdrew from intervention group. This may be because the intervention group did not want to take the time to view the three webinars and BAP (estimated time: 3.5 hours of continuing education), whereas the control were only asked to consider guidelines recommendations. Criteria for retention were therefore not achieved.

Chiropractors also felt that 3-months did not allow them sufficient time to complete all the study requirements (viewing the educational KT strategy, recruiting all neck pain patients, administering care and collecting study outcome measures). Poor recruitment may have occurred because in clinical settings, practitioners may forget to recruit patients due to a demanding workload [211, 212]. Low enrolment made it difficult to compare between the groups and therefore we were unable to make a future sample size estimate. Two chiropractors admitted they did not open documents we sent.

All recruited chiropractors were asked to complete an end of study questionnaire asking about challenges encountered during the study. The main reasons for not completing all components of the intervention were: the webinars were too long to watch, (nearly 40% of the chiropractors discontinued after watching 2 webinars) and time constraints. Further, participants found that the information provided in the invitation letter was confusing. Two of the chiropractors did not understand the meaning of non-specific neck pain.

Chiropractors indicated that some patients were not ready to participate in the study as they were afraid about the new treatment strategy. Some clinicians may also have waited for the "ideal" new patients presenting with severe neck pain visiting their clinic for the first time. The small sample size and unequal group distribution of patients reduced the external validity of our findings [213]. Lack of transportation and remuneration for travel and time was also seen as a barrier by patients since many of the patients had to travel a long distance to visit their chiropractor. Also, patients were not sure whether to participate or not.

Short-term effects of the intervention on patients were also assessed at the 3-month follow-up. While significant differences in pain and disability were observed in the intervention group, it is not known whether this results from the educational KT intervention considering the small number of participants. Despite the excellent clinical measurement properties of NDI [188], participating chiropractors did not routinely measure patient's level of disability using a validated instrument. Similarly, the VAS was not used frequently in practice, despite its properties (high reproducibility, sensitivity to treatment effects), and practicality (ease of administration and of analysis) [214]. In spite of the significance found for pain and disability measures (NDI and VAS), these results should be interpreted with caution in light of the low number of neck pain patients for this pilot study.

The volume of paper-work needed to complete the study was a barrier for participants. Many chiropractors and patients felt that it was too time consuming to fill in the forms. While financial incentives can increase protocol adherence rate [215], our budget did not allow us to reimburse participants for their time, or patient transportation or parking. We were unable to collect the complete contact information from some patients as they were not willing to provide their home contact details. Follow-up contact was therefore challenging with the recruited patients.

5.2 Lessons learned and suggestions

Conducting an implementation study in the chiropractic setting nationwide was challenging and researchers should be aware of the potential barriers to recruitment, adherence and retention. Considerations for reaching the desired sample size may include altering the selection criteria, replacing poor recruitment sites and extending the recruitment period [216]. Possible solutions to

the barriers encountered in this pilot study are displayed in Table 16. Some key points to consider include: 1) Practitioners should receive a brief summary of the research protocol clearly outlining the objectives of the project and related tasks to clear up misconceptions; 2) The role of office staff is key in recruiting patients as they can assist participants in explaining the study and filling in questionnaires. It is therefore important to regularly engage with study participants. Knowledge brokers (KB) acts as a linkage agents that focus on development of positive relationships between researchers, clinicians and staff [217]. Using a KB may be beneficial to increase the chance of successfully implementing KT strategies; 3) Identifying potential barriers and facilitators at the practitioner and patient level before conducting a trial in a clinical setting may save time and ease subject recruitment for the study; 4) Providing incentives to participate in the study in the form of travel expenses, or a draw to win a gift certificate should be provided wherever possible; and 5) Monthly follow-ups by a research team member to update participating clinicians and patients on the study progress and address potential concerns or questions and 6) Shorter intervention and more transparency regarding the time commitment.

Other suggestions include: placing monthly advertisements in the professional newsletter; obtaining support from professional associations and regulatory boards to encourage chiropractors to engage in the study; increasing the study duration (up to one year) to allow sufficient time for recruitment and for completing all study phases; and having a database of chiropractors who specialize in treating neck pain patients. This may save time and increase the chances of successful recruitment and retention. For patients, providing funding allowances in form of reimbursements for transportation, time given for their participation in the study or a gift coupon will be considered when designing larger trials. Finally, paperwork needs to be simplified.

Table 16 Identified barriers and suggested solutions

Barriers	**Suggestions**
Ineffective recruitment	Target chiropractors with a practice focused on neck pain patients; Provide clear and precise study material and appropriate administrative support [202] and incentives to participate.
Follow-up contact	Weekly follow-up calls by a research coordinator/assistant [218] by telephone, email and if possible in person.
Retention	Encourage participants to remain in a study for the full duration by engaging with them early on and maintaining contact [209].
Adherence to the guideline recommendations	Guideline adherence can be increased by incorporating guidelines into a registry, designing flow charts and patient assessment tools coupled with educational support from peer opinion leaders such as health care professionals [219].
Patient education	Educative strategies should be interactive and participatory. Education may be delivered in person or online [220].
Difficulty in understanding the information of the study	Use lay language (maximum of grade 8 reading level); attractive images of graphics; overall visual appeal adapted to the target audience [221].
Staff education and engagement	Educate all levels of staff by providing the original scientific literature supporting the proposed interventions, along with concise summaries of importance of study and a check-list of the evidence [222].
Study remuneration	Offer participating clinicians incentives for recruited patients. Reimburse recruited patients for their time spent for the study [202].
Paper-work both for clinician and patients	Simplify the paper work with complete information in just a page or two.
Health issues for clinicians e.g., sickness, pregnant, accident	Determine if they can confirm their availability to be involved when they return to work.

5.3 Relevance to practice

We are not aware of published studies on the success and failure to implement a multifaceted KT strategy aimed at improving the management of NSNP among chiropractors. The conduct of this feasibility study was expected to be compatible with the existing infrastructure while permitting a certain degree of flexibility and adaptation to the needs and routines of individual community-based clinicians. This study does not confirm the effectiveness of using multimodal care. The study only aimed to explore the feasibility of implementing a KT intervention in the chiropractic setting.

5.4 Future plan

In order for an effective KT strategy to be effective, the barriers and facilitators faced by chiropractors treating neck pain patients, in their regular clinical practice, must be identified and addressed well in advance. A better understanding of the challenges and issues related to barriers in recruitment, retention and adherence can help researchers to think ahead about the strategies to overcome these potential issues and consequently save the time and energy of the participants, researchers and funding agencies [209].

Conclusion

While we successfully recruited the number of clinicians needed for this pilot study, it is expected that the number of participants for a large trial would prove difficult to recruit. In addition, the number of patients recruited was insufficient which should be of significant concern for a larger trial. Chiropractors from the intervention group who had completed the webinars and e-learning modules indicated that the intervention components were very useful and that by implementing these, they had successfully changed practice behaviour. Patients who were treated by their chiropractors in the intervention group also found the BAP may be a useful approach to improve their health. However, because of small sample size, the results prevent from making any firm conclusion about behavioural change. Overall, the conduct of this pilot study encountered several challenges. Whilst we were successful in some components of the pilot study, important components like retention and compliance to the study protocol were not achieved and therefore there is a need additional piloting before conducting a confirmatory trial.

Involvement of health care organizations, professional boards of chiropractors, continuing education of health professionals and multi-stakeholder can offer important support by fostering positive attitudes among practitioners about research and best practice, motivate them to participate and to recruit potential patients in studies. Variations in terms of practice locations, main approach of treatment and years of practice should also be considered when designing studies [223]. Commitment to conduct clinical research is a challenge among health care professionals [224]. Adherence to guidelines could be further explored within research-based practice networks [93].

Despite considerable efforts toward the conduct of this feasibility study, implementing the protocol was not easy. Valuable lessons learned however should help address limitations encountered in future studies.

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Appendices

Appendix 1

"Chiropractors Can DO: Testing the Feasibility of Intervening to Optimize Chiropractic Care for Adults with Neck pain Disorders"

Dear colleague,

You are being invited to participate in a study on the use of multimodal care in patients with non-specific neck pain. The invitation pack you received includes an information sheet, a consent form to participate, a demographic questionnaire and a pre-paid return envelope.

The aim of this study is to assess the feasibility of implementing a knowledge translation strategy in clinical practice designed to increase the use of multimodal care for neck pain patients. Results may inform the design of a clinical trial to evaluate strategies to integrate evidence-based multimodal care approach into clinical practice for neck pain patients and methods for bringing new research findings into practice.

This study is being conducted in collaboration with McGill University and the Canadian Chiropractic Guideline Initiative (CCGI).

We would also like you to be aware of the following information should you choose to participate:
- Participation in the research is entirely voluntary and you are free to withdraw at any time without penalty.
- Your identity will remain confidential and no identifying information will ever be reported. When reporting our findings, no personal identifiers will be included.
- As a University requirement, all the data will be destroyed 7 years after study completion.
- Participation or lack thereof, in this research will not affect your status with the CCA in any way.

The Canadian Chiropractic Guideline Initiative appreciates your collaboration in this project.

If you have any questions or concerns, please do not hesitate to contact Dr. André Bussières at andre.bussieres@mcgill.ca or Prakash Dhopte at prakash.dhopte@mail.mcgill.ca

Thank you for supporting chiropractic research.

CONSENT FORM

"Chiropractors Can DO: Testing the Feasibility of Intervening to Optimize Chiropractic Care for Adults with Neck pain Disorders"

Consent to Participate in Research

I am aware that I am being asked to participate in a research study that seeks to assess the feasibility of implementing a knowledge translation intervention designed to improve the management of non-specific neck pain.

I have read this consent form. I have been informed of the purpose of this study, and I am aware of the study procedures, and the risks and benefits of taking part. I have asked any questions I had, and my questions were answered. I have been informed that participation in this study is voluntary, and that I can withdraw from this study at any time without giving a reason. I agree to take part in this research study. I do not give up any of my legal rights by signing this consent form.

Signatures

_____
Participant's Name (Please Print)

_____ _____
Participant's Signature Date

_____
Name of Investigator/Delegate (Please Print)

_____ _____
Signature Date

Chiropractors Demographic/Questionnaire

Please complete the following demographic and questionnaire. Afterward, place your completed questionnaire in the attached envelope and seal it. Your answers will be returned to the Investigator and will remain completely confidential.

1. Name: Dr. _____

2. Age: _____

3. Gender: ❑ Female ❑ Male

4. Email: _____

5. Chiropractor school attended: _____

6. Years in practice since graduation: _____

7. Education-Highest level obtained:
A. Diploma/Fellowship
B. Bachelor degree
C. Doctorate of Chiropractic (DC)
D. Master degree
E. Doctorate/PhD
F. Other

8. Geographical location: _____

9. Practice location (Urban/rural): _____

10. Practice
A. Full-time
B. Part-time

11. Type of practice
A. Solo
B. Group or multidisciplinary

12. Percentage (%) case load with neck pain (<5, 5-20, 21-50, >50) _____

13. Main chiropractic technique/approach used:
Example: Diversified, Gonstead, BCP, etc. _____

14. Professional membership of Canadian Chiropractors Association (CCA):
A. Yes
B. No

Appendix 2

"Chiropractors Can DO: Testing the Feasibility of Intervening to Optimize Chiropractic Care for Adults with Neck pain Disorders"

Dear colleague,

This letter is a follow-up to an invitation you recently received requesting your participation in a research project. The invitation pack you received includes an information sheet, a consent form to participate, a demographic questionnaire and a pre-paid return envelope.

The aim of this study is to assess the feasibility of implementing a knowledge translation strategy in clinical practice designed to increase the use of multimodal care for neck pain patients. Results may inform the design of a clinical trial to evaluate strategies to integrate evidence-based multimodal care approach into clinical practice for neck pain patients and methods for bringing new research findings into practice.

This study is being conducted in collaboration with McGill University and the Canadian Chiropractic Guideline Initiative (CCGI).

We would also like you to be aware of the following information should you choose to participate:
- Participation in the research is entirely voluntary and you are free to withdraw at any time without penalty.
- Your identity will remain confidential and no identifying information will ever be reported. When reporting our findings, no personal identifiers will be included.
- As a University requirement, all the data will be destroyed 7 years after study completion.
- Participation or lack thereof, in this research will not affect your status with the CCA in any way.

The Canadian Chiropractic Guideline Initiative appreciates your collaboration in this project.

If you have any questions or concerns, please do not hesitate to contact Dr. André Bussières at andre.bussieres@mcgill.ca or Prakash Dhopte at prakash.dhopte@mail.mcgill.ca

Thank you for supporting chiropractic research.

Appendix 3

"Chiropractors Can DO: Testing the Feasibility of Intervening to Optimize Chiropractic Care for Adults with Neck pain Disorders"

Dear colleague,

This letter is a follow-up to a reminder you recently received requesting your participation in a invitation you recently received requesting your participation in a research project. The invitation pack you received includes an information sheet, a consent form to participate, a demographic questionnaire and a pre-paid return envelope.

The aim of this study is to assess the feasibility of implementing a knowledge translation strategy in clinical practice designed to increase the use of multimodal care for neck pain patients. Results may inform the design of a clinical trial to evaluate strategies to integrate evidence-based multimodal care approach into clinical practice for neck pain patients and methods for bringing new research findings into practice.

This study is being conducted in collaboration with McGill University and the Canadian Chiropractic Guideline Initiative (CCGI).

We would also like you to be aware of the following information should you choose to participate:
- Participation in the research is entirely voluntary and you are free to withdraw at any time without penalty.
- Your identity will remain confidential and no identifying information will ever be reported. When reporting our findings, no personal identifiers will be included.
- As a University requirement, all the data will be destroyed 7 years after study completion.
- Participation or lack thereof, in this research will not affect your status with the CCA in any way.

The Canadian Chiropractic Guideline Initiative appreciates your collaboration in this project.

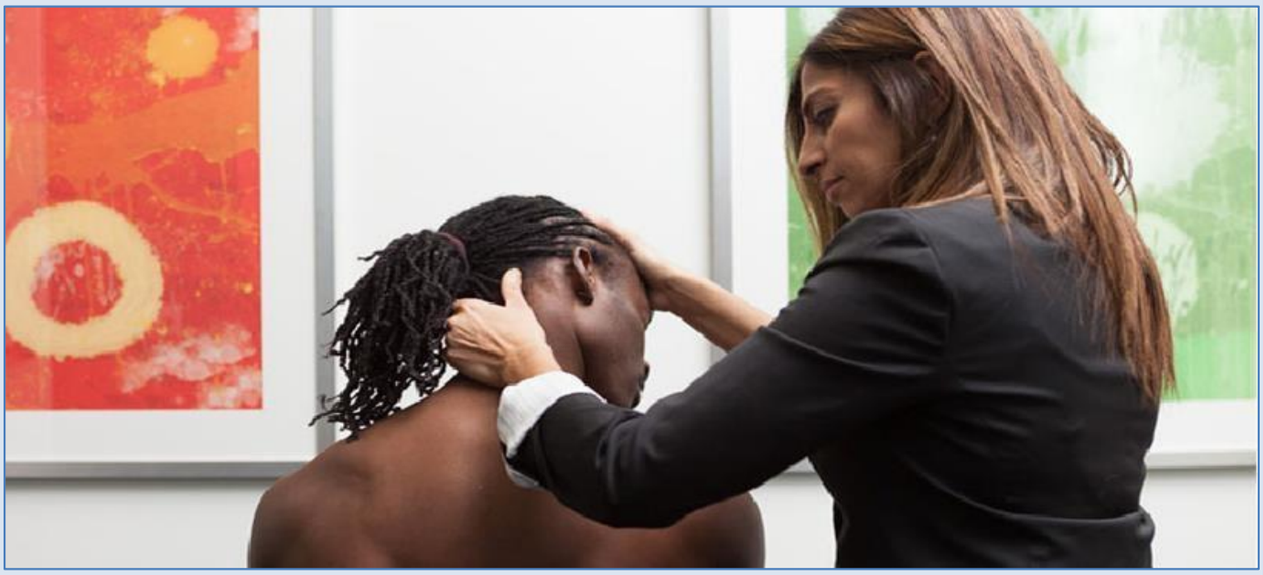
If you have any questions or concerns, please do not hesitate to contact Dr. André Bussières at andre.bussieres@mcgill.ca or Prakash Dhopte at prakash.dhopte@mail.mcgill.ca

Thank you for supporting chiropractic research.

Appendix 4

Do you have a neck pain associated disorder?

A new study evaluating the management of people with neck pain



We invite you to consider participating in this study that looks at ways of managing neck pain. This study involves testing a strategy for chiropractors to increase the use of a clinical practice guideline on the management of neck pain and to measure how patients respond to care.

Possible benefits of participating in this study include, at no extra cost: receiving the latest form of care including advice, multimodal care and exercise prescriptions.

Ask the clinic staff or your chiropractor for more information on how to participate in this study.

*This research study conducted by McGill University and the Centre for interdisciplinary Research in Rehabilitation of Greater Montreal (CRIR) in conjunction with the Canadian Chiropractic Guideline Initiative (CCGI).

Canadian Chiropractic Guideline Initiative
ADVANCING EXCELLENCE IN CHIROPRACTIC CARE

CRIR

McGill

Appendix 5

Participant enrolment procedures by Chiropractors

Approaching Patients:

The chiropractor will approach every patient who will be visiting his/her clinic with a history of nonspecific neck pain. We suggest using the following wording when approaching a potential participant:

Hello, my name is Dr. ……, The Canadian Chiropractic Guideline Initiative is conducting a study that aims to describe the effects and advantages of using a multimodal care approach. If you accept to participate, you will either receive this new approach to managing neck pain or the care I usually provide for people with a neck pain conditions such as yours. This decision is made by the research team. All participants will be asked to complete questionnaires about their own health on satisfaction with care. This study consists of obtaining information about your neck pain and its management. Your participation is expected to take between 30-45 minutes.

If you ever become uncomfortable for any reason and would like to stop participating, that is OK, just say so. Also, you should know that your data will be stored according to a coding number, so your responses will remain confidential.

If you have any questions, just ask me.

Thank you

Participant/Patient Information Sheet and Consent Form

"Chiropractors Can DO: Testing the Feasibility of Intervening to Optimize Chiropractic Care for Adults with Neck pain Disorders"

Principal Study Investigator:
Dr. André Bussières, DC, PhD, Assistant Professor, School of Physical and Occupational Therapy, Faculty of Medicine, McGill University.

1. INTRODUCTION:

You are invited to participate in a research study conducted by McGill University and the Canadian Chiropractic Guideline Initiative (CCGI) because you have neck pain and are undergoing care. The research team has developed a strategy to increase the use of multimodal care by chiropractors who are treating patients with neck pain. We are enrolling patients with neck pain across chiropractic practices in Canada.

In order to decide whether or not you want to be a part of this research study, you should be aware what is involved in the study and the potential risks and benefits. This form gives detailed information about the research study, which will be discussed with you. Once you understand the study, you will be asked to sign this form if you wish to participate. Please take your time to make your decision.

If you volunteer to be in this study, you may withdraw at any time. This will in no way affect the quality of care you receive at this clinic. You may also refuse to answer any questions that you do not want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

2. WHY IS THIS RESEARCH BEING DONE?

The objective of our research is to provide a foundation for understanding clinical responses to multimodal care in patients with non-specific neck pain. It involves testing a strategy for clinicians to increase the use of multimodal care and using clinically relevant and feasible outcome measures. Multimodal care means the use of two or more treatment modalities, including spinal manipulative therapy, mobilization, massage, exercise, and advice on self-management.

We plan to build on the results of this feasibility study by evaluating the strategies to integrate an evidence-based multimodal care approach into clinical practice for individuals with nonspecific neck pain.

3. STUDY PROCEDURES?

The researchers are comparing two methods of treatment currently used and approved in clinical care. You will be asked to attend your regular chiropractic visits for the treatment of your neck pain condition. Each visit may last between 10-20 minutes. Depending on the severity of your condition and how your neck pain responds to the treatments, your chiropractor may recommend you receive 1 to 3 visits per week for a duration of 2-6 weeks. The treatment plan provided by your chiropractor will remain essentially the same throughout the procedure. You will be asked to complete questionnaires to help us assess your pain and function levels.

4. WHAT ARE THE POSSIBLE RISKS?

There are no major risks to the safety of the patients in this study.

5. WHAT ARE THE POSSIBLE BENEFITS FOR ME AND/OR FOR SOCIETY?

We cannot promise any personal benefits to you from your participation in this study. By participating in this study, you will help healthcare workers better understand how to treat non-specific neck pain and determine the best dosage of multimodal care approach.

6. IF I DO NOT WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

It is important for you to know that you can choose not to take part in the study. If you do not wish to participate, we respect your decision and it will in no way affect your care or treatment and you may continue to receive your regular chiropractic care.

7. CONFIDENTIALITY?
No identifying information will be reported in any publications, reports or presentations. Confidentiality of the data will be protected by assigning each participant such as yourself a unique identification number replacing the name and the registration number of care providers and using that number on all data about participation. All paper records will be stored in a locked office. Only the principal investigator will have access to your data. All electronic records will be stored at the administrative services building of McGill University and protected by a user password. The study data retention is for 7 years after which time the data will be destroyed. For the research purposes, organizations involved in the study may audit your records.

9. WILL I BE COMPENSATE TO PARTICIPATE IN THIS STUDY?
You will not receive any reimbursements for any costs (e.g. travel or parking) for taking part in this study**.**

10. WILL THERE BE ANY COSTS?
Your participation in this research project does not involve additional costs to you.

11. IF I HAVE ANY QUESTIONS OR PROBLEMS, WHOM CAN I CALL?
A. If you have any questions or concerns about the study, please contact Dr. André Bussières at andre.bussieres@mcgill.ca. or by phone: 514-398-4400 ext-00489.
B. If you have any questions about your rights as a research participant, please contact Ilde Lepore, McGill IRB Ethics Officer, by email: ilde.lepore@mcgill.ca or by phone: 514-398-8302

CONSENT STATEMENT

I have read this consent form. I have been informed of the purpose of this study, and I am aware of the study procedures, and the risks and benefits of taking part. I have asked any questions I had, and my questions were answered. I have been informed that participation in this study is voluntary, and that I can withdraw from this study at any time without giving a reason. I agree to take part in this research study. I will receive a signed and dated copy of this consent form. I do not give up any of my legal rights by signing this consent form.

_____

Name of Participant

_____ _____

Signature of Participant Date

Consent form administered and explained in person by:

I acknowledge the receipt of participant's consent form and my responsibility for the care and well-being of the above research participant, to respect the rights and wishes of the research participant, and to conduct the study according to applicable Good Clinical Practice guidelines and regulations.

Principal Investigator of Study:

_____

Name and title

_____ _____

Signature Date

Appendix 6
Patient's Demographics

Please read the form carefully, sign and return it to your chiropractor. Your information will be confidential and will be used only for the research purposes. If you have any questions, feel free to ask your chiropractor and they will be happy to answer all your queries. The form will take only 5 minutes to complete.

Date: _____

1. Name: _____
2. Age: _____
3. Address: _____
4. Gender: ❑ Female ❑ Male
5. Occupation: _____
6. Education level: ❑ High School ❑ Post-secondary ❑ Graduate degree
7. Duration of neck pain: ❑ < 3 months ❑ > 3 months
8. History of trauma: ❑ Yes ❑ No
9. Any specific disease of neck: ❑ Yes ❑ No
10. Previous neck surgery: ❑ Yes ❑ No
11. Pregnant: ❑ Yes ❑ No If yes, please indicate the trimester:
❑ First (week 1-week 12) ❑ Second (week 13-week 28) ❑ Third (week 29-week 40)
12. Medication use for neck pain: ❑ Yes ❑ No
13. Total number of visits rendered for this condition: _____
14. Number of days in preceding months with neck pain:
❑ <30 ❑ 30-60 ❑ >60
15. Professional consulted previously for neck pain:
❑ Family physician ❑ Physiotherapist
❑Chiropractor ❑ Osteopath
❑ Massage therapist

_____
Signature

Appendix 7

Object: Research project entitled *'Chiropractors can do: Testing the feasibility of intervening to optimize chiropractic care for adults with neck pain disorders'.*

Dear Dr.,

Thank you again for accepting to participate in this study. You have been randomly assigned to the intervention group. Please find attached a copy of the 'Neck Pain Guideline'. After reading through this document, please follow this link to complete all components of the educational intervention:

http://www.chiropractic.ca/guidelines-best-practice/practitioners/resources/new-ccgi-webinar-series-and-learning-modules-2/

The course components and estimated time to complete are as follows:

1) A three-part webinar series: Please watch and complete all the three webinars with the associated quizzes (estimated time per webinar: 60 minutes).

2) Two (2) online clinical vignettes also accessible via this link. We recommend completing these vignettes soon after viewing the second webinar on the 'Neck Pain Guideline' (estimated time per clinical vignette: 10-15 minutes)

3) An online self-management module on the Brief Action Planning (BAP). We recommend viewing this module soon after the third webinar on the topic. The module is designed to demonstrate how clinicians can facilitate patient decisions regarding life style changes (estimated time of the module: 22 minutes).

To view the webinar and self-management module you will need to have an account with CMCC Continuing Education. If you do not already have one, this can be easily done by following the prompt when you click on the above link for the first time, and you will then be invited to create a new account. If at any point you experience technical challenges, please contact Mr. Greg Roberts at GRoberts@cmcc.ca so this can be resolved quickly. All the components should be completed by 29th November, 2015.

Kindly let us know when you have finished viewing all the components of the educational intervention. We will then send you a package containing all the necessary documents for the study. After receiving this package, you will be asked to recruit five (5) consecutive neck pain patients. Each recruited neck pain patient should complete the consent form to participate in the study before you start treating them.

Please do not hesitate to contact me at andre.bussieres@mcgill.ca or our co-investigator Prakash Dhopte at prakash.dhopte@mail.mcgill.ca if you have any questions.

We value your participation in this research and hope you will enjoy it.

Appendix 8

Object: Research project entitled *'Chiropractors can do: Testing the feasibility of intervening to optimize chiropractic care for adults with neck pain disorders'.*

Dear Dr.,

Thank you again for accepting to participate in this study. You have been randomly assigned to the control group. Please find attached a package including:

- A copy of the 'Neck Pain Guideline'
- Poster for recruitment of patients to display in your reception room
- Five (5) patient informed consent forms
- Questionnaires for the clinician and for the patient to complete
- Prepaid return envelope

Please consider the following key points designed for the intervention group.

1. Please recruit up to five (5) neck pain patients (new patients or regular patients presenting new neck pain complaint) within six to eight weeks and collect all the forms (consent, demographics and questionnaires). Please return all completed forms in the prepaid return envelope we sent you. *Patients are allowed to take the study information and questionnaires at their home and after reading it, they can then decide whether to participate or not. They can then bring the forms when coming for next sitting at your clinic. We encourage the staff member of the clinic to assist in filling the questionnaires if any of the patients is not able to do so.*

2. The Algorithm of the Neck Pain Guideline recommends treatment plans for acute (< 3 months duration) or chronic (> 3 months duration) neck pain. The demographic information (provided in the package) requires to mention the duration of the complaint of recruited patients. For example, for chronic neck pain, the following is recommended:

(i) A multi-modal approach to treatment including the modalities of spinal manipulative therapy, mobilization, exercise and massage can be recommended for both acute, and chronic neck pain.
(ii) Spinal manipulative therapy for the management of chronic neck pain.

3. At the end of the study (after three months/final visit of the patients), we will send another patient encounter form to know their level of pain and disability (clinical outcomes).

Please note that the components of the educational intervention (webinar series, clinical vignettes and online-learning module) may be watched only after the end of the study period (i.e., after you have recruited and treated the 5 neck pain patients).

We value your participation in this research. Please do not hesitate to contact me at andre.bussieres@mcgill.ca or our co-investigator Prakash Dhopte at prakash.dhopte@mail.mcgill.ca; if you have any questions.

Appendix 9

Dear Dr.,

Thank you for completing all the components of an educational intervention. Please find attached

a package including:

- A copy of the 'Neck Pain Guideline'
- Five (5) patient informed consent forms
- Questionnaires for the clinician to complete
- Questionnaires for the patient to complete

Please consider the following key points designed for the intervention group.
1. Please recruit up to five (5) neck pain patients (new patients or regular patients presenting new neck pain complaint) and collect all the forms (consent, demographics and questionnaires). Please return all completed forms in the prepaid return envelope we sent you. These forms must be collected from the patients at the time of recruitment (at the start of their treatment) and send to us in the return envelope. Also include questionnaires for the clinicians in the envelope.

2. You can then start implementing the strategies on your patients you have learned from Webinars, Clinical vignettes, Self-management strategies and the Clinical Practice Guideline.

3. The Algorithm of the Neck Pain Guideline recommends treatment plans for acute (< 3 months duration) or chronic (> 3 months duration) neck pain. The demographic information (provided in the package) requires to mention the duration of the complaint of recruited patients. For example, for chronic neck pain, the following is recommended:
(i) A multi-modal approach to treatment including the modalities of spinal manipulative therapy, mobilization, exercise and massage can be recommended for both acute, and chronic neck pain.
(ii) Spinal manipulative therapy for the management of chronic neck pain.

4. The third webinar and the e-learning module on Self-management strategies (The Brief Action Planning) teach clinicians a structured way to help patient make inform decisions about their own health. This can be applied by clinicians throughout care to discuss (with patient permission) ways to increase their level of physical activity.

5. At the end of the study (after three months), we will send you another envelope to assess patients health outcomes. This will consists of short questionnaires about their satisfaction with care and experience during the treatment protocol. The envelope will also include a short questionnaires for you regarding the skills you have learned in brief action planning and your experience and challenges encountered during the study period.

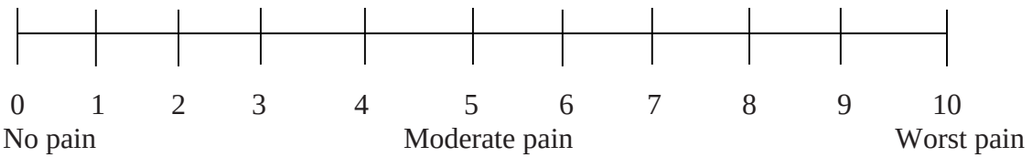
At the end of the study (after three months/final visit of the patients), we will send another patient encounter form to know their level of pain and disability (clinical outcomes).
We highly appreciate for your very active involvement in the research study.
If you have any questions, please contact me at andre.bussieres@mcgill.ca or our co-investigator Prakash Dhopte at prakash.dhopte@mail.mcgill.ca.

Thank you for supporting chiropractic research.

Appendix 10

How would you rate your presenting neck pain today?
(Please circle a number from 0 to 10):

0-10 Numeric **Visual Analog scale**



10. **Neck Disability Index**: This questionnaire has been designed to give your chiropractor information as to how your neck pain has affected you in your everyday life activities. Please answer each section; marking only ONE box which best describes your status today.

Section 1 – Pain Intensity
- I have no pain at the moment.
- The pain is very mild at the moment.
- The pain is moderate at the moment.
- The pain is fairly severe at the moment.
- The pain is very severe at the moment.
- The pain is the worse imaginable at the moment.

Section 2 – Personal Care (Washing, dressing, etc.)
- I can look after myself normally without causing extra pain.
- I can look after myself normally but it causes me extra pain.
- It is painful to look after myself and I am slow and careful.
- I need help every day in most aspects of self-care.
- I do not get dressed, wash with difficulty and style in bed.

Section 3 – Lifting
- I can lift heavy weights without extra pain.
- I can lift heavy weights but it gives extra pain.
- Pain prevents me from lifting heavy weights off the floor, but I can manage light to medium weights if they are conveniently positioned.
- I can lift only very lightweights.
- I cannot lift or carry anything at all.

Section 4 – Reading
- I can read as much as I want to with no pain in my neck.
- I can read as much as I want to with slight pain in my neck.
- I can read as much as I want with moderate pain in my neck.
- I can't read as much as I want because of moderate pain in my neck.
- I can hardly read at all because of severe pain in my neck.
- I cannot read at all.

Section 5 – Headache
- I have no headache at all.
- I have slight headaches, which come infrequently.
- I have moderate headaches, which come infrequently.
- I have moderate headaches, which come frequently.
- I have severe headaches, which come frequently.
- I have headaches almost all the time.

Section 6- Concentration
- I can concentrate fully when I want to with no difficulty.
- I can concentrate fully when I want to with slight difficulty.
- I have a fair degree of difficulty in concentrating when I want to.
- I have a lot of difficulty in concentrating when I want to.

- I have a great deal of difficulty in concentration when I want to.
- I cannot concentrate at all.

Section 7- Work

- I can do as much as I want.
- I can only do my usual work but no more.
- I can do most of usual work, but no more.
- I cannot do my usual work.
- I can hardly do any work at all.
- I can't do any work at all.

Section 8 – Driving

- I can drive my car without any neck pain.
- I can drive my car as long as I want with slight pain in my neck.
- I can drive my car as long as I want with moderate pain in my neck.
- I can't drive my car as long as I want because of moderate pain in my neck.
- I can hardly drive at all because of severe pain in my neck.
- I can't drive my car at all.

Section 9 – Sleeping

- I have no trouble sleeping.
- My sleep is slightly disturbed (less than 1 hour sleep loss).
- My sleep is mildly disturbed (1-2 hour sleep loss.)
- My sleep is moderately disturbed (2-3 hours sleep loss).
- My sleep is greatly disturbed (3-5 hours sleep loss).
- My sleep is completely disturbed (5-7 hours sleep loss).

Section 10- Recreation

- I am able to engage in all my recreational activities with no neck pain at all.
- I am able to engage in all my recreational activities with some pain in my neck.
- I am able to engage in most but not all of my usual recreational activities because of pain in my neck.
- I am able to engage in a few of my usual recreational activities because of pain in my neck.
- I can hardly do any recreational activities because of pain in my neck
- I can't do any recreational activities at all.

11. How satisfied are you with the chiropractic care you have received?

- ❑ Very satisfied
- ❑ Satisfied
- ❑ Somewhat satisfied
- ❑ Dissatisfied
- ❑ Very dissatisfied

12. If you had another episode of neck pain, how likely would you be to choose chiropractic care again?

- ❑ Definitely would
- ❑ Very likely
- ❑ Somewhat likely
- ❑ Not likely

Appendix 11

Patient's information (provided by Chiropractor)

1. Patient's Name/Age: _____/_____

2. Patients Address: _____

3. Patient's gender: ❑ Female ❑ Male ❑ Other

4. Total number of visits rendered for this condition _____

5. Consent form obtained from patient? ❑ Yes ❑ No

6. Patient meets eligibility criteria? ❑ Yes ❑ No

7. Did you follow the guidelines for treatment of neck pain? ❑ Yes ❑ No

8. Did the patient complete the treatment plan that you recommended? ❑ Yes ❑ No
   b. If no, why not?
   ❑ The patient was referred to another provider.
   ❑ The patient discontinued care of their own accord.

9. a. Was the primary condition caused by history of trauma? ❑ Yes ❑ No
   b. If yes, what was the mechanism of the trauma?
   ❑ Automobile collision ❑ Sports ❑ Fall ❑ Other (Describe) _____

10. Did the patient have a history of neck pain? ❑ Yes ❑ No

11. Duration of neck pain: Month or year _____ or _____

12 a. Did you refer this patient to another health care provider? ❑ Yes ❑ No
   b. If yes, what type of health care provider(s)? (Mark all that apply)
❑ Another chiropractor ❑ Physical therapist ❑ Medical doctor ❑ Naturopath
❑ Osteopath ❑ Massage therapist ❑ Acupuncturist ❑ other _____

13. Which interventions did you undertake or recommend for this patient at this visit?
(The list below contains techniques that are commonly used by chiropractors; please tick all that apply, or add to the list, as relevant to you. Note: this list is not intended to be comprehensive or guide treatment; it is simply a way of documenting techniques employed):

❑ Spinal manipulation
❑ Spinal adjustment *(please specify):* _____
❑ Mobilisation
Other techniques *(please circle or specify)*:
Activator / SOT blocks / Flexion distraction
Other *(specify):* _____
❑ Massage
❑ Acupuncture / dry needling
❑Electrotherapy (e.g. TENS, interferential, ultrasound) Thermal modalities (e.g. heat, ice)
❑ Spinal traction
❑ Bed rest for _____ days *(please specify number of days)*
❑ Advice to stay active
❑ Advice regarding alternate ways of moving or performing activities
❑ Advice to avoid pain provoking movements
❑ Recommended home exercises (neck)
❑ Recommended physical activity (e.g. walking, swimming, etc…)
❑ Neck brace
❑ Printed information
(Please specify): _____

❑ Work modification (Ergonomics advice)

❑ Other 1
(Please specify): _____
❑ Referral to another health care provider (*e.g. another chiropractor, physiotherapist, general practitioner, pain clinic or specialist)*

Appendix 12

Patient's questionnaire/Encounter form

Please mark the best answer to the following questions. Afterward, place your completed questionnaire in the attached envelope and seal it. Your answers will be returned to the Investigator and will remain completely confidential.

1. Name/Age: _____

2. Address: _____

3. Gender: ❑ Female ❑ Male

4. Total number of visits to this clinic for neck pain:

5. Did you receive treatment for your neck pain from other health care providers?
❑ Yes ❑ No

5a. If yes, what type of health care provider(s)? (Mark all that apply)

❑ Another chiropractor ❑ Naturopath
❑ Medical doctor ❑ Massage therapist
❑ Osteopath ❑ Holistic practitioner
❑ Acupuncturist ❑ Other
❑ Physical therapist _____

6. If you saw other health care provider(s), which provider helped you the most?

❑ This chiropractor ❑ Physical therapist
❑ Another chiropractor ❑ Naturopath
❑ Medical doctor ❑ Massage therapist
❑ Osteopath ❑ Holistic practitioner
❑ Acupuncturist ❑ Other ❑ Not applicable

7. Which treatment(s) and advice did your chiropractors recommend or give you for your neck pain at this visit *(The list below contains techniques that are commonly used by chiropractors; please tick all that were provided to you, or add to the list, as relevant to you)*

❑ Manual therapy such as massage, manipulation or neck movement by chiropractor
❑ Acupuncture / dry needling
❑Electrotherapy (e.g. TENS, interferential, ultrasound) Thermal modalities (e.g. heat, ice)
❑ Spinal traction
❑ Bed rest for _____ days *(please specify number of days)*
❑ Advice to stay active
❑ Advice regarding alternate ways of moving or performing activities
❑ Home exercise (neck exercises)
❑ Printed information
❑ Physical activity (e.g., walking, swimming, etc…)
❑ Referral to another health care provider *(e.g. another chiropractor, physiotherapist, general practitioner, pain clinic or specialist).If yes, please specify*

8. Please describe your experience with the home program (if you need additional space, please use the back of this questionnaire):

_____
_____
_____
_____
_____
_____
_____

Appendix 13

Brief Action Planning skills survey

Please check the box with ✓ that best describes the skills covered in any training you have had (including the recent BAP training) and your experiences with those skills. The responses range from left to right, starting with not having an opportunity to learn about it, to being confident using a skill you have learned. You may choose one answer per row.

	I don't know much about this	**I tried to practice this during my training**	**I use this skill in my work**	**I am confident using this skill routinely in my work**
The spirit of Motivational Interviewing				
Teach-back for health literacy				
Using reflections to emphasize hope and encourage change				
Helping patients create action plans				
Collaborative problem solving				
Checking in on action plans				
Using a confidence scale or ruler				
Helping patients to talk about change				
Developing strategies for working with challenging situations and people				
Using Ask-Tell-Ask when giving information or advice				

Appendix 14
Brief Action Planning (BAP)

Post-intervention questionnaire

This questionnaire was design to help us gather more information about your experience of using the BAP tool in your practice.

Read carefully the following statements. For each statement, please answer by circling ONE number which best applies to you.
Let's Be Better Health Care Partners: We Want *Your* Feedback!

1. How important is it for you to explain things in a way your patients can understand?
0 1 2 3 4 5 6 7 8 9 10
Not at all important Extremely important

How confident are you that you can explain things in a way that your patients can understand?
0 1 2 3 4 5 6 7 8 9 10
Not at all confident Extremely confident

2. How important is it for you to elicit your patients' preferences and cultural traditions when planning their care?
0 1 2 3 4 5 6 7 8 9 10
Not at all important Extremely important

How confident are you that you can elicit your patients' preferences and cultural traditions when planning their care?
0 1 2 3 4 5 6 7 8 9 10
Not at all confident Extremely confident

3. How important is it for you to work *collaboratively* with your patients to set goals to help them to improve their health and well-being?
0 1 2 3 4 5 6 7 8 9 10
Not important Very important

How confident are you that you can work *collaboratively* with your patients to set goals to help them to improve their health and well-being?
0 1 2 3 4 5 6 7 8 9 10
Not at all confident Extremely confident

4. How important is it for you to address the barriers that your patients' face in setting or reaching their goals?
0 1 2 3 4 5 6 7 8 9 10
Not at all important Extremely important

How confident are you that you can address the barriers that your patients' face in setting or reaching their goals?
0 1 2 3 4 5 6 7 8 9 10
Not at all confident Extremely confident

5. How important is it for you to arrange or provide follow up with your patients regarding their goals?
0 1 2 3 4 5 6 7 8 9 10
Not at all important Extremely important

How confident are you that you can arrange or provide follow up with your patients regarding their goals?
0 1 2 3 4 5 6 7 8 9 10
Not at all confident Extremely confident

6. How important is it for you to talk with your patients about including family or other supporters in a care plan?

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not at all important										Extremely important

How confident are you that you can talk with your patients about including family or other supporters in a care plan?

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not at all confident										Extremely confident

7. How important is it for you to work with your patients to facilitate behavior changes that will make their health better?

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not at all important										Extremely important

How confident are you that you can work with your patients to facilitate behavior changes that will make their health better?

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Not at all confident										Extremely confident

Appendix 15

Patient Survey - Brief Action Planning

Put a *X* in the box that best describes how confident you are:

	Not Very Confident 	**Somewhat Confident** 	**Very Confident** 	**I do not have any health problems**
How confident (sure) are you that you can control and manage most of your health problems?				

Support for Healthy Behaviors

Staying healthy can be challenging. We would like to learn about the type of help you get from your chiropractor. Your answers will be kept confidential and will not be shared with your chiropractor.

ver the past 3 months, when I received health care, I was:

	None of the time	A Little of the Time	Some of the Time	Most of the Time	Always
Asked to talk about my goals for my health.	☐1	☐2	☐3	☐4	☐5
Asked for my ideas when we made a plan for my health.	☐1	☐2	☐3	☐4	☐5
Helped to set specific plans to improve my health, such as eating or exercise.	☐1	☐2	☐3	☐4	☐5
Helped to make a plan that I could carry out in my daily life.	☐1	☐2	☐3	☐4	☐5
Contacted me after a visit to see how things were going.	☐1	☐2	☐3	☐4	☐5