Evidence-Based Review

Effectiveness and Safety of Chiropractic for the Management of Musculoskeletal Conditions

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Abbreviations

The following abbreviations are used in this report and are collated here for the reader's convenience

Abbreviation		Abbreviation		
ACC	Accident Compensation Corporation	NPRS	Numeric pain rating scale	
ADE	Adverse drug event	NSD	No significant difference	
AE	Adverse event	NSLBP	Non-specific low back pain	
CAD	Cervical artery dissection	NSCLB	Non-specific chronic low back pain	
ССТ	Controlled clinical trial	ODI	Oswestry Disability Index	
CDH	Cervical disc herniation	OR	Odds ratio	
CGH	Cervicogenic headache	PAR	Participatory action research	
CSMT	Chiropractic spinal manipulative therapy	PICOT	Population, intervention, control, outcome, time	
CI	Confidence interval	PRO	Patient-reported outcome	
CNP	Chronic neck pain	PT	Physiotherapy	
cROM	Cervical range of motion	QOL	Quality of life	
EMG	Electromyographic	RCT	Randomised controlled trial	
HRQL	Health-related quality of life	RMDQ	Roland-Morris Disability Questionnaire	
HVLA	High velocity low amplitude	ROM	Range of motion	
iCAHE	International Centre for Allied Health Evidence	RR	Risk ratio	
IAM	Instrument-applied manipulation	Rx	Treatment	
LBP	Low back pain	S/A	Sub-acute	
LLLT	Low-level laser therapy	SAE	Serious adverse event	
LSS	Lumbar spinal stenosis	SAP	Self-acupressure pillow	
LVLA	Low velocity low amplitude	SIGN	Scottish Intercollegiate Guidelines Network	
MA	Meta-analysis	SMD	Standard mean difference	
MAM	Manually applied manipulation	SMT	Spinal manipulative therapy	
MC	Maintenance care	SD	Significant difference	
mCPR	Modified clinical prediction rule	SR	Systematic review	
MD	Mean difference	UC	Usual care	
MeSH	Medical Subject Headings	UK	United Kingdom	
MNP	Mechanical neck pain	USA	United States of America	
MRI	Magnetic resonance imaging	VAS	Visual analogue scale	
mth	Month	VBA	Vertebrobasilar artery	
NSCNP	Non-specific chronic neck pain	WAD	Whiplash-associated disorders	
NDI	Neck Disability Index	wks	Weeks	
Quality ra	atings			
HQ	High quality	CS	Can't say	
AQ	Acceptable quality	NA	Not applicable	
LQ	Low quality	QS	Quality of study	



Timeframes

The following timeframes are used in this review

Timeframe	Duration from Commencement of Treatment
Short Term	< 6 weeks
Medium Term	6 to 12 weeks
Long Term	> 12 weeks



Executive Summary

Objective of the Review

The objective of this evidence-based review is to systematically identify, critically appraise, extract and synthesise the published academic literature on the effectiveness and safety of chiropractic interventions for the management of musculoskeletal conditions and injuries. This review aims to answer the following research questions:

Primary research questions:

- 1. How effective is chiropractic in the management of musculoskeletal conditions?
- 2. How safe is chiropractic in the management of musculoskeletal conditions?

Secondary research questions:

- 1. How clinically effective and safe is chiropractic for the treatment of different injuries, conditions and body sites?
- 2. Are there any specific patient subgroups for which chiropractic is more, or less, effective?
- 3. What is the evidence on effectiveness for different injury or condition subgroups?
- 4. Does effectiveness vary according to post-injury or recovery stage, e.g. sub-acute versus chronic?
- 5. What evidence is there regarding the recommended length of treatment, number of treatments and duration of individual treatment sessions?

Evidence Sourced

The literature search for all musculoskeletal conditions using 10 databases yielded 24,306 articles. The final search was conducted on 11 November 2021. After scrutiny, 24,168 articles were excluded as duplicates or for failing to meet the inclusion criteria, leaving 138 studies for inclusion. These included 45 systematic reviews, 36 controlled trials, 22 observational studies and 35 case reports.

The main issues affecting the methodological quality of the studies included:

Systematic reviews

- A) Extensive searches were often not reported.
- B) Few reviews considered the potential for publication bias in their reporting.
- C) Reviews often included studies where treatment was delivered by non-chiropractors, for example physiotherapists, general practitioners, manual therapists and osteopaths.
- D) The included studies were often of poor quality, with moderate to high risk of bias, but quality of study was not taken into account in the synthesis of the findings.
- E) Reviews often included heterogeneous populations, with a large variety of musculoskeletal conditions, and combined the results.
- F) Excluded studies were rarely listed.
- G) Heterogeneous comparison groups were often used.
- H) Significant variability in treatments was common within the reviews.



Primary studies

- A) Lack of long term follow-up was common.
- B) Subjects and investigators were rarely blinded to the intervention involved.
- C) Expertise of practitioners administrating the intervention was rarely reported.
- D) Many studies did not report use of power calculations to inform sample size.
- E) Studies often did not control for confounders, for example involvement in co-interventions such as exercise/medication etc.
- F) Some studies failed to report the use of intention to treat analysis.
- G) Where studies were carried out at more than one site, results which would have allowed comparison between the sites were not provided.

General comments on the evidence base of chiropractic for musculoskeletal conditions:

- A) Follow-up times during the studies were often not sufficient to evaluate effectiveness over longer times.
- B) Many studies/reviews used practitioners who were not trained chiropractors. Due to variations in training this presents a significant confounder to understanding the relationship between chiropractic and treatment effectiveness. The aim of this review was to explore the evidence base of chiropractic for musculoskeletal conditions, not that of general manual therapy; therefore, for validity purposes many studies which reported on treatments delivered by non-chiropractors were excluded.
- C) Insufficient quality and quantity of studies for many conditions meant conclusions about effectiveness could not be made.
- D) The available evidence made it difficult to draw conclusions on the relationship between training/experience and safety/risk because it was poorly reported in papers.

Summary of Findings

The tables in the next section outline the key findings of the evidence-based review. The findings are presented in the form of evidence statements, which offer a systematic and consistent way of summarising the evidence base for each injury, condition or research question. See Section 2.7 on data synthesis for a description of how the evidence statements were developed.

Each evidence statement is aligned with the PICOT framework, so that readers can quickly identify the type of patient/intervention/treatment timeframe the statement may be applied to:

The PICOT framework

Р	Patient or Population
Ι	Intervention(s)
С	Comparison or Control
0	Outcome(s)
Т	Time or Timeframe

The tables also report the volume and level of evidence on which each finding is based.



Summary of findings: evidence statements and PICOT framework

1. Primary research questions

Primary research question 1: How effective is chiropractic in the management of musculoskeletal conditions?				
Evidence statement		PICOT framework	Volume & type of evidence	
There is variable evidence, in terms of volume, strength, quality and consistency, that chiropractic is effective in the management of musculoskeletal conditions:	Р	Patients with musculoskeletal conditions		
 The vast majority of the evidence on effectiveness focuses on effectiveness over the short to medium term The published evidence on effectiveness covers a wide range of study designs. For a number of conditions, the only available evidence comes from lower- 	Т	Chiropractic interventions	Based on 430 studies (including 52 systematic reviews, 152 RCTs, 95 cohort studies and 131 case	
	С	-		
	0	Pain & function		
 level studies (e.g. case studies/observational studies) The strength and volume of the available evidence vary significantly over the different injury types/conditions and body sites 			reports)	
		Short to long term		

Primary research question 2: How safe is chiropractic in the management of musculoskeletal conditions?				
Evidence statement		PICOT framework	Volume & type of evidence	
There is usuable suideness in terms of uslance, strength, and sensistence, that	Ρ	Patients with musculoskeletal conditions	Based on 430 studies	
There is variable evidence, in terms of volume, strength, and consistency, that chiropractic treatment is safe in the management of musculoskeletal conditions. The risk of adverse event, either minor or major, varies significantly over the different injury types/conditions and body sites	Т	Chiropractic interventions	(including 52 systematic reviews, 152 RCTs, 95 cohort studies and 131 case	
	С	-		
	0	Safety	reports)	
	т	Short to long term		



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2. Secondary research questions

Secondary question 1: How clinically effective and safe is chiropractic for the treatment of different injuries, conditions and body sites?

I. CERVICAL

	Evidence statement		PICOT framework	Level of evidence	
	There is consistent moderate quidence that chiranzactic		Acute & sub-acute NSNP	Consistent moderate	
	interventions may reduce pain and improve range of motion (ROM) in the short term in patients presenting with	Т	Chiropractic interventions	Based on 2 HQ (including 1 RCT each) and 1 LQ	
		С	-		
Non-specific	non-specific neck pain	0	Pain & ROM	(Including 4 RCIS) SRS, plus 4	
neck pain		т	Short term		
acute &	There is limited moderate evidence that chiropractic	Ρ	Acute & sub-acute NSNP		
sub-acute	intervention is as effective as mobilisation or use of an activator instrument in reducing pain and improving range of motion in the short term in patients presenting with acute or sub-acute non-specific neck pain	Т	Chiropractic interventions	Limited moderate Based on 2 AQ RCTs	
		с	Mobilisation or use of an activator instrument		
		0	Pain & ROM		
		т	Short term		
	There is consistent moderate evidence that chiropractic intervention is as effective as physical therapy, or dry needling, in reducing pain and improving function in the short term in patients presenting with chronic nonspecific neck pain	Ρ	Chronic NSNP	Consistent moderate	
Non-specific		Т	Chiropractic interventions	Based on 1 LQ (involving 4	
neck pain (NSNP): chronic		С	Physical therapy or dry needling	RCTs) and 1 HQ (involving 1	
		0	Pain & function	RCT) SRs, plus 2 AQ and 1 LQ	
		т	Short term	KUIS	
	There is consistent strong evidence that chiropractic manipulative therapy is as effective as mobilisation, physical	Ρ	Chronic NSNP	Consistent strong	
		Т	Chiropractic manipulative therapy	Based on 1 LQ SR (with 4	
	therapy, or dry needling, in reducing pain and improving	С	Mobilisation, physical therapy or dry needling	included RCTs) and 1 HQ SR	



	function in the short term in patients presenting with chronic non-specific neck pain				
Non-specific					
neck pain		Ρ			
(NSNP):	There is limited evidence that chiropractic manipulative	Т			
chronic	therapy may reduce pain, improve range of motion or reduce disability in the long term in patients presenting with	С			
	chronic non-specific neck pain	0			
		т			
	There is inconsistent weak evidence that chiropractic	Ρ			
	management may reduce pain and improve function in patients with acute, sub-acute or chronic whiplash associated disorder				
Whiplash					
disorder		T			
(WAD)	There is limited weak evidence that a chiropractic				
	multimodal approach including mobilisation, information/				
	instruction, unsupervised and supervised cROM exercise may reduce pain and improve function in patients with acute, sub-acute or chronic whiplash associated disorder				
		ı D			
Cervical pain	There is limited weak evidence that chiropractic	1			
due to facet dysfunction	interventions may reduce pain and improve range of motion				
	in the short/medium term in patients with cervical pain due to facet dysfunction				

0	Pain & function	(with 2 included RCTs), plus
т	Short term	2 AQ and 1 LQ RCTs
Ρ	Chronic NSNP	
I.	Chiropractic manipulative therapy	
С	-	Limited evidence
0	Pain, ROM & disability	
т	Long term	
Ρ	Acute, sub-acute or chronic WAD	
I.	Chiropractic management	Inconsistent weak
С	-	Based on 1 AQ SR
0	Pain & function	(involving 2 studies)
т	Not reported	
Ρ	Acute, sub-acute or chronic WAD	
Т	Chiropractic management, multimodal	Limited weak
С	-	Based on 1 AQ SR
0	Pain & function	(involving 2 studies)
т	Not reported	
Ρ	Cervical pain due to facet dysfunction	
I	Chiropractic interventions	
С	-	Limited weak Based on 1 HO PCT
0	Pain & ROM	
т	Short to medium term	



		P			
	There is limited weak evidence that chiropractic				
Cervical	interventions may improve pain and disability in the	C			
spondylosis	short/medium term in patients with tervical spondylosis	C			
		т			
	There is limited you weak avidence that chirepractic	P			
Cervical	interventions may improve pain and function in the	I			
radiculo-	short/medium term in patients with cervical radiculopathy	C			
patny	from cervical disk herniation (CDH)				
	There is consistent strong ouideness that objective				
	interventions may reduce headache pain, intensity and frequency in the short/medium term for patients with				
	cervicogenic headaches	C			
Cervicogenic					
neadache	There is inconsistent moderate evidence that chiropractic	P			
	manipulation is as effective as laser, massage or physical therapy in reducing headache pain intensity and frequency in the short/medium term for patients with cervicogenic headaches				
		Т			
Safety	There is consistent strong evidence of a relationship	P			
	between minor adverse events and chiropractic treatment				
	for neck pain				

	Cervical spondylosis	
	Chiropractic interventions	Limited weak
	-	Based on 1 AQ and 1 LQ RCTs
	Pain & disability	and 2 case series
	Short to medium term	
	Cervical radiculopathy from CDH	
	Chiropractic interventions	Limited very weak
	-	Based on 1 case series
	Pain & function	
	Short to medium term	
	Cervicogenic headache	Consistent strong - Based on
	Chiropractic interventions	1 HQ (involving 5 RCTs) and 3
	-	AQ SRS (Including respectively 9 qualitative studies 3 RCTs
	Headache pain, intensity & frequency	1 RCT), plus 1 HQ RCT
	Short to medium term	
	Cervicogenic headache	Inconsistent moderate
	Chiropractic interventions	Based on 1 HQ (involving 2
	Laser, massage or physical therapy	RCTs) SR and 3 AQ SRs
1	Headache pain, intensity & frequency	(including 3 RCTs, 1 RCT, 1
	Short to medium term	RCT respectively)
	Neck pain	Consistent strong
	Chiropractic treatment	Based on 2 LQ and 1 HQ SRs
	-	



		0	Minor adverse events	
		т	Short to medium term	
	There is inconsistent weak evidence of a relationship between serious adverse events and chiropractic treatment for neck pain	Ρ	Neck pain	Inconsistent weak
		I	Chiropractic treatment	Based on 2 LQ SRs (including
		С	-	6 case control/12 case
Safety		ο	Serious adverse events	studies), 2 AQ SRs (including 2 case control/227 case studies) & 1 HQ SR (including 6 RCTs and 2 case series)
Salety		т	Short to medium term	
	There is limited weak evidence of a relationship between minor adverse events and chiropractic treatment for neck pain	Ρ	Neck pain	
		I	Chiropractic treatment	Limited weak
		С	-	Based on 1 AQ SR (including
		0	Minor adverse events	o conort studies and SI RCIS)
		т	-	

II. THORACIC					
	Evidence statement		PICOT framework	Level of evidence	
Non-specific		Ρ	Non-specific thoracic spine pain		
thoracic spine pain	There is inconsistent weak evidence that chiropractic interventions may have an effect on pain and function for patients with non-specific thoracic pain	I	Chiropractic interventions	Inconsistent weak	
		С	-	Based on 1 AQ and 1 HQ	
		0	Pain and function	RCT	
		т	-		
	There is inconsistent weak evidence that chiropractic	Ρ	Chest wall pain	Inconsistent weak	
	interventions may have an effect on pain and function for	Т	Chiropractic interventions		



Chest wall	patients with chest wall pain in the short term (4 weeks) but		-	Based on 3 AQ RCTs
pain	no better than self-management in the long term	0	Pain and function	
			Short term (+), long term (-)	
		Р	Thoracic outlet syndrome	
	There is limited very weak evidence of effectiveness of chirapractic management for treating symptoms in therasis	Т	Chiropractic interventions	Limited very weak
	outlet syndrome	С	-	Based on 1 case study
Thoracic	,	0	Symptoms	
outlet		т	Short term	
syndrome			Thoracic outlet syndrome	
	There is no evidence of effectiveness of chiropractic care versus usual care or no care for thoracic outlet syndrome	I	Chiropractic interventions	
		С	Usual care or no care	No evidence
		0	-	
		т	-	
	There is limited very weak evidence of effectiveness of chiropractic management for postural signs in Scheuermann's kyphosis syndrome	Ρ	Scheuermann's kyphosis syndrome	
		I	Chiropractic interventions	Limited very weak
		С	-	Based on 1 case study
Scheuer-		0	Posture	based on 1 case study
mann's		т	Short term	
kyphosis syndrome		Ρ	Scheuermann's kyphosis syndrome	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic interventions	
	versus usual care or no care for Scheuermann's kyphosis	С	Usual care or no care	
	synutome	0	-	
		т	-	



Safety There is limited weak evidence of a relationship between adverse events and chiropractic treatment for thoracic pain	Ρ	Thoracic pain	Limited weak	
	There is limited weak evidence of a relationship between adverse events and chiropractic treatment for thoracic pain	Т	Chiropractic treatment	Based on 2 AO (including
		С	-	respectively 7 case reports,
		0	Adverse events	15 case studies and 4 case series) SRs
		т	-	

III. LUMBAR					
	Evidence statement		PICOT framework	Level of evidence	
	There is consistent strong evidence that chiropractic interventions may reduce pain and improve function in the short/medium term for patients with non-specific low back pain	Ρ	NSLBP	Consistent strong	
		I	Chiropractic interventions	Based on 5 AQ SRs (incl. 4 RCTs and 2 observational	
Non-specific low back pain (NSLBP)		С	-	studies / 3 RCTs / 1 RCT / 15 RCTs / 2 RCTs and 1 CT	
		0	Pain & function	respectively), and 4 HQ SRs	
		т	Short to medium term	 (including 2 RCTs / 12 RCTs / 6 RCTs / 16 RCTs respectively), plus 11 RCTs, 8 observational studies and 1 case study 	
		Ρ	NSLBP	Inconsistent strong	
	intervention is no more effective than massage, exercise	I	Chiropractic interventions	Based on 2 AQ SRs (incl.	
	therapy, medical care or physical therapy in reducing pain	с	Massage, exercise therapy, medical care or physical therapy	3 RCTs / 15 RCTs respectively) and 3 HQ SRs	



	and improving function in the short/medium term for		Pain & function	(including 12 RCTs / 6 RCTs	
	patients with non-specific low back pain	т	Short to medium term	16 RCTs respectively), plus 1 AQ and 1 HQ RCTs	
		Ρ	NSLBP		
	There is inconsistent weak evidence for the effectiveness of	I	Chiropractic interventions	Inconsistent weak	
	chiropractic interventions on pain and function in the long	С	-	Based on 1 HQ SR (including	
	term for patients with non-specific low back pain	ο	Pain & function	16 RCTs) plus 1 AQ RCT	
		Т	Long term		
		Ρ	Disc herniation		
Disc	There is inconsistent weak evidence that chiropractic interventions may reduce pain and improve function in the short/medium term for patients with disc herniation	I	Chiropractic interventions	Inconsistent weak	
herniation		С	-	Based on 1 observational	
		ο	Pain & function	study and 1 case study	
		т	Short to medium term		
	There is limited weak evidence that chiropractic interventions may reduce pain and improve function in the short/medium term for patients with spinal stenosis	Р	Spinal stenosis	Limited weak	
Spinal		I	Chiropractic interventions		
stenosis		С	-	Based on 1 AQ RCT	
		ο	Pain & function		
		т	Short to medium term		
		Ρ	Sacroiliac joint pain	Limited weak	
		I	Chiropractic interventions	Based on 1 case-control	
Sacroiliac joint pain	There is limited weak evidence of effectiveness of	С	-	study	
	chiropractic management for sacroiliac joint pain	0	Pain & function		
		т	Short term		



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	There is no evidence on the effectiveness of chiropractic	Ρ	Sacroiliac joint pain	
		I	Chiropractic interventions	No evidence
	management versus usual care or no care for sacroiliac joint	С	Usual care or no care	Based on 1 case-control
	pain	0	-	study
		т	-	
		Р	Low back pain	Consistent moderate
	There is consistent moderate evidence of a relationship between minor adverse events and chiropractic treatment for low back pain	I.	Chiropractic treatment	Based on 1 AQ SR (incl. 41
		С	-	case studies) and 2 HQ SRs
		0	Minor adverse events	(including 7 case studies /
Safety		т	Short to medium term	10 RCTs respectively)
	There is limited weak evidence of a relationship between serious adverse events and chiropractic treatment for low back pain	Р	Low back pain	
		I	Chiropractic treatment	Limited weak
		С	-	Based on 1 AQ and 2 HQ
		0	Serious adverse events	SRs
		т	Short to medium term	

IV. SPINAL PAIN IN GENERAL

	Evidence statement	PICOT framework		Level of evidence
Spinal pain in general	There is consistent strong evidence that chiropractic interventions may be effective for general spinal pain	Ρ	General spinal pain	Consistent strong
		Т	Chiropractic interventions	Based on 1 AQ SR (including
		С	-	(involving 7 RCTs and 25
		0	Pain	comparative studies



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		т	Short to medium term	respectively), plus 1 AQ RCT and 5 cohort studies
		Ρ	General spinal pain	Consistent moderate
	There is consistent moderate evidence that chiropractic	Т	Chiropractic interventions	Based on 2 HQ SRs
intervention is no more effective for general spinal pain th	С	Usual care or sham treatment	(including 7 RCTs and 25	
	usual care or sham treatment	0	Pain	comparative studies
		т	Short to medium term	RCT

V. LOWER LIMB

	Evidence statement		PICOT framework	Level of evidence	
		Ρ	Non-specific hip pain		
Non-specific hip		Т	Chiropractic management	Limited weak	
pain	There is limited weak evidence of effectiveness of	С	-	Based on 1 RCT	
		ο	Pain	based on 1 Ker	
		т	Short term		
	There is consistent weak evidence of effectiveness of chiropractic management for pain and function in patients with hip osteoarthritis	Ρ	Hip osteoarthritis	Consistent weak	
Hin		Т	Chiropractic management	Based on 3 RCTs (2 HQ, 1 LQ), plus 2 case series and 2 case studies	
osteoarthritis		С	-		
		ο	Pain and function		
		т	Short term		
		Ρ	FAI	Limited very weak	
	There is limited very weak evidence of effectiveness of chiropractic management for EAL	Т	Chiropractic management	Based on 1 case series	
	chiropractic management for FAI	С	-	Based on I case series	



		0	Pain and function
Femoro-		т	Short term
acetabular		Ρ	FAI
impingement		I	Chiropractic management
(FAI)	There is no evidence of effectiveness of chiropractic care	С	Usual care or no care
		ο	-
		т	-
		Ρ	Proximal hamstring tendinop
	There is limited very weak evidence of effectiveness of	I	Chiropractic management
	chiropractic management for proximal hamstring tendinopathy		-
Proximal hamstring			Pain
		т	Short term
tendinopathy	There is no evidence of effectiveness of chiropractic care versus usual care or no care for proximal hamstring tendinopathy	Ρ	Proximal hamstring tendinop
		Т	Chiropractic management
		С	Usual care or no care
		0	-
			-
		Ρ	Non-specific knee pain
	There is limited very weak evidence of effectiveness of	I.	Chiropractic management
	chilopractic management for hon-specific knee pain	С	-
Non-specific		0	Pain
knee pain		т	Short term
	There is no evidence of effectiveness of chiropractic care	Ρ	Non-specific knee pain
	versus usual care or no care for non-specific knee pain	I.	Chiropractic management
			Usual care or no care

C	Pain and function	
Г	Short term	
Р	FAI	
I	Chiropractic management	
С	Usual care or no care	No evidence
C	-	
Г	-	
Р	Proximal hamstring tendinopathy	
I	Chiropractic management	Limited very weak
С	-	Based on 1 case study
C	Pain	,
Г	Short term	
Р	Proximal hamstring tendinopathy	
I	Chiropractic management	
С	Usual care or no care	No evidence
C	-	
Г	-	
Р	Non-specific knee pain	
I	Chiropractic management	Limited very weak
С	-	Based on 1 case study
C	Pain	
Г	Short term	
Р	Non-specific knee pain	
I	Chiropractic management	No evidence
С	Usual care or no care	



		0	-		
		т	-		
		Ρ	PFPS	Limited weak	
	There is limited weak evidence of effectiveness of	Т	Chiropractic management	Bacad on 1 AO CD (including	
	chiropractic management for PFPS	С	-	1 RCT), plus 1 LO RCT and	
		0	Pain and Function	1 case study	
		т	Short to medium term		
		Ρ	PFPS		
Patellofemoral	There is limited very weak evidence of effectiveness of full chiropractic kinetic chain group intervention and myofascial manual therapy for PFPS	Т	Full chiropractic kinetic chain group intervention and myofascial manual therapy	Limited very weak Based on 1 AQ SR (including 1 RCT), plus 1 LQ RCT	
(PFPS)		С	-		
()		0	-		
		т	Short term		
	There is no evidence of effectiveness of chiropractic care versus usual care or no care for PFPS	Ρ	PFPS		
		Т	Chiropractic management	No evidence	
		С	Usual care or no care		
		0	-		
		т	-		
		Ρ	Knee osteoarthritis	Consistent weak	
	There is consistent weak evidence of effectiveness of	Т	Chiropractic management	Deced on 1 UO DCT 1	
	chiropractic management for pain and function in	С	-	cohort study. 1 case series	
	patients with knee osteoarthritis	0	Pain and function	and 3 case studies	
Knee		т	Short to medium term		
	There is limited very weak evidence that chiropractic	Ρ	Knee osteoarthritis	Limited very weak	
	management is no more effective than home	I	Chiropractic management		



	rehabilitation programme on self-reported pain, stiffness,		Home rehabilitation	Based on 1 HQ RCT
	and physical functioning and ROM in the short term for	0	Pain, stiffness, function and ROM	
	patients with knee osteoartnritis	т	Short term	
		Ρ	Knee osteoarthritis	
	There is no evidence of effectiveness of chiropractic care	1	Chiropractic management	
	versus usual care or no care for pain and function in	С	Usual care or no care	No evidence
	patients with knee osteoarthritis	0	-	
		т	-	
	There is limited very weak evidence of effectiveness of chiropractic management for knee cruciate ligament ruptures	Ρ	Knee cruciate ligament ruptures	Limited yony week
		I	Chiropractic management	Linited very weak
		С	-	Based on 1 case study
		ο	Function	
		т	Short term	
	There is limited very weak evidence of effectiveness of chiropractic management for knee cruciate ligament ruptures postoperatively	Ρ	Knee cruciate ligament ruptures postoperatively	
Knee cruciate		Т	Chiropractic management	Limited very weak
ligament		С	-	Based on 1 case study
ruptures		ο	Pain and Function	
		т	Short to medium term	
		Ρ	Knee cruciate ligament ruptures including postoperatively	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	No evidence
	ruptures, including postoperatively	С	Usual care or no care	
		ο	-	
		т	-	



	There is limited very weak evidence of effectiveness of					
Post-operative	of knee lateral retinacular release	С				
knee lateral		Т				
release		Р				
	There is no evidence of effectiveness for chiropractic care	I				
	rehabilitation of knee lateral retinacular release	С				
		0				
		т				
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain in patients with recurrent ankle sprain					
Recurrent ankle		Т				
sprain		Ρ				
	There is no evidence of effectiveness of chiropractic care	I				
	versus usual rehabilitation in reducing disability in	С				
	patients with recurrent ankle sprain over the short term					
		Т				
		Р				
	There is limited weak evidence of effectiveness of	I				
valgus	chiropractic management for reducing pain in patients	С				
(bunions)	with symptomatic hallux abducto valgus					

Ρ	Retinacular release, post-op rehab	
I.	Chiropractic management	Limited very weak
С	-	Based on 1 case study
0	Pain and function	
т	Short to medium term	
Ρ	Retinacular release, post-op rehab	
I –	Chiropractic management	
С	Usual care or no care	No evidence
0	-	
т	-	
Ρ	Recurrent ankle sprain	
I.	Chiropractic management	Limited weak
С	-	Based on 1 HQ and 1 AQ
0	Pain	RCT studies
т	Short term	
Ρ	Recurrent ankle sprain	
I.	Chiropractic management	Limited weak
С	Usual rehabilitation	Based on 1 HO RCT
0	Disability	
т	Short term	
Р	Hallux abducto valgus	
I.	Chiropractic management	Limited weak
С	-	Based on 1 HQ RCT and 1
0	Pain	case series
т	Short term	



	There is limited you weak avidance that chirapractic	Ρ	Hallux abducto valgus	
	management is no more effective than usual care	Т	Chiropractic management	Limited very weak
	splinting in reducing pain in patients with symptomatic	С	Usual care splinting	Based on 1 HQ RCT and 1
	hallux abducto valgus	0	Pain	case series
		т	Short to medium term	
		Ρ	Plantar fasciitis	
	There is limited weak evidence of effectiveness of	Т	Chiropractic management	Limited weak
	chiropractic management for reducing pain and disability	С	-	Based on 1 case study
	in patients with plantar fascillis	0	Pain and disability	based on I case study
Plantar fascilitis		т	Short term	
	There is no evidence of effectiveness of chiropractic care versus usual rehabilitation for reducing pain and disability in patients with plantar fasciitis	Ρ	Plantar fasciitis	
		Т	Chiropractic management	
		С	Usual rehabilitation	No evidence
		0	Pain and disability	
		т	-	
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with tarsal tunnel syndrome	Ρ	Tarsal tunnel syndrome	
		Т	Chiropractic management	Limited week
		С	-	Based on 1 case study
		0	Pain and disability	based on I case study
Tarsal tunnel		т	Short term	
syndrome		Ρ	Tarsal tunnel syndrome	
	There is no evidence of effectiveness of chiropractic care	Т	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability	С	Usual rehabilitation	No evidence
	in patients with tarsal tunner syndrome	0	Pain and disability	
		т	-	



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Achilles tendinopathy	There is limited weak evidence of effectiveness of	Ρ	Achilles tendinopathy
	chiropractic management for reducing pain and disability	I	Chiropractic management
	in patients with Achilles tendinopathy		-
			Pain and disability
			Short term
		Ρ	Achilles tendinopathy
	There is no evidence of effectiveness of chiropractic care versus usual rehabilitation for reducing pain and disability	I	Chiropractic management
		С	Usual rehabilitation
	in patients with Achilles tendinopathy		Pain and disability
			-

VI. UPPER LIMB

	Evidence statement		PICOT framework	Level of evidence
		Ρ	Shoulder pain	Limited weak
	There is limited weak evidence of effectiveness of	Т	Chiropractic management	Based on 1 LQ (including
General shoulder pain	chiropractic management for reducing pain and disability in patients with shoulder pain	С	-	22 case reports, 4 case series and 1 RCT) and 1 HQ (including 1 RCT) SR
		ο	Pain and disability	
		т	Not reported	
	There is limited very weak evidence that chiropractic management is more effective than sham ultrasound for	Ρ	Shoulder pain	
		Т	Chiropractic management	Limited very weak
		С	Sham ultrasound	Based on 1 HQ (including
	reducing pain and disability in patients with shoulder pain	0	Pain and disability	1 RCT) SR
		т	Not reported	



Limited weak

No evidence

Based on 1 case study

		Р	Shoulder pain	Deceder 110 (including	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	22 case reports, 4 case	
	versus usual rehabilitation for reducing pain and disability	С	Usual rehabilitation	series and 1 RCT) and 1	
	in patients with shoulder pain	ο	Pain and disability	HQ (including 1 RCT) SR	
		т	Not reported		
		Р	Adhesive capsulitis	Limited weak	
	There is limited weak evidence of effectiveness of	I	Chiropractic management	Pased on 110 (including	
	chiropractic management for reducing pain and disability	С	-	1 RCT) SR, plus 1 case	
	in patients with shoulder adhesive capsulitis	0	Pain and disability	series and 1 case study	
		т	Not reported		
	There is limited very weak evidence that a fascial distortion model of care is more effective than standard chiropractic management for reducing pain and disability in patients with shoulder adhesive capsulitis	Р	Adhesive capsulitis		
		Т	Fascial distortion model of care	Limited very weak	
Adhesive		С	Chiropractic management	Based on 1 LQ (including	
capsulitis		0	Pain and disability	1 RCT) SR	
		т	Short to medium term		
	There is no evidence of effectiveness of chiropractic care versus usual rehabilitation for reducing pain and disability in patients with adhesive capsulitis	Р	Adhesive capsulitis		
		I.	Chiropractic management	Based on 1 LQ (including	
		С	Usual rehabilitation	1 RCT) SR, plus 1 case	
		0	Pain and disability	series and I case study	
		т	-		
		Р	Shoulder myofascial pain		
Shoulder myofascial pain	There is limited weak evidence of effectiveness of chiropractic management involving ischemic compressions on shoulder muscle trigger points, compared to cervical and upper thoracic trigger point	I	Chiropractic management (ischemic compressions on shoulder muscle trigger points)	Limited weak	
		с	Cervical and upper thoracic trigger point treatment	Based on 1 HQ RCT	



	treatment, for reducing pain and disability in patients	0	Pain and disability	
	with shoulder myofascial pain	т	Short to medium term	
		Ρ	Shoulder myofascial pain	
	There is no evidence of effectiveness of chiropractic	Т	Chiropractic management	
	management versus usual rehabilitation for reducing pain	С	Usual rehabilitation	No evidence
	and disability in patients with shoulder myorascial pain	0	Pain and disability	
		т	-	
		Ρ	SLAP lesions	
	There is limited weak evidence of effectiveness of	I	Chiropractic management	Limited weak
	chiropractic management for reducing pain and disability in patients with SLAP lesions	С	-	Based on 1 case study
Superior labrum		ο	Pain and disability	
anterior to		т	Short term	
posterior (SLAP)	There is no evidence of effectiveness of chiropractic management versus usual rehabilitation for reducing pain and disability in patients with SLAP lesions	Ρ	SLAP lesions	
lesions		Т	Chiropractic management	
		С	Usual rehabilitation	No evidence
		0	Pain and disability	
		т	-	
	There is limited weak evidence of effectiveness of	Ρ	Lateral elbow epicondylopathy	
		Т	Chiropractic management	Limited weak
Lateral elbow	chiropractic management for reducing pain and disability	С	-	Based on 3 case studies
epicondvl-	in patients with lateral endow epicondylopatity	ο	Pain and disability	
opathy		т	Short term	
	There is no evidence of effectiveness of chiropractic care	Р	Lateral elbow epicondylopathy	
	versus usual rehabilitation for reducing pain and disability	I	Chiropractic management	No evidence
	in patients with lateral elbow epicondylopathy	С	Usual rehabilitation	



		0	Pain and disability	
		т	-	
		Ρ	Medial elbow epicondylopathy	
	There is limited weak evidence of effectiveness of	I.	Chiropractic management	Limited weak
	chiropractic management for reducing pain and disability	С	-	Based on 1 case study
Medial elbow	in patients with medial elbow epicondylopathy	0	Pain and disability	
epicondyl-		т	Short term	
opathy		Ρ	Medial elbow epicondylopathy	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in patients with medial elbow epicondylopathy	С	Usual rehabilitation	No evidence
		0	Pain and disability	
		т	-	
	There is limited very weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with radial nerve entrapment	Ρ	Radial nerve entrapment	
		I	Chiropractic management	Limited very weak
		С	-	Based on 1 case study
		Ο	Pain and disability	,
Radial nerve		т	Short term	
entrapment	There is no evidence of effectiveness of chiropractic care versus usual rehabilitation for reducing pain and disability in patients with radial nerve entrapment	Ρ	Radial nerve entrapment	
		I.	Chiropractic management	
		С	Usual rehabilitation	No evidence
		0	Pain and disability	
		т	-	
	There is limited very weak evidence that chiropractic	Ρ	Carpal tunnel syndrome	
	management is effective for reducing pain and disability	I	Chiropractic management	Limited very weak
	in patients with carpai tunnel syndrome	С	-	



			Pain and disability	Based on 1 HQ (including
Carpal tunnel		т	Short to medium term	1 RCT) SR
syndrome	The section lies in the statement of the section of	Р	Carpal tunnel syndrome	
	nere is limited very weak evidence that chiropractic management is no more effective than usual care for	I.	Chiropractic management	Limited very weak
	reducing pain and disability in patients with carpal tunnel	С	Usual care	Based on 1 HQ (including
	syndrome	0	Pain and disability	1 RCT) SR
		т	Short to medium term	
		Ρ	De Quervain's stenosing tenosynovitis	
	There is limited very weak evidence of effectiveness of	Т	Chiropractic management	Limited very weak
	chiropractic management for reducing pain and disability in patients with de Quervain's stenosing tenosynovitis	С	-	Based on 1 case study
De Ouervain's		0	Pain and disability	
stenosing		т	Short term	
tenosynovitis	There is no evidence of effectiveness of chiropractic care versus usual rehabilitation for reducing pain and disability in patients with de Quervain's stenosing tenosynovitis	Ρ	De Quervain's stenosing tenosynovitis	
		Т	Chiropractic management	
		С	Usual rehabilitation	No evidence
		0	Pain and disability	
		т	-	
		Ρ	Ulnar nerve compression	
	There is limited very weak evidence of effectiveness of	Т	Chiropractic management	Limited very weak
Ulnar nerve compression	chiropractic management for reducing pain and disability in patients with ulnar nerve entrapment	С	-	Based on 1 case study
		0	Pain and disability	, ,
		т	Short term	
	There is no evidence of effectiveness of chiropractic care	Ρ	Ulnar nerve compression	
	versus usual rehabilitation for reducing pain and disability	I.	Chiropractic management	No evidence
	in patients with uinar nerve entrapment	С	Usual rehabilitation	



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O Pain and disability

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General management reduces pain and improves function in sports-related musculoskeletal conditionsPSports-related musculoskeletal conditionsInconsistent weak Based on 1 AQ (including Based on 3 observational diagement reduces pain and improves function in sports-related musculoskeletal conditionsPInconsistent weak Based on 1 AQ (including Based on 3 observational diagement results in a better outcome than usual medical care for general musculoskeletal conditionsPInconsistent weak Based on 3 observational studiesOlder adultsFGeneral (including GeneralGeneral (including (including diagement results in a better outcome than usual medical care for general musculoskeletal conditionsIGeneral (including (including diagement results in a better outcome than usual management results in a better outcome than usual medical care for general musculoskeletal conditionsIGinogractic management (including diagementOlder adultsThere is inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditionsIGinogractic managementInconsistent weak (including 3 RCTs and 1 cohort) 3 RCTs and 1 cohort 3 RCTs and 1 co	VII. GENERAL MUSCULOSKELETAL & TEMPOROMANDIBULAR JOINT (TMJ) CONDITIONS					
PerformancePSports-related musculoskeletal conditionsInconsistent weakGeneral musculoskeletal conditions1Chiropractic managementBased on 1 AQ (including 3 RCTs and 2 CCTs) SRMusculoskeletal conditions1Short to medium termBased on 1 AQ (including 3 RCTs and 2 CCTs) SRMusculoskeletal conditions1Short to medium termPMusculoskeletal conditions1Chiropractic managementConsistent weakMusculoskeletal conditions1Chiropractic managementConditionsMusculoskeletal conditions1Chiropractic managementSector on 3 observational studiesMusculoskeletal conditions1Chiropractic managementSector on		Evidence statement	PICOT framework		Level of evidence	
General musculoskeletal conditionsFnere is inconsistent weak evidence that chiropractic management reduces pain and improves function in sports-related musculoskeletal conditionsIChiropractic managementInconsistent weakBased on 1 AQ (including a RCTs and 2 CCTs) SR0Pain and functionPGeneral musculoskeletal conditionsACTs and 2 CCTs) SR1Chiropractic management results in a better outcome than usual medical care for general musculoskeletal conditionsPGeneral musculoskeletal conditionsConsistent weak1Chiropractic managementGeneralGeneralGeneralBased on 3 observational studies1Short to medium termGeneralGeneralBased on 1 AQ (including actors term1Short to medium termGeneralInconsistent weakBased on 3 observational studies1Short to medium termGeneralGeneralInconsistent weakInconsistent weak1Chiropractic managementGeneralGeneralInconsistent weakInconsistent weak1Chiropractic managementGeneralGeneralInconsistent weakInconsistent weak1Chiropractic managementGeneralGeneralInconsistent weakInconsistent weak1Gen			Р	Sports-related musculoskeletal conditions		
General musculoskeletal conditionsmanagement reduces pain and improves function in sports-related musculoskeletal conditionsc-Based on 1 AQ (including Based on 1 AQ (including ACTs and 2 CCTs) SRonditionsTShort to medium term3 RCTs and 2 CCTs) SRThere is consistent weak evidence that chiropractic management results in a better outcome than usual medical care for general musculoskeletal conditionsPGeneral musculoskeletal conditionsConsistent weak0GeneralC Usual medical careBased on 3 observational studies1Short to medium termShort to medium term0GeneralShort to medium term0GeneralF1Short to medium termShort to medium term0GeneralShort to medium term1Short to medium termNonosistent weak1Chiropractic management reduces pain and improves function in older patients with musculoskeletal conditionsNonosistent weak1Chiropractic managementNonosistent weak1Chiropractic managementShort to medium term1Short to medium termShort to medium term1Short to medium termShort to medium term1Short to medium termNonosistent weak1Short to medium termShort to medium term1Short to medium termNonosistent weak1Short to medium termShort to medium term1Short to medium termNonosistent weak1Short to medium termNonosistent w		There is inconsistent weak evidence that chiropractic	I	Chiropractic management	Inconsistent weak	
General musculoskeletal conditions Sports-related musculoskeletal conditions 0 Pain and function 3 RCTs and 2 CCTs) SR T Short to medium term T Short to medium term Consistent weak There is consistent weak evidence that chiropractic management results in a better outcome than usual medical care for general musculoskeletal conditions I Chiropractic management Based on 3 observational studies Older adults There is inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditions P Older patients with musculoskeletal conditions Inconsistent weak Older adults There is inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditions P Older patients with musculoskeletal conditions Inconsistent weak I Chiropractic management chiropractic techniques There is inconsistent weak evidence that chiropractic management using instrument-assisted soft tissue P General General Based on 1 AQ (including 3 RCTs and 1 cohort study) SR I Short to medium term P General Based on 1 AQ (including 3 RCTs and 1 cohort study) SR		management reduces pain and improves function in	С	-	Based on 1 AQ (including	
Induction server conditionsImage from the server of the s	General	sports-related musculoskeletal conditions	0	Pain and function	3 RCTs and 2 CCTs) SR	
PGeneral musculoskeletal conditionsConsistent weakThere is consistent weak evidence that chiropractic management results in a better outcome than usual medical care for general musculoskeletal conditionsIChiropractic managementBased on 3 observational studiesImage definitionGeneralShort to medium termImage definitionConsistent weakImage definitionGeneralShort to medium termImage definitionImage definitionImage definitionThere is inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditionsImage definitionImage definitionImage definitionThere is inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditionsImage definitionImage definitionImage definitionThere is inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditionsImage definitionImage definition management reduces pain and improves function in older patients with musculoskeletal conditionsImage definition management reduces pain and improves function in older patients with musculoskeletal conditionsImage definition management reduces pain and improves function management reduces pain and improves functionImage definition management reduces pain and improves functionImage definition m	conditions		т	Short to medium term		
IndexIndexIndexConsistent weakConsistent weakConsistent weakImageIma	conditions	There is consistent weak evidence that chiropractic management results in a better outcome than usual medical care for general musculoskeletal conditions	Ρ	General musculoskeletal conditions		
Image mean age mean results in a better outcome than usual medical care for general musculoskeletal conditionsCUsual medical careBased on 3 observational studiesImage mean resultsGGeneralGeneralBased on 3 observational studiesImage mean resultsFShort to medium termImage mean resultsImage m			1	Chiropractic management	Consistent weak	
Image: medical care for general musculoskeletal conditionsImage: studies and			С	Usual medical care	Based on 3 observational	
Image: Chiropractic techniquesImage: Chiropractic techniquesIm			0	General	studies	
Polder adultsThere is inconsistent weak evidence that chiropractio management reduces pain and improves function in older patients with musculoskeletal conditionsPOlder patients with musculoskeletal conditionsInconsistent weakIChiropractic management			т	Short to medium term		
Older adultsInterest inconsistent weak evidence that chiropractic management reduces pain and improves function in older patients with musculoskeletal conditionsIChiropractic managementBased on 1 AQ (including 3 RCTs and 1 cohort study) SRChiropractic techniquesThere is inconsistent weak evidence that chiropractic management using instrument-assisted soft tissueIChiropractic management study) SRBased on 1 AQ (including 3 RCTs and 1 cohort study) SRImage: Description of the patient section of the patie		There is inconsistent weak evidence that chiropractic	Ρ	Older patients with musculoskeletal conditions	Inconsistent weak	
Chiropractic techniques Chiropractic techniques C - 3 RCTs and 1 cohort study) SR Chiropractic techniques There is inconsistent weak evidence that chiropractic management using instrument-assisted soft tissue P General Inconsistent weak Inconsistent weak Imagement using instrument-assisted soft tissue Inconsistent weak	Older adults		I	Chiropractic management	Based on 1 AQ (including	
Image: DefinitionPain and functionStudy) SRThere is inconsistent weak evidence that chiropractic management using instrument-assisted soft tissuePGeneralImage: DefinitionImage: Definition<		older patients with musculoskeletal conditions	С	-	3 RCTs and 1 cohort	
TShort to medium termChiropractic techniquesTShort to medium termThere is inconsistent weak evidence that chiropractic management using instrument-assisted soft tissuePGeneralIChiropractic management using instrument- assisted soft tissue mobilisationIInconsistent weak			0	Pain and function	study) SR	
P General P General Image: Chiropractic techniques P General Image: P General Image: P General Image: P General Image: P General Image: P General Image: P General Image: P General Image: P General Image: P Image: P </th <th></th> <th></th> <th>т</th> <th>Short to medium term</th> <th></th>			т	Short to medium term		
techniques management using instrument-assisted soft tissue II Chiropractic management using instrument- assisted soft tissue mobilisation	Chiropractic	There is inconsistent weak evidence that chironractic	Ρ	General		
	techniques	management using instrument-assisted soft tissue	Т	Chiropractic management using instrument- assisted soft tissue mobilisation	Inconsistent weak	



(instrument assisted)	mobilisation is as effective as non-instrument-assisted soft tissue mobilisation	с	Non- instrument-assisted soft tissue mobilisation	Based on 2 AQ SRs (incl. 3 RCTs, 1 clinical trial and
		0	Pain	2 cohort studies / 3 RCTs
		т	Short to medium term	and 1 CCT respectively) SRs
		Ρ	General	
	There is inconsistent weak evidence that maintenance	I	Maintenance care	Inconsistent weak Based on 1 AQ SR (including 4 RCTs)
Maintenance	care following chiropractic management is cost- or	С	-	
care	clinically effective in preventing pain and disability	0	Cost- or clinical effectiveness in preventing pain and disability	
		т	Short to medium term	
	There is limited weak evidence that chiropractic management results in improved pain and function in patients with TMJ pain	Ρ	TMJ pain	Limited weak Based on 1 AQ SR (including 1 RCT and 3 case series), plus 1 AQ RCT
		Т	Chiropractic management	
		С	-	
		ο	Pain and function	
TMJ disorders		т	Short to medium term	
	There is limited weak evidence that chiropractic management is no more effective than sham treatment or exercise in improving pain and function in patients with TMJ pain	Ρ	TMJ pain	Limited weak
		Т	Chiropractic management	Decod on 1 AO CD (including
		С	Sham treatment or exercise	1 RCT and 3 case series).
		ο	Pain and function	plus 1 AQ RCT
		т	-	
		Ρ	Older patients	Consistent weak
	There is consistent weak evidence that chiropractic	I	Chiropractic treatment	Pacad on 1 AO CD (including
Safety	management does not result in a higher risk of adverse	С	-	14 observational studies)
	events in older patients with musculoskeletal conditions	0	Adverse events	
		т	Short to medium term	



Secondary research question 2: Are there any specific patient subgroups for which chiropractic is more, or less, effective?		
Musculoskeletal neck & low back conditions in general	There is inconsistent weak evidence that the greatest degree of improvement from chiropractic care is seen in patients with acute presentations	Inconsistent weak Based on one observational study (Peterson et al 2012)
	There is limited very weak evidence that patients treated by conservative evidence-based care improved with lower costs than patients treated with non-standardised clinical approaches	Limited very weak Based on 1 observational study
Chronic low back pain	There is limited weak evidence that a modified clinical prediction rule for spinal manipulative therapy was not able to predict which patients with chronic low back pain would experience an effect	Limited weak Based on one observational study

Secondary research question 3: Does effectiveness vary according to post-injury or recovery stage, e.g. sub-acute versus chronic?		
Musculoskeletal conditions in general	There is inconsistent weak evidence that the greatest degree of improvement from chiropractic care is seen in patients with acute presentations	Inconsistent weak Based on one observational study (Peterson et al 2012)
Neck & low back conditions in general	There is inconsistent weak evidence that the greatest degree of improvement from chiropractic care is seen in patients with acute presentations	Based on the lack of evidence undertaken on chronic/sub-acute presentations



Secondary research question 4: What evidence is there regarding the recommended length of treatment, number of treatments and duration of individual treatment sessions?

Non-specific neck pain (NSNP)	Most studies demonstrating effectiveness of chiropractic spinal manipulation compared to other modalities for NSNP used dosages of:	 *Miranda et al 2015, Gemmel and Miller 2010, Skargren et al 1998 **Aki et al 2020, Leaver et al 2007, Vavrek, Haas and Peterson 2010, Haas et al 2004, Martel et al 2011
Cervicogenic headache	Most studies demonstrating effectiveness of chiropractic spinal manipulation compared to other modalities for cervicogenic headaches used dosages of 8-16 treatments over 6-8 weeks There is no evidence on optimal duration of individual treatment sessions	Haas et al 2010, Chaibi et al 2017, Haas et al 2018
Spinal pain in general	There is limited weak evidence that most patients with neck or low back pain reach maximum therapeutic improvement at 3 months, but only a minority either: • experience a rapid complete recovery <u>or</u> • develop chronic severe pain Most report a trajectory of symptoms characterised by persistent or fluctuating pain of low or medium intensity The greatest improvement is seen in patients with worse baseline pain and function, who may have had more room for improvement	Based on 2 observational studies



Non-specific low back pain	There is limited weak evidence that 12 visits yielded the most favourable results, but this was not well distinguished from other dose levels	Based on 1 RCT (Haas et al 2010)
	There is limited weak evidence that the proportion of patients reporting overall improvement from chiropractic intervention was no greater after 1 month compared to 6 months There is no evidence on optimal duration of individual treatment sessions	Based on 1 observational study (Wirth et al 2019)
Musculoskeletal conditions in general	There is no evidence for the recommended length of treatment, number of treatments and duration of each individual treatment session	



1. Background

1.1 Objective of this Review	 The objective of this evidence-based review is to systematically identify, critically appraise, extract and synthesise the published academic evidence on the effectiveness and safety of chiropractic-specific interventions for the management of musculoskeletal conditions and injuries. This review aims to answer the following research questions: Primary research questions: How effective is chiropractic in the management of musculoskeletal conditions? How safe is chiropractic in the management of musculoskeletal conditions? Secondary research questions: How clinically effective and safe is chiropractic for the treatment of different injury types, conditions and body sites? Are there any specific patient subgroups for which chiropractic is more, or less, effective? What is the evidence on effectiveness for different injury/condition subgroups? Does effectiveness vary according to post-injury or recovery stage, e.g. sub-acute versus chronic? What evidence is there regarding the recommended length of treatment, number of treatments and duration of individual treatment sessions? 	
1.2 Introduction	number of treatments and duration of individual treatment sessions? Musculoskeletal conditions are the leading cause of disability worldwide (Palazzo et al 2014). There are more than 150 diagnoses that affect a variety of anatomical regions, such as neck, shoulder, back, elbow, wrist, hand, hip, knee, ankle and foot (Briggs et al 2016). These conditions are characterised by pain and reduced physical function, often negatively affecting mental health and increasing the risk of developing other chronic health conditions (Posadzki et al 2011). Several risk factors have been identified, including occupational exposure, educational status, psychosocial characteristics such as stress, anxiety, emotions, cognitive functioning and maladaptive behaviours, such as avoidance, smoking, gender and age (Posadzki et al 2011). Allied health is the third major group in the New Zealand health and disability workforce (alongside medical and nursing professionals), and includes physiotherapists, occupational therapists, speech therapists, acupuncturists, chiropractors and osteopaths (Allied Health Aotearoa New Zealand 2021). Allied health professionals are qualified practitioners with specialised expertise in preventing, diagnosing and treating a range of conditions and illnesses. Amongst the regulated health professionals, physiotherapists, chiropractors and osteopaths deal with musculoskeletal complaints as a major component of their work (Ryan et al 2018).	



The 2018 and 2020 Agency for Healthcare Research and Quality systematic reviews (SR) recommend non-invasive, non-pharmacological approaches to a number of the most common musculoskeletal conditions, including chronic low back pain, chronic neck pain, osteoarthritis, fibromyalgia and chronic tension headache (Skelly et al 2018 & 2020).

Chiropractic management incorporates a range of non-invasive, non-pharmacological approaches such as exercise, dietary advice, ergonomic advice and soft tissue treatment. However, the primary approach for the chiropractic profession has traditionally been joint manipulation (Hestbaek & Stochkendahl 2010). Chiropractors diagnose, treat and prevent mechanical disorders of the musculoskeletal system and the effects of these disorders on the function of the nervous system and general health (Hartvigsen et al 2020). Surveys of patients seeking chiropractic care have shown that spinal pain is the most common reason, with 64%-86% reporting spine-related symptoms (Hestbaek & Stochkendahl 2010). Peripheral-related symptoms are less common, with an Australian survey suggesting that shoulder pain and symptoms are responsible for 12% of total weekly visits to chiropractors (Pribicevic et al 2009).

Manual therapy is a common non-invasive, non-pharmacological approach used by chiropractors with a wide variety of different techniques used, including manipulation (thrust manipulation), mobilisation (non-thrust manipulation), static stretching, and muscle energy techniques (Clar et al 2014). Manual therapy is not without its risks with the most common adverse reaction to manual therapy reported as treatment soreness (Carnes et al 2010). Although low in incidence, serious adverse events have been associated with the use of manipulative procedures (Clar et al 2014), with thrust manipulations thought to carry a greater risk of major complications than the non-thrust approaches (Dvorak et al 2008).

To better understand how chiropractors can be used in the management of musculoskeletal conditions, Accident Compensation Corporation New Zealand (ACC-NZ) commissioned an evidence-based review of the effectiveness and safety of chiropractic interventions across a wide range of musculoskeletal conditions. The aim of the review is to evaluate the evidence for specific injury types/conditions and chiropractic interventions and to extract information on specific patient subgroups and recovery stages, and treatment dose, duration and frequency where possible.



2. Methodology

2.1 Review question	How clinically effective and safe are chiropractic interventions for the treatment of musculoskeletal conditions and injuries?	
2.2 Methods	A review of published available research evid the treatment of music was developed to loca December 2021. The e systematic reviews (SF without meta-analysis explicitly evidence bas lacking for specific inju- randomisation, cohort pragmatic approach to common major clinica are not represented, r	research literature was undertaken to provide a synthesis of the currently dence related to the effectiveness and safety of chiropractic interventions for culoskeletal conditions and injuries. A systematic and rigorous search strategy te all published and accessible research evidence from January 2010 to evidence base for this review included research evidence from existing Rs) of randomised controlled trials (RCTs) or other primary studies, with or ; RCTs; health technology assessments (HTAs); or clinical guidelines that are ed (i.e. based on SRs of the literature). If SR and RCT level evidence was uries/conditions/body sites, lower-level studies (e.g. controlled trials without a studies, case-control studies, case series) were used. This review took a the presentation of the literature, sub-dividing the studies into the most I presentations reported in the literature evidence. Where clinical conditions to studies which met inclusion criteria were identified.
2.3 Search strategy	The literature search was developed using a standard PICO structure (shown in Table 1). All study timeframes were considered within the review and for the analysis the timeframes were divided into short term (< 6 weeks), medium term (6 to 12 weeks) and long term (> 12 weeks). Only articles published in English that used human participants and were accessible in full text were included. Table 1: Criteria for considering studies in the review Included: Adults aged 18 years and over receiving treatment for musculoskeletal conditions or injuries Excluded: Studies involving healthy volunteers or experimentally induced pain; pain due to malignancy or infection (e.g. post-herpetic neuralgia); dental pain; dysmenorrhoea; systemic inflammatory conditions; angina; migraines; visceral pain; peripheral vascular disease; or haematological disorders Included: Network in Table 1: Criteria for considering approach Excluded: Studies involving healthy volunteers or experimentally induced pain; pain due to malignancy or infection (e.g. post-herpetic neuralgia); dental pain; dysmenorrhoea; systemic inflammatory conditions; angina; migraines; visceral pain; peripheral vascular disease; or haematological disorders Included: Numerication interventions, i.e. studies must explicitly state they are adhering to a chiropractic clinical reasoning approach Excluded: Studies exploring non-chiropractic manual therapy and exer	

A combination of search terms (see Table 2) was used to identify and retrieve articles in the following databases:



- Medline
- Cochrane Library
- Embase
- Emcare
- REHABDATA
- TRIP Database
- Health Collection
- Google Scholar
- ChiroSearch
- Index to Chiropractic Literature

Search terms were developed in conjunction with an independent senior health science academic librarian. The MeSH keyword search terms and Boolean operators were modified to accommodate each search database. The detailed search strategy for the MEDLINE database search can be found in Appendix 1.

Search terms - Chiropractic	Limits
Musculoskeletal Manipulations/	Limit to year: 2010 - Current
Chiropractic/	
Manipulation, Chiropractic/	
Manipulation, Spinal/	
Manipulation, Orthopedic/	
manual or manip* adj2 therap* or musculoskeletal chiropract* or manipulat* or adjust*	

The titles and abstracts identified from the above search strategy were assessed for eligibility by the iCAHE researchers. Full-text copies of eligible articles were retrieved for full examination and assessed for eligibility by ACC. Reference lists of included full-text articles were searched for relevant literature not located through database searching.

Inclusion criteria

- Population: adults being treated for musculoskeletal conditions or injuries
- Interventions: chiropractic interventions, i.e. studies must explicitly state they are adhering to a chiropractic clinical reasoning approach

Study selection

2.4

- Comparison/control: placebo and head-to-head comparisons with other active or conservative treatment/usual care/waitlist/watchful waiting
- Outcomes: pain-related outcomes, functional and mobility outcomes, return to work or other activity, quality of life, safety, adverse events and risk
- Study design criteria: SRs of RCTs or other primary studies, with or without meta-analysis; RCTs; HTAs or clinical guidelines that are explicitly evidence based (i.e. based on SRs of the literature).


If SR and RCT level evidence was lacking for specific injuries/conditions/body sites, lower-level studies (e.g. controlled trials without randomisation, cohort studies, case-control studies, case series) may be used following consultation with ACC Publication criteria: English language studies published in or after 2010 in peer-reviewed journals. **Exclusion criteria** Studies only available in abstract form, e.g. conference presentations. These were excluded as it is impossible to determine risk of bias through critical appraisal of an abstract • Grey literature and non peer-reviewed publications Studies involving healthy volunteers or experimentally induced pain – the aim of this review was to reflect ACC service provision Animal studies Studies reporting on pain due to malignancy or infection (e.g. post-herpetic neuralgia); dental pain; dysmenorrhoea; systemic inflammatory conditions; angina; concussion; visceral pain; peripheral vascular disease; or haematological disorders Studies exploring non-chiropractic manual therapy and interventions, or chiropractic interventions not provided by a qualified chiropractor. **Selecting studies** A pragmatic approach was taken in regard to cut-off for study design, with the cut-off depending on the level of evidence available. If SRs and RCTs were available for a particular condition, lower-level studies (e.g. cohort studies and case series) were not included. However, if limited SRs and RCTs but a number of cohort studies were available for a particular condition, those cohort studies were included but lower-level studies (e.g. case series) were not. The SIGN (Scottish Intercollegiate Guidelines Network) checklist specific to the study design of the included studies was used to assess their methodological quality. The SIGN checklist asks a number of questions with yes, no, can't say or not applicable as responses, with the appraiser giving an overall rating of quality, based on the responses to those questions, of either high quality (++), acceptable (+), appraisal low quality (-) or unacceptable. Copies of the SIGN checklists are provided in Appendix 2.



2.5

Critical

(SIGN)

Data was extracted from the identified publications using a data extraction tool which was specifically developed for this review. The following information was extracted from individual studies: Evidence source (Author, Date) Study design Level of evidence Objective 2.6 Characteristics of participants • Data Interventions • extraction Treatment regimen Practitioner qualifications and background • Control or comparator interventions Outcome measures • Results . The descriptions of the clinical conditions and interventions provided by the SRs and RCTs included in this review were used to classify the data. As described, for this review each included study was graded for overall methodological quality using the SIGN checklist specific to its study design. To standardise the strengths of recommendations from the extensive literature used for this review, a structured system was developed to incorporate a number of quality measures. Four measures were selected as important variables in assessing the strength of recommendations from the evidence base for each musculoskeletal condition. These were: 2.7 Strength of the evidence base a) Data b) Consistency of the evidence synthesis c) Statistical significance (SIGN) d) Timeframe

A summary matrix and wording proforma that considered all key criteria were developed in order to create a standardised method to summarise the evidence:

Key criteria	Descriptors	Wording	
Strength of the evidence	▶ ≥2 HQ SRs or ≥3 HQ	Very strong	
base	controlled trials	> Strong	



	➤ 1 HQ SR or ≥2 AQ SR or ≥
	1 HQ controlled trials
	and >3 AQ controlled
	trials/cohorts > Moderate
	➤ 1 AQ SR or ≥1 LQ SR and
	≥1 HQ controlled trial or
	≥5 AQ controlled
	trials/cohorts > Weak
	> 1 LQ SR or <5 AQ or LQ
	controlled trials/cohorts Very weak
	> 1 LQ cohort or \geq 1 AQ
	case control
Consistency of the	▶ ≥75% agreement ▶ Consistent
evidence base	➤ <a> < 274% agreement > Inconsistent
	Less than 3 studiesLimited
Statistical significance	➢ P<0.05 ➢ Significant
	➢ P>0.05 ➢ Non-significant
Timeframe	> < 6 weeks
	➢ 6 to 12 weeks➢ Medium term
	➤ > 12 weeks ➤ Long term

Evidence statement proforma:

• There is [Consistency of evidence] [Strength of evidence] evidence that [Intervention] may [Direction of change] [Outcome] in the [Timeframe] when compared to [Comparator] for patients with [Musculoskeletal condition]

3. Results

The chiropractic literature search for all musculoskeletal conditions yielded 24,306 articles from the seven databases (See Appendix 1 for search strategy). The final search was performed on November 11, 2021. After removal of duplicates from the search, 13,799 articles were identified for screening of title and abstract. After scrutiny, 13,494 articles were excluded for failing to meet the inclusion criteria (shown in Figure 1), leaving 141 studies that fitted all inclusion criteria for the report. Figure 1 illustrates the process involved in study selection.



Figure 1: PRISMA diagram of search results – Chiropractic search results



The literature found for this report varied significantly in quality according to the SIGN critical appraisal checklists:

	N =	HQ (++)	AQ (+)	LQ (-)
SRs	47	15	25	7
Controlled trials	42	15	20	7
Cohort studies	17	1	7	9
Case reports	35	-	-	-

Within the systematic reviews identified, a further 5 systematic reviews, 110 RCTs, 78 cohort studies and 96 case studies/case series were included.

Therefore, this review synthesises the evidence from 430 studies:

- Appendix 2 presents the SIGN critical appraisal tools used in this review.
- Appendices 3, 4 and 5 present the critical appraisal scores for the SRs, RCTs and cohort studies included in this review.
- Appendices 6 and 7 present the data extraction tables for the SRs and RCTs included in this review.
- Appendix 8 lists the primary studies included in the reviews.

the **Evidence** The main issues affecting the methodological quality of the studies included:

Systematic reviews

3.2

Quality of

- Extensive searches were often not used.
- Lack of addressing potential for publication bias.
- SRs often included studies where treatment was delivered by a variety of practitioners including physiotherapists, physical therapists, osteopaths and general practitioners.
- The included studies were often of poor quality, with moderate to high risk of bias.
- Excluded studies were frequently not listed.
- Heterogeneous comparison groups were often used.
- Some of the reviews did not utilise two independent researchers to screen the search results, assess trial eligibility, assess risk of bias and extract data from the included trials.
- The status of publication was often not used as an inclusion criterion.
- Significant variability in treatments was common within the reviews.

Primary studies

- Lack of long term follow-up.
- Subjects and investigators were rarely blinded to the intervention involved.



- Expertise of practitioners administrating the intervention was regularly not reported.
- Small sample sizes, with a priori power calculations often not conducted.
- Some studies had a sizeable percentage of participants drop out before the study was completed.
- Studies often did not control for the patient's involvement in co-interventions such as exercise/medication etc.
- A number of studies failed to report the use of intention to treat analysis when reporting findings.
- Where studies were carried out at more than one site, the results were not provided which allowed for comparison between the sites.

General comments on the evidence base of chiropractic for musculoskeletal conditions:

- Follow-up times during the studies were often not sufficient to evaluate effectiveness over longer timeframes.
- Many studies/reviews used practitioners who were not trained chiropractors. Due to variations in training this presents a significant confounder to understanding the relationship between chiropractic and treatment effectiveness. The aim of this review was to explore the evidence base of chiropractic for musculoskeletal conditions, not that of general manual therapy. Therefore, for validity purposes, many studies which reported on treatments by non-chiropractors were excluded.
- Insufficient quality and quantity of studies for many conditions meant conclusions about effectiveness could not be made.
- The available evidence made it difficult to draw conclusions on the relationship between training/ experience and safety/risk because it was poorly reported in papers.



Part 1: Spinal Conditions

The following section explores the evidence for the effectiveness and safety of chiropractic-specific interventions for the management of musculoskeletal conditions and injuries involving the spine. This includes general spinal conditions, cervical, thoracic, lumbar and sacroiliac joints.

A total of 67 studies were included in Part 1: Spinal Conditions

Systematic reviews - Level I Evidence

A total of 21 SRs were found in this review that investigated the effectiveness of chiropractic interventions for the management of musculoskeletal conditions and injuries related to spinal conditions (neck, thoracic, lumbar and sacroiliac joint). Appendix 6 presents the data extracted from the SRs included in this review.

3.3

Part 1: Spinal Conditions

Randomised controlled trials – Level II Evidence

A total of 25 relevant RCTs that were not included in the 21 SRs were identified in this review. Appendix 7 presents the data extracted from the RCTs included in this review.

Cohort/Case series/Case studies – Level III and IV Evidence

18 cohort studies (Level III evidence) and 3 case series/case reports (Level IV evidence) were identified in this review. The findings are discussed within the body of the review.

	SR	RCT	Cohort	Case reports
General Spinal Pain	3	1	5	
Cervical				
Non-specific cervical pain	3	4		
Whiplash associated disorders	1			
Facet dysfunction		1		
Cervical spondylosis		2	2	
Cervical radiculopathy			1	
Cervicogenic headache	4	1		
Thoracic				
Non-specific thoracic spine pain		2		
Chest wall pain		3		
Thoracic outlet syndrome				1
Scheuermann's kyphosis syndrome				1
Lumbar				
Non-specific low back pain	10	9	8	1
Disc herniation			2	
Spinal stenosis		1		
Pelvis				
Sacroiliac joint pain		1		
Total	21	25	18	3



Study selection process

The studies were sorted and selected based on the musculoskeletal condition being investigated. For each condition, the best available evidence based on the hierarchy of evidence was selected. If there were SRs and controlled trials, they were selected as primary source of evidence. Of note, the controlled trials and cohort studies reported in the SRs were excluded in the data extraction and synthesis to avoid double reporting. If there were limited SRs and controlled trials, the next available evidence based on the hierarchy of evidence was selected.

1. General Spinal Pain

A. Systematic Reviews (Level I Evidence)

One umbrella review and two systematic reviews (SRs) were found that explored the use of chiropractic treatment for the management of general spinal pain (i.e. not cervical- or lumbar-specific).

Ernst 2012

Ernst 2012 (QS:AQ) presented an umbrella review of Cochrane reviews on the effectiveness of chiropractic spinal manipulation. The Cochrane database was searched for all reviews of chiropractic manipulation with the terms 'chiropractic', 'manipulation' or 'manual therapy' in the title, abstract or keywords. Studies that did not focus specifically on chiropractic spinal manipulation were excluded. The review identified five Cochrane reviews. Due to clinical and statistical heterogeneity, a meta-analysis was not possible, and the findings of the reviews were discussed narratively. The five reviews related to the following conditions: low back pain, asthma, dysmenorrhoea, and neck pain. Each review included between three and 39 primary studies. Cautiously positive conclusions emerged for low back pain and neck pain; however, for the non-spinal conditions, the conclusions were negative.

3.3 Part 1: Spinal Conditions

Study	SIGN rating	Conclusions	Strength of evidence
		Cochrane reviews provide limited evidence that chiropractic	Based on 5
Ernst 2012 AQ	AQ	may be effective for low back and neck pain, but failed to	Cochrane
		support the use of chiropractic for non-spinal conditions	reviews

Scholten-Peeters et al 2013

Scholten-Peeters et al 2013 (QS: HQ) presented a systematic review and meta-analysis on the efficacy of manipulations compared to sham manipulations in adults with a variety of complaints. The review included all forms of manipulation and identified 19 RCTs for inclusion. There was moderate level of evidence that manipulative therapy had a significant effect in adults on pain relief immediately after treatment (standardised mean difference [SMD] -0.68, 95% confidence interval (-1.06 to -0.31). There was low level of evidence that manipulative therapy had a significant effect in adults on pain relief (SMD -0.37, -0.69 to -0.04) at short term follow-up. In patients with musculoskeletal disorders, they found moderate level of evidence for pain relief (SMD -0.73, -1.21 to -0.25) immediately after treatment and



low level of evidence for pain relief (SMD - 0.52, -0.87 to -0.17) at short term follow-up. No serious adverse events were reported in the manipulative therapy or sham group. The authors undertook subgroup analysis by profession and identified that, while physical therapy and medical practitioner manipulative therapy were significantly more effective statistically than sham manipulation, chiropractic manipulation was not significantly more effective than sham on meta-analysis. Caution should be taken in interpreting these results as they are based on small subject numbers.

	man	ipulati	on	sham n	nanipula	tion		Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
1.4.1 independent on prot	fession						-		
Cleland 2005	26.1	17.2	19	43.5	19.5	17	11.5%	-0.93 [-1.62, -0.24]	
Ghroubi 2007	49.4	16.8	32	58.4	28.8	32	16.8%	-0.38 [-0.87, 0.12]	
Hondras 1999	-10.1	14.8	68	-8	16.6	69	22.6%	-0.13 [-0.47, 0.20]	
Kokjohn 1992	-18.7	19.4	23	-7.8	15.7	21	13.6%	-0.60 [-1.21, 0.00]	
Mansilla- Ferragut 2009	0.7	0.4	19	0.9	0.3	18	12.3%	-0.55 [-1.21, 0.11]	
Senna 2011	29.4	5.5	12	33.2	7.3	18	10.5%	-0.56 [-1.30, 0.19]	
Senna 2011	23.5	8	13	38.3	12.8	19	9.8%	-1.30 [-2.08, -0.51]	
Vernon 2009 Subtotal (95% CI)	-8.4	7.5	4 190	3.1	5.4	5 199	2.9% 100.0%	-1.60 [-3.24, 0.04] -0.58 [-0.88, -0.29]	•
Heterogeneity: Tau ² = 0.07	r; Chi ² =	12.10	df = 7 (P = 0.10)	; I ² = 429	6			
Test for overall effect: Z = 3	3.88 (P =	= 0.000)1)						
1.4.2 chiropracter									
Hondras 1999	-10.1	14.8	68	-8	16.6	69	52.9%	-0.13 [-0.47, 0.20]	
Kokjohn 1992	-18.7	19.4	23	-7.8	15.7	21	37.1%	-0.60 [-1.21, 0.00]	
Vernon 2009	-8.4	7.5	4	3.1	5.4	5	9.9%	-1.60 [-3.24, 0.04]	
Subtotal (95% CI)			95			95	100.0%	-0.45 [-1.02, 0.11]	
Heterogeneity: Tau ² = 0.13	3; Chi² =	4.32, (df = 2 (P	= 0.12);	$ ^{2} = 54\%$				
Test for overall effect: Z = 1	1.58 (P =	= 0.11)							
1.4.3 physical therapist									
Cleland 2005	26.1	17.2	19	43.5	19.5	17	24.6%	-0.93 [-1.62, -0.24]	
Ghroubi 2007	49.4	16.8	32	58.4	28.8	32	48.2%	-0.38 [-0.87, 0.12]	
Mansilla- Ferragut 2009	0.7	0.4	19	0.9	0.3	18	27.2%	-0.55 [-1.21, 0.11]	
Subtotal (95% CI)			70			67	100.0%	-0.56 [-0.90, -0.22]	•
Heterogeneity: Tau ² = 0.00); Chi² =	1.61, 0	df = 2 (P	= 0.45);	I ² = 0%				
Test for overall effect: Z = 3	3.20 (P =	= 0.001)						
1.4.4 physician									
Senna 2011	23.5	8	13	38.3	12.8	19	48.7%	-1.30 -2.08 -0.511	
Senna 2011	29.4	5.5	12	33.2	7.3	18	51.3%	-0.56 [-1.30, 0.19]	
Subtotal (95% CI)	177722	100	25	0.010	N. Walter	37	100.0%	-0.92 [-1.64, -0.19]	-
Heterogeneity: Tau ² = 0.12	2; Chi ² =	1.80, 0	df = 1 (P	= 0.18);	$ ^2 = 44\%$				
Test for overall effect: Z = 2	2.48 (P =	= 0.01)							
	ana an								
									-2 -1 U 1 2
Test for subgroup differen	ces: Ch	i ^z = 1.0	3, df = 3	P = 0.7	9), l² = 0°	%			Favours manipulation Favours shart manipulation

Study	SIGN rating	Conclusions	Strength of evidence
Scholten-Peeters et al 2013	HQ	 There did not appear to be a significant difference in effectiveness for pain levels with manipulation from physical therapists, medical practitioners or chiropractors 	Based on 7 RCTs

Dagenais et al 2015

Dagenais et al 2015 (QS:HQ) presented a systematic review exploring studies that compared health care costs for patients with any type of spine pain who received chiropractic care or care from other health care professionals. Only studies conducted in the US and published in English between 1993 and 2015 were included. Health care costs were summarised for studies examining: 1. private health plans, 2. workers' compensation (WC) plans, and 3. clinical outcomes. The review included 25 studies, including 12 from private health plans, 6 from WC plans, and 7 that examined clinical outcomes. Chiropractic care was most commonly compared to care from a medical physician, with few details about the care received.



International Centre for Allied Health Evidence

Heterogeneity was noted among studies in terms of patient selection, definition of spine pain, scope of costs compared, study duration, and methods to estimate costs. Overall, cost comparison studies from private health plans and WC plans reported that health care costs were lower with chiropractic care. In studies that also examined clinical outcomes, there were few differences in efficacy between groups, and health care costs were higher for those receiving chiropractic care. The effects of adjusting for differences in sociodemographic, clinical, or other factors between study groups were unclear.

Study	SIGN rating	Conclusions	Strength of evidence
Dagenais et al 2015	HQ	 Cost comparison studies from private health plans and WC plans reported that health care costs were lower with chiropractic care In studies that also examined clinical outcomes, there were few differences in efficacy between groups, and health care costs were higher for those receiving chiropractic care Although cost comparison studies suggest that health care costs were generally lower among patients whose spine pain was managed with chiropractic care, the studies reviewed had many methodological limitations. Better research is needed to determine if these differences in health care costs were attributable to the type of health care professional managing their care 	Based on 25 comparative studies

B. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that focused on the effect of chiropractic treatment for the management of general spinal pain (i.e. not cervical or lumbar specific)

Study	SIGN rating	Objective	Intervention	Result	
Walker et al 2013a	AQ	To establish the short- term effectiveness of chiropractic therapy for spinal pain compared with a sham intervention and explore the predictors of chiropractic treatment satisfaction	183 adults with spinal pain (chiropractic, n = 92; sham, n = 91) Two treatments were provided approximately one week apart	 Participants receiving chiropractic therapreported greater improvements in pain (mean difference, 95% confidence interval [CI] = 0.5 [0.1–0.9]), physical function (medifference [95% CI] = 2.1 [0.3–4.0]), and were more likely to experience global improvement (48% vs. 24%, P = 0.01) and treatment satisfaction (78% vs. 56%, P < 0.01) There was no between-group difference i achieving a minimally acceptable outcom (34% sham vs. 29% chiropractic, P = 0.42) Awareness of treatment assignment and achieving minimally important improvem in pain intensity were associated with chiropractic treatment satisfaction There were no serious adverse events 	y al ean d in ne)



				•	Common adverse events were increased
					pain (sham group, 29%; usual care group,
					36%), muscle stiffness (sham group, 29%;
					usual care group, 37%), and headache (sham
					group, 17%; usual care group, 9%)
Short-term chiropractic treatment was superior to sham; however, treatment effects were not clinically important					

 Awareness of treatment assignment and clinically important reductions in pain were associated with chiropractic treatment satisfaction

C. Observational Studies (Level III Evidence)

Six cohort studies explored the effectiveness of chiropractic treatment for the management of general spinal pain (i.e. not cervical- or lumbar-specific):

Study	SIGN rating	Study design	Objective	Intervention	Result
Ailliet et al 2018	LQ	Prospective cohort study (n= 448 patients (153 NP, 295 LBP)	To study the course of both NP and LBP in patients presenting to chiropractors in Belgium and the Netherlands	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 90% of patients with neck pain or low back pain presenting to chiropractors have a 30% improvement within 6 weeks and then show a trajectory of symptoms characterised by persistent or fluctuating pain of low or medium intensity. Only a minority either experience a rapid complete recovery or develop chronic severe pain
 Most parallel persiste or development 	atients with NP ent or fluctuatir lop chronic sev	or LBP presenting in ng pain of low or me vere pain	n chiropractic care sho dium intensity. Only a	ow a trajectory of syn n minority either expe	nptoms characterised by erience a rapid complete recovery
Elder et al 2018	LQ	Prospective cohort study using propensity score-matched controls	To evaluate the comparative effectiveness of usual care with or without chiropractic care for patients with chronic recurrent musculoskeletal back and neck pain	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor. The mean number of visits with the chiropractor was 4.0 (SD 4.4; median = 3, IQR= 0–7).	 Both groups' pain scores improved significantly over the first 3 months, with less change between months 3 and 6. No significant between-group difference was observed No significant differences in cost
 No signi for patie 	ificant differen ents with chror	ces in comparative on in comparative on the comparative on the comparative of the compara	effectiveness or cost c loskeletal back and ne	omparing usual care ck pain	with or without chiropractic care
Hays et al 2019	AQ	Prospective observational study	To evaluate group- level and individual- level change in health-related quality of life among persons with chronic low back pain or neck pain receiving chiropractic care in the United States	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 Chiropractic care was associated with significant group-level improvement in health-related quality of life over time, especially in pain. But only a minority of the individuals in the sample got significantly better ('responders') This study suggests some benefits of chiropractic on functioning and well-being of patients with low back pain or neck pain.



 Chiropractic care led to significant group-level change (p < 0.05) for all scores except for emotional distress, but the changes represented small improvements in health (absolute value of effect sizes ranged from 0.08 for physical functioning to 0.20 for pain) 						
Herman et al 2020	LQ	Prospective observational study	To examine the predictors of visit frequency in a large sample of patients with CLBP and CNP using ongoing chiropractic care	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 Patients with worse function or just starting care also had more visits and those near to ending care had fewer visits Visit frequency was also determined by the chiropractor/clinic where treatment was received Chiropractors with 20 to 30 years of experience had fewer visits per month. The state in which care was received made a difference 	
Chiropraction	care visit freq	uency related to lev	el of function, stage o	f care, chiropractor e	experience and state of treatment	
Herman et al 2021	LQ	Prospective observational study	To examine the predictors of visit frequency in a large sample of patients with CLBP and CNP using ongoing chiropractic care.	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 This 3-month window on chiropractic patients with CLBP and/or CNP revealed that they were improving, although slowly; may have reached maximum therapeutic improvement; and are possibly successfully managing their chronic pain using a variety of chiropractic visit frequencies To improve symptoms required more than one chiropractic visit per week for those with CLBP and possibly the addition of massage to chiropractic care for CNP functional improvement The more-than-weekly chiropractic visit frequency associated with increased improvement occurred more often in patients with worse baseline pain and function who may have had more room for improvement 	
Chiropraction	care visit freq	uency related to lev	el of function, stage o	f care, chiropractor e	experience and state of treatment	
Reichardt et al 2022	LQ	Retrospective observational study	To explore the potential relationship of a course of care, including soft tissue therapy, spinal manipulation, acupuncture, and other treatments commonly delivered by chiropractors, to spine pain and extremity pain in patients diagnosed with OA	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	Statistically significant improvements that exceed a clinically meaningful difference in pain numeric rating scale scores were demonstrated by point change reductions from baseline to discharge visits. Change scores exceeding a minimally clinically important difference of '2-points' were present in the sacroiliac (-2.91), extremity (-2.84), cervical (-2.73), thoracic (-2.61), and lumbar (-2.59) regions	
Patients scores in	diagnosed wit both a clinica	h UA in a socioecond Ily meaningful and si	omically disadvantage tatistically significant r	d community demon <u>nanner</u> concurrent w	strated reductions in mean pain vith a course of chiropractic care	



2. Cervical - Non-Specific Cervical Pain

Non-specific neck pain is defined in this review as neck pain in which no systemic disease or structure can be detected as the underlying cause of the complaint. This group includes patients with mainly mechanical disorders (Balague et al 2012).

A. Systematic Reviews (Level I Evidence)

Three SRs, including eleven RCTs and one cohort study, were identified that reviewed the effectiveness of chiropractic interventions in treating non-specific cervical pain.

Shekelle et al 2017

Shekelle et al (2017) (QS: HQ) conducted an SR to explore the benefits and harms of spinal manipulative therapy (SMT)/chiropractic services for acute neck pain (less than 6 weeks' duration) compared to usual care or other forms of acute pain management, and if there was a relationship between the use of spinal manipulation/chiropractic services for acute neck pain and the use of opiate medication. While the review reported that it focused on chiropractic care, it included all types of SMT, including that performed by physiotherapists (n=3) and medical practitioners (n=1) with only one of the five studies (Pikula 1999) specifically related to care provided by a qualified chiropractor. Patients received a single high velocity, low amplitude thrust manipulation (chiropractic spinal manipulative therapy (CSMT)) to the cervical spine to either the ipsilateral or contralateral neck with reference to the side of the cervical pain. The remaining 12 received 8 minutes of detuned ultrasound. A visual analogue pain score was determined both pre-treatment and immediately post-treatment. In the ipsilateral CSMT group, pain scores improved from 42.5 to 23.6. In the contralateral CSMT group, pain scores improved from 44.1 to 41.4 and in the placebo group, pain scores improved from 50.4 to 46.5. This pilot study demonstrated greater improvement in immediate pain scores using ipsilateral CSMT than contralateral CSMT (p<0.05).

Study	SIGN rating	Conclusions	Strength of evidence
Shekelle et al	HQ	Greater improvement in immediate pain scores using ipsilateral CSMT than contralateral CSMT	Based on 1 RCT
2017		Contralateral CSMT no better than sham ultrasound	Based on 1 RCT

Silva et al 2012

Silva et al (2012) (QS: LQ) conducted an SR exploring the evidence for chiropractic care for cervical pain. They reported on six RCTs that focused on chiropractic care. No effect of CSMT was reported compared to cervical mobilisation (n=366, Hurwitz et al 2002; n=47, Gemmell & Miller 2010; n=182, Leaver et al 2010) or massage from 8-16 weeks (n= 60, Haas et al 2010). The authors reported that Leaver et al (2007) found improvements in CSMT compared to chiropractic mobilisations (n=182); however, it should be noted that this was a protocol paper that did not collect any data. Vavrek, Haas & Peterson (2010) reported benefits of CSMT compared to conservative treatment (n=80); however, it should be noted that this study did not study neck pain but was focused on cervicogenic headaches. Despite four of the remaining five RCTs



indicating no specific benefit of chiropractic manipulative therapy, the authors concluded that 'manipulation techniques have promoted pain relief in a faster and more prolonged way'.

Study	SIGN rating	Conclusion	Strength of evidence
Silva et al 2012	LQ	CSMT no better than massage or cervical mobilisation from 8 weeks for pain relief	Based on 4 RCTs

Miller et al 2010

Miller et al (2010) (QS: HQ) conducted an SR exploring the effectiveness of manual therapy and exercise for neck pain with or without radicular symptoms or cervicogenic headache on pain, function/disability, quality of life, global perceived effect and patient satisfaction. While the review included all practitioners, there were 3 chiropractic-specific RCTs in the 17 reported on. Chiropractic SMT + exercise was better than exercise or CSMT alone (Chronic neck pain: Bronfort et al 2001). Chiropractic SMT was better in reducing neck pain than advice (Chronic neck pain: Palmgren et al 2006), but not as effective as physiotherapy in reducing pain and improving cost effectiveness (Chronic neck pain: Skargren et al 1998).

Study	SIGN rating	Conclusions	Strength of evidence
Miller et al 2010	HQ	CSMT was better than advice in reducing pain and improving function	Based on 1 RCT
		CSMT was more effective in reducing pain and improving function	Based on 1 RCT
		when complined with exercise	
		CSMT was not as effective as physiotherapy in reducing pain and	Based on 1 PCT
		improving cost effectiveness	based on 1 Ker

B. Randomised Controlled Trials (Level II Evidence)

Four RCTs not included in the previously reported SRs that reviewed the effect of chiropractic treatment on non-specific neck pain were identified.

Study	SIGN Rating	Objective	Intervention	Result
Aki et al 2020 • Chiropractic (diver	AQ	To compare the effectiveness of chiropractic application (diversified technique) and dry needling therapy in patients with chronic mechanical neck pain que) as effective as dry needli	Chiropractic (diversified technique) treatment at two applications/week (eight applications in total) ng on pain, range of m	• Dry needling and chiropractic treatments were found to be effective in terms of pain relief, increasing the joint range of motion, and decreasing the degree of neck disability in patients with chronic mechanical pain otion and disability for chronic
mechanical neck p	pain in short to	erm		
Gorrell et al 2016aAQTo compare the effects of 2 different cervical manipulation techniques for mechanical neck pain (MNP) > 1 month durationMAM - manually applied manipulation plus active muscle stretching routine IAM - instrument- applied manipulation plus active muscle stretching routineSubjective pain scores decreased at 7 day follow-up in the MAM group compared with control onlyGorrell et al 2016aAQTo compare the effects of 2 different cervical manipulation techniques for mechanical neck pain (MNP) > 1 month durationMAM - manually applied manipulation plus active muscle stretching routine• Subjective pain scores decreased at 7 day follow-up in the MAM group compared with control only • Cervical ROM improved in most measures in MAM compared to IAM • Contralateral hand grip-strength increased in IAM				
Single cervical manipulation is capable of producing immediate and short-term benefits for MNP				



 Not all manipulative techniques have the same effect and differences may be mediated by neurological or biomechanical factors inherent to each technique 					
Martel et al 2011	HQ	To investigate the efficacy of preventive spinal manipulative therapy (SMT) compared to a no treatment group in NCNP patients	After symptomatic phase finished they received a maximum of 4 spinal manipulations to the cervical and upper thoracic areas compared to SMT plus exercise or attention control	 No group difference was observed for the primary, secondary and exploratory variables. Significant improvements in FABQ scores were noted in all groups during the preventive phase of the trial However, no significant change in health related quality of life (HRQL) was associated with the preventive phase 	
There is no addition home exercise pro-	onal benefit fo ogramme com	or patients with NCNP to rece ppared to meeting a chiroprac	ive monthly preventive ctor once every 2 mont	e SMT or monthly preventive SMT with a hs to discuss neck problems	
Miranda et al 2015LQTo evaluate the influence of SMT in patients with chronic neck pain (EG) compared to a manipulative sham group (SG)Gonstead Technique's Cervical Chair manipulative procedure• Significant differences for NDI between pre- and post-treatment evaluations of both the EG and the SG • There were significant post-treatment differences between the EG and the SG					
• The result shows that after the treatment period both groups showed improvement in disability; however, the SMT resulted in an improved outcome in the treatment of patients with chronic neck pain immediately post-treatment					

Reviews and studies reporting on chiropractic for non-specific neck pain varied in quality from low to high quality. While numerous SRs were identified that included all forms of manual therapy, three SRs specifically explored the effect of chiropractic management of non-specific neck pain. One SR focused on acute neck pain while the remaining three did not specify chronicity. Of the RCTs, three focused on chronic neck pain (> 6 weeks), one on sub-acute stage neck pain, one on patients with neck pain > 1 month and one on neck pain < 3 months. Treatments included traditional chiropractic manipulation (diversified technique, Gonstead Technique), the use of an activator instrument, mobilisations and preventive care.

Treatment dosages ranged from the effect of one treatment (Pikula 1999, Gorell et al 2016a) to 20 treatments (Bronfort et al 2001). Most studies demonstrating effectiveness of chiropractic spinal manipulation compared to other modalities for non-specific neck pain used dosages of 4-6 treatments over 1-2 weeks (Miranda et al 2015, Gemmel and Miller 2010, Skargren et al 1998) or 8-12 treatments over 3-4 weeks (Aki et al 2020, Leaver et al 2007, Vavrek, Haas & Peterson 2010, Haas et al 2004, Martel et al 2011).

3. Cervical - Whiplash Associated Disorders

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the use of chiropractic treatment for whiplash associated disorders (WAD).

Shaw et al 2010

Shaw et al (2010) (QS: AQ) conducted an SR exploring the effectiveness of chiropractic management of adults with WAD. This 'review' used a Participatory Action Research (PAR) approach to engage a chiropractic community of practice and stakeholders in a systematic review to address the question:



'Does chiropractic management of WAD clients have an effect on improving health status?'. Chiropractic management of WAD in this review was inclusive of all potential treatment modalities used by any manual practitioners. The treatments included ranged from exercise, rest, physiotherapy, etc. with only two studies specifically referring to treatment provided by chiropractors (Fitz-Ritson 1995, Osterbauer et al 1992). Fitz-Ritson suggested some benefit of CSMT in pain and disability when CSMT is used with unsupervised exercise compared to the use of CSMT with supervised exercise; however, neither study compared CSMT against another intervention. The authors concluded that there is a baseline of evidence that suggests chiropractic care improves cervical range of motion (cROM) and pain in the management of acute WAD. The authors recommended combinations of the following modalities: early mobilisation, information/instruction, unsupervised and supervised cROM exercise within multimodal treatment regimens for treatment of pain, and cROM in acute and sub-acute WAD. However, the level of this evidence relevant to clinical practice remained low or drew on clinical consensus at this time.

Study	SIGN rating	Conclusions	Strength of evidence
		The evidence is unclear about the role of chiropractic	Based on 1 RCT and
Shaw et al		manipulative therapy in WAD	1 cohort study
2010	AQ	The evidence is clearer for the use of multimodality	
		approaches including early mobilisation, information/	Based on 27 studies
		instruction, unsupervised and supervised cROM exercise	

4. Cervical - Facet Joint Dysfunction

A. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that assessed the effect of chiropractic management on cervical pain secondary to facet joint dysfunction.

Study	SIGN rating	Objective	Intervention	Result	
Saayman et al 2011	HQ	To determine the short- term effect of chiropractic joint manipulation therapy (CMT) and low-level laser therapy (LLLT) on pain and range of motion in the management of cervical facet dysfunction	Specific short lever, high-velocity, low- amplitude diversified techniques of cervical manipulation were then used to restore joint motion	 A significant difference was seen between groups 1 (CSMT) and 2 (LLLT) for cervical flexion, between groups 1 (CSMT) and 3 (CSMT + LLLT) for cervical flexion and rotation, and between groups 2 (LLLT) and 3 (CSMT + LLLT) for pain disability in everyday life, lateral flexion, and rotation All 3 groups showed improvement in the primary and secondary outcomes 	
 A combination of CMT and LLLT was more effective than either of the two on their own Both therapies are indicated as potentially beneficial treatments for cervical facet dysfunction 					



5. Cervical – Cervical Spondylosis

A. Randomised Controlled Trials (Level II Evidence)

Two RCTs were identified that focused on the effect of chiropractic management on cervical pain due

to cervical spondylosis.

Study	SIGN rating	Objective	Intervention	Result		
Wei et al 2015	AQ	To observe the therapeutic effect of Governor Vessel- unblocking and yang- regulating acupuncture plus chiropractic treatment on upper cervical spondylosis	Governor Vessel- unblocking and Yang- regulating needling method, fine adjustment of the upper cervical spine and lumbosacral Ban-pulling manipulation	Governor Vessel-unblocking and yang-regulating acupuncture and regulate yang plus chiropractic therapy is better than routine acupuncture plus chiropractic therapy in the therapeutic effect in the treatment of upper cervical spondylosis		
Chiropractic m	nanipulation w	vorks better with specific forms	of acupuncture as an adju	nct		
Fan et al 2018	LQ	To observe the curative effect of cervical chiropractic for cervical spondylosis of vertebral artery type (CSA)	In accordance with the requirements of the cervical chiropractic, the displacement of the cervical spine was corrected one by one, once every other day, 7 times in total	Cervical chiropractic is an effective method for CSA, and its curative effect is better than that of flunarizine hydrochloride alone. Its mechanism may relate to correcting cervical instability		
Chiropractic ma	Chiropractic manipulation Improved the haemodynamic parameters of left and right vertebral and basilar arteries and					

B. Case Report/Case Series studies (Level IV Evidence)

Two case series explored the effect of chiropractic treatment on cervical spondylosis.

Study	Study design	Objective	Intervention	Result	
Xiu 2015	Prospective case series (n=36)	To observe the clinical efficacy of treatment of cervical spondylosis with acupuncture and cupping combined with chiropractic massage	Acupuncture, cupping and chiropractic cervical massage and manipulation	Twenty patients were cured, 14 were improved, and ineffectiveness was seen in 2 cases. The total effective rate was 94.4% (34/36)	
Chiropractic manipu	ulation with acupun	cture and cupping may help	p pain associated with c	ervical spondylosis.	
Fedorchuk et al 2020	Retrospective case series (n=8)	Effect of Chiropractic BioPhysics® care in patients with cervical spondylosis	30 sessions of Mirror Image [®] spinal exercises, adjustments, and traction over 12 weeks per CBP [®] protocols	Patients reported improved symptoms and disabilities. Radiographs revealed improvements in cervical alignment, spondylosis, and spinal canal diameter	
• CBP [®] spinal rehabilitation may be an effective conservative, non-surgical treatment for cervical spondylosis and associated symptoms including neck pain and cervical radiculonathy.					



6. Cervical – Cervical Radiculopathy

A. Case Report/Case Series studies (Level IV Evidence)

One case series explored the effect of chiropractic intervention on cervical radiculopathy.

Study	Study design	Objective	Intervention	Result
Peterson et al 2013	Prospective case series (n=50)	To investigate outcomes for patients with cervical radiculopathy from cervical disk herniation (CDH) who are treated with spinal manipulative therapy	A standardised, single, high- velocity, low-amplitude cervical manipulation with rotation to the opposite side and lateral flexion to the same side of the affected arm. Treatments were repeated 3 to 5 times per week for the first 2 to 4 weeks and carried on 1 to 3 times per week thereafter until the patient was asymptomatic	 55.3% were 'improved' at two weeks, 68.9% at one month and 85.7% at three months Significant decreases in neck pain, arm pain, and NDI scores were noted at 1 and 3 months compared with baseline scores. Of the sub- acute/chronic patients, 76.2% were improved at 3 months
Most patien	its in this study, inclue	ding sub-acute/chronic	patients with symptomatic magn	etic resonance imaging-

 Most patients in this study, including sub-acute/chronic patients with symptomatic magnetic resonance imagingconfirmed CDH treated with spinal manipulative therapy, reported significant improvement with no adverse events

7. Cervical – Cervicogenic Headache

A. Systematic Reviews (Level I Evidence)

Four SRs were identified that included studies which reviewed the effectiveness of chiropractic interventions in treating cervicogenic headaches.

Moore et al 2017

Moore et al (2017) (QS: AQ) conducted an SR exploring the effectiveness of manual therapy for headache disorders in terms of prevalence, profiles, motivations, communication and self-reported effectiveness. The review included all practitioners, but reported on 9 chiropractic-specific qualitative studies of the 35 reported on in the review. The prevalence of chiropractic use for those with migraine ranged from 1.0 to 36.2% (mean: 14.4%) within the general population and from 8.9 to 27.1% (mean: 18.0%) within headache clinic patient populations. The prevalence of chiropractic use for those reporting headache ranged from: 4 to 28.0% (mean: 12.9%) within the general population; 12.0 to 22.0% (mean: 18.6%) within headache/pain clinic patient populations; and 1.9 to 45.5% (mean: 9.8%) within chiropractic patient populations. For chiropractic treatments, patient self-reporting of partially effective or fully effective headache relief ranged from 27.0 to 82.0% (mean: 45.0%).

Study	SIGN rating	Conclusions	Strength of evidence
Moore et al 2017	AQ	Patient self-reporting of partially effective or fully effective headache relief ranged from 27.0 to 82.0% (mean: 45.0%)	Based on 9 qualitative studies



Posadzki et al 2011

Posadzki et al (2011) (QS: AQ) conducted an SR exploring the evidence related to the use of CSMT for cervicogenic headache (CGH). The review included all practitioners but reported on 3 chiropractic-specific RCTs of the 9 reported on in the review. Haas et al (2010) reported significant improvements in headache pain and disability with CSMT compared to gentle massage over 6 months and Haas et al (2004) reported that this effect was greater when treatment was delivered 9 or 12 times compared to 3 times over 12 weeks, although the authors cautioned about the low quality of the study. Nilsson et al (1997) reported better effects from CSMT in headache pain scores and frequency of headaches compared to physical therapy after 1 week.

Study	SIGN rating	Conclusions	Strength of evidence
Posadzki et al 2011	AQ	 The quality of the evidence is low There is some evidence of benefit of CSMT for cervicogenic headaches on pain and headache frequency in both short and long term 	Based on 3 RCTs
		 CSMT more effective than physical therapy in short term (one week) 	Based on 1 RCT

Bryans et al 2011

Bryans et al (2011) (QS: AQ) conducted an SR exploring the evidence related to chiropractic treatment of headache in adults. The authors included controlled clinical trials, RCTs, and SRs. The review defined chiropractic treatment as including the most common therapies used by any practitioners and was not restricted to treatment modalities delivered only by chiropractors. The review found 21 studies (16 CCT/RCTs) and 5 SRs) of which 6 RCTs were focused on chiropractic management (Tuchin et al 2000 (migraine), Nelson et al 1998 (migraine), Boline et al 1995 (tension type headache), Bove and Nilsson 1998 (tension type headache), Donkin et al 2002 (tension type headache), Nilsson et al 1997 (cervicogenic headache)). They reported that for migraine, spinal manipulation and multimodal multidisciplinary interventions including massage are recommended for management of patients with episodic or chronic migraine. For tension-type headache, spinal manipulation cannot be recommended for the management of episodic tension-type headache. A recommendation cannot be made for or against the use of spinal manipulation for patients with chronic tension-type headache. Low-load cranio-cervical mobilisation may be beneficial for longer term management of patients with episodic or chronic tension-type headaches. For cervicogenic headache, spinal manipulation is recommended. Joint mobilisation or deep neck flexor exercises may improve symptoms. There is no consistently additive benefit of combining joint mobilization and deep neck flexor exercises for patients with cervicogenic headache.

Study	SIGN rating	Conclusions	Strength of evidence
Bryans et al 2011	AQ	For cervicogenic headache, chiropractic spinal manipulation is effective in reducing pain compared to laser/massage	Based on 1 RCT



Fernandez et al 2020

Fernandez et al (2020) (QS: HQ) conducted an SR exploring the evidence related to the use of spinal manipulative therapy (SMT) for cervicogenic headache (CGHA). The review was limited to RCTs and included all practitioners. The review identified 7 RCTs of which 5 were chiropractic specific spinal manipulative therapy (CSMT). Across the 5 RCTs, chiropractic SMT for cervicogenic headache was found to be no better than sham SMT (n= 8, Chaibi et al 2017) or soft tissue work (n=38, Nilsson 1995) in two RCTs. In the remaining 3 RCTs, CSMT resulted in improvements in headache duration, intensity and medication usage compared to laser/soft tissue work (n=53, Nilsson et al 1997), light massage (n= 256, Haas et al 2010; n=80, Haas et al 2018).

Study	SIGN rating	Conclusions	Strength of evidence
Fernandez et al 2020	HQ	 CSMT provides small, superior short-term benefits for pain intensity, frequency and disability, but not pain duration 	Based on 5 RCTs
		 CSMT was no better than other forms of manual therapy in long term for headache pain intensity and frequency 	Based on 2 RCTs

B. Randomised Controlled Trials (Level II Evidence)

One RCT not included in the previously reported SRs that reviewed the effect of chiropractic treatment on cervicogenic headaches was identified.

Study	SIGN Rating	Objective	Intervention	Result	
Vernon et al 2015	HQ	To determine if the addition of a self-acupressure pillow (SAP) to typical CSM treatment results in significantly greater improvement in tension- type and cervicogenic headache sufferers	Usual chiropractic treatment plus a pillow	The number of subjects in usual CSMT achieving a reduction in headaches greater than 40% was 71%, while for usual CSM + pillow, this was 28%.	
Usual chiropractic spinal manipulation was more effective in reducing headache than usual chiropractic spinal manipulation and self asupressure pillow					
 Vernon et al 2015 Usual chiropract manipulation and 	HQ ic spinal mani d self-acupres	(SAP) to typical CSM treatment results in significantly greater improvement in tension- type and cervicogenic headache sufferers pulation was more effective in ssure pillow	Usual chiropractic treatment plus a pillow n reducing headache	The number of subjects in usual CSMT achieving a reduction in headaches greater than 40% was 71%, while for usual CSM + pillow, this was 28%.	

Treatment dosages ranged from the effect of six treatments over 3 to 6 weeks (Haas et al 2018, Nilsson 1995, Nilsson et al 1997, Vernon et al 2015) to 18 treatments over 8 weeks (Haas et al 2018). Most studies demonstrating effectiveness of chiropractic spinal manipulation compared to other modalities for cervicogenic headaches used dosages of 8 to 16 treatments over 6 to 8 weeks (Haas et al 2010, Chaibi et al 2017, Haas et al 2018).



8. Lumbar – Non-Specific Low Back Pain

A. Systematic Reviews (Level I Evidence)

Ten systematic reviews were identified that explored the effect of chiropractic management of nonspecific low back pain. Non-specific low back pain in this review is defined as low back pain in which no systemic disease or structure can be detected as the underlying cause of the complaints.

Parkinson et al 2013

Parkinson et al (2013) (QS: AQ) conducted an SR exploring the impact of chiropractic care on quality of life, lifestyle, health and economic status in patients presenting with back pain. The review identified four RCTs: Descarreaux et al 2004, Hawk et al 2005, Wilkey et al 2008 and the UCLA low back pain study (reported in Kominski et al 2005, Hertzman-Miller et al 2002 and Hurwitz et al 2005); plus two observational studies: Langworthy and Breen 2007 and Giles et al 2003). There was a high degree of inconsistency and lack of standardisation in measurement instruments and outcome measures: three studies reported reduced use of other/extra treatments as a positive outcome; two studies reported a positive effect of chiropractic intervention on pain; and two studies reported a positive effect on disability. The six studies reviewed concentrated on the impact of chiropractic on physical health and disability, rather than a wider holistic view which was the intended focus of the review. The authors concluded that it was difficult to defend any conclusion about the effect of chiropractic intervention on quality of life, lifestyle, health and economic status in chiropractic patients presenting with back pain.

Study	SIGN rating	Conclusions	Strength of evidence
Parkinson et al	AQ	The evidence was unclear about the effect of chiropractic intervention on the quality of life, lifestyle, health and economic status of patients presenting with back pain	Based on 4 RCTs and 2 observational studies
2013		Chiropractic intervention appeared to reduce pain and disability in patients presenting with back pain	Based on 2 RCTs

Ruddock et al 2016

Ruddock et al (2016) (QS: HQ) conducted an SR exploring RCTs of spinal manipulation (SM) vs sham manipulation in the treatment of non-specific low back pain. While the review included all practitioners, there were two chiropractic-specific RCTs among the nine reported on.

Waagen et al (1986) found improvements in pain measured using the VAS in both the experimental group and the control group immediately after the intervention. At the 2-week post-treatment assessment, there was evidence of reduced pain in the experimental group only. Hoiiris et al (2004) reported a decrease in pain and disability scores, using the VAS and the OLBPDQ, from baseline to 2-week follow-up in all treatment arms. The chiropractic SM group showed the greatest decline in scores. The study found no evidence of a difference between the changes observed for each group.



Study	SIGN rating	Conclusions	Strength of evidence
Ruddock et al 2016	HQ	There is evidence that chiropractic SM has specific treatment effects and is more effective at reducing non-specific low back pain when compared with a sham intervention	Based on 2 RCTs

Walker et al 2010

Walker et al (2010) (QS: HQ) conducted an SR exploring the effects of combined chiropractic interventions (a combination of therapies, other than spinal manipulation alone) on pain, disability, back-related function, overall improvement, and patient satisfaction in adults with LBP, aged 18 and older. The review identified 12 suitable RCTs. Included studies evaluated a range of chiropractic procedures in a variety of sub-populations of people with LBP. No trials were located of combined chiropractic interventions compared to no treatment. For acute and subacute LBP, chiropractic interventions improved short- and medium-term pain (SMD -0.25 (95% CI -0.46 to -0.04) and MD -0.89 (95%CI -1.60 to -0.18)) compared to other treatments, but there was no significant difference in long-term pain (MD -0.46 (95% CI -1.18 to 0.26)). Short-term improvement in disability was greater in the chiropractic group compared to other therapies (SMD -0.36 (95% CI -0.70 to -0.02)). However, the effect was small and all studies contributing to these results had high risk of bias. There was no difference in medium- and long-term disability. No difference was demonstrated for combined chiropractic interventions for chronic LBP and for studies that had a mixed population of LBP.

Study	SIGN rating	Conclusions	Strength of evidence
Walker et al 2010	HQ	Combined chiropractic interventions slightly improved pain and disability in the short term, and pain in the medium term, for acute and sub-acute LBP. However, there is currently no evidence that supports or refutes that these interventions provide a clinically meaningful difference for pain or disability in people with LBP when compared to other interventions	Based on 12 RCTs

Yeganeh et al 2017

Yeganeh et al (2017) (QS: AQ) conducted an SR to determine the effectiveness of acupuncture, acupressure and chiropractic (non-pharmacological) interventions on the treatment of chronic nonspecific low back pain in Iran. The review identified 3 chiropractic specific RCTs published in Persian (Farsi) or English languages, and carried out in Iran. This systematic review demonstrates that chiropractic interventions may have a favourable effect on self-reported pain and functional limitations on NSCLBP. However, the results should be interpreted in the context of the limitations identified, particularly in relation to the heterogeneity in the study characteristics and the low methodological quality in many of the included studies. The meta-analysis of the three RCTs showed that chiropractic care was not significantly different to physical therapy modalities (SMD -0.02 (-0.76, 0.72).

Study	SIGN rating	Conclusions	Strength of evidence	
Yeganeh et al 2017	AQ	Chiropractic may have a favourable effect on self-reported pain and functional limitations in Iranian NSCLBP patients		
		Chiropractic is as effective as physical therapy modalities in reducing	Based on 3 RCTs	
		pain and disability in Iranian NSCLBP patients		



Andronis et al 2017

Andronis et al (2017) (QS: AQ) conducted an SR exploring the cost-effectiveness of non-invasive and non-pharmacological interventions for low back pain. While the review included all practitioners there was one chiropractic-specific RCT in the 33 reported studies. Haas et al (2005) (USA) calculated the total health care costs in relation to Medicare expenditure for chiropractic care and found that this option was associated with only moderately higher total costs than usual care, mainly owing to fewer onward/ external referrals. The cost per reduction in pain and disability score for chiropractic care was lower for chronic than for acute patients. The intervention becomes more cost effective for chronic patients at 12 months than at 3 months, though the opposite results are observed for acute patients. In general, combined physical and psychological treatments, information and education interventions, and manual therapies appeared to be cost effective when compared with the study-specific comparators. There is inconsistent evidence around the cost effective.

Study	SIGN rating	Conclusions	Strength of evidence
Andronis et al 2017	AQ	Chiropractic care was associated with only moderately higher total costs than usual care, mainly owing to fewer onward/external referrals	Based on 1 RCT

Blanchette et al 2016

Blanchette et al (2016) (QS: HQ) conducted an SR exploring the clinical effectiveness and economic evaluation of chiropractic care compared to other commonly-used care approaches among adult patients with non-specific LBP. Chiropractic standard care was defined as patient-centred, multimodal care (e.g. combinations of SMT, soft tissue techniques, prescription of exercise, advice and reassurance) planned and delivered by a licensed chiropractor. Five RCTs with low risk of bias compared chiropractic care to exercise therapy (n = 1), physical therapy (n = 3) and medical care (n = 1). Overall, individual studies showed similar effects of chiropractic care compared to exercise therapy, physical therapy or medical care for the treatment of low back pain regardless of type of outcome. Similarly, the pooled results revealed no significant difference in effectiveness between provider groups. Three low to high quality full economic evaluations studies (one cost-effectiveness, one cost-minimization and one cost-benefit) compared chiropractic care, equivalent options), mixed evidence was found for economic evaluations of chiropractic care compared to medical care. Moderate evidence suggests that chiropractic care for LBP appears to be equally effective as physical therapy. Limited evidence suggests the same conclusion when chiropractic care is compared to exercise therapy and medical care, although no firm conclusion can be reached at this time.



Study	SIGN rating	Conclusions	Strength of evidence
Blanchette et al 2016	HQ	Chiropractic care is as effective as exercise therapy, physical therapy or medical care for the treatment of low back pain regardless of type of outcome	Based on 6 RCTs
		Evidence of economic benefits of chiropractic care compared to usual care appears inconclusive	Based on 3 RCTs

Rubinstein et al 2019

Rubinstein et al (2019) (QS: HQ) conducted an SR exploring the benefits and harms of spinal manipulative therapy (SMT) for the treatment of chronic low-back pain (LBP). While the review included all practitioners there were 16 chiropractic-specific RCTs of the 47 reported studies. The review focuses on the effects of both spinal manipulation (i.e. high-velocity low-amplitude (HVLA) techniques) as well as mobilisation (i.e. low-velocity low-amplitude (LVLA) techniques). Overall the results suggest moderate quality evidence that SMT results in similar effects for short-term pain relief (MD -3.17, 95% CI -7.85 to 1.51) and a small, clinically better improvement in function (SMD -0.25, 95% CI -0.41 to -0.09). When compared to non-recommended therapies, there is high-quality evidence that SMT results in small, not clinically better effects for short-term pain relief (MD -7.48, 95% CI -11.50 to -3.47), but does result in a small to moderate clinically better improvement in function (SMD -0.41, 95% CI -0.67 to -0.15). Of the chiropractic-specific studies, ten of the fourteen studies that explored function reported no significant difference compared to the comparative intervention group, two reported greater improvement in the comparative intervention group and three reported greater improvement with chiropractic care. Of the thirteen studies that explored pain, ten reported no significant difference compared to the comparative intervention group, one reported greater improvement in the comparative intervention group and three reported greater improvement with chiropractic care. Of the pain measures that showed improvement, most were taken under three months, with reducing difference noted in the longer-term studies.

Study	Chronicity of NSLBP	Treatment dosage	Compared to other treatments
Bronfort 2011	Chronic	12 wks	Function (1,3,6,12 mth) NSD
			Pain (1,3,6,12 mth) NSD
Bronfort 1996	Chronic	10 Rx over 5 wks	Function (1,3 mth) NSD
			Pain (1,3 mth) NSD
Dougherty 2014	Chronic	8 Rx over 4 wks	Function (1,3,6 mth) NSD
			Pain (1,3,6 mth) NSD
Gudavalli 2006	Chronic	16 Rx over 4 wks	Function (1, 3,6,12 mth) NSD
			Pain (1,6 mth) SD
			Pain (3, 12 mth) NSD
Haas 2014	Chronic	6 - 18 Rx over 6 wks	Function (1, 6, 12 mth) NSD
			Function (3 mth) SD
			Pain (1,3 mth) SD
			Pain (6, 12 mth) NSD
Hondras 2009	S/A - chronic	12 Rx over 6 wks	Function (1, 3, 12 mth) SD
			Function (6 mth) NSD
Hsieh 2002	S/A - chronic	9 Rx over 3 wks	Function (1, 6mth) NSD
			Pain (1, 6mth) NSD
Hurwitz 2002	All	Not reported	Function (1, 6, 12mth) NSD
			Pain (1. 6. 12mth) NSD



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Muller 2005	Chronic	Not reported	Function Not reported
			Pain Not reported
Petersen 2011	Chronic	15 Rx over 12 wks	Function (3 mth) NSD
			Function (6,12 mth) SD**
			Pain (3, 6, 12 mth) NSD
Pope 1994	S/A - chronic	3 Rx over 3 wks	Pain (1 mth) NSD
Postacchini 1988	Chronic	12 Rx over 6 wks	Not reported
UK BEAM trial 2004	S/A - chronic	8 Rx over 12 wks	Function (1,3,12 mth) NSD
			Pain (1,3,12 mth) NSD
Waagen 1986	S/A - chronic	6 Rx over 2 wks	Not reported
Walker 2013	Acute - chronic	2 Rx over 2 wks	Function (2 wks) SD**
			Pain (2 wks) SD**
Wilkey 2008	Chronic	16 Rx over 8 wks	Function (1 mth) SD
			Pain (1 mth) SD
Xia 2016	S/A - chronic	4 Rx over 2 wks	Function (1 mth) NSD
			Pain (1 mth) NSD

** Greater effect of the comparative intervention.

Study	SIGN rating	Conclusions	Strength of evidence
Rubinstein 2019	HQ	 The evidence suggests that chiropractic management for low back pain is effective in reducing pain and improving function in short term 	Based on 4 RCTs
		• The evidence suggests that chiropractic management is as effective as other management approaches for low back pain	Based on 12 RCTs

Goertz et al 2012

Goertz et al (2012) (QS: AQ) conducted an SR exploring the current literature on patient-centred outcomes in randomized controlled trials of HVLA SM in patients with low back pain. While the review included all practitioners there were 15 chiropractic specific RCTs of the 38 reported studies. The authors reported that HVLA SM for LBP appeared to convey a small but consistent treatment effect at least as large as that seen in other conservative methods of care. The heterogeneity and inconsistency in reporting within the studies reviewed makes it difficult to draw definitive conclusions or adequately summarize patient-centred outcomes for clinical trials of HVLA SM for LBP. Overall, the majority of chiropractic-specific papers reported short term improvements in Roland Morris, Oswestry Back Pain Disability Index, pain and NPRS.

Study	SIGN rating	Conclusions	Strength of evidence
Goertz et al 2012	AQ	Chiropractic care as effective for disability and pain in the short term as medical care, surgery, ultrasound, exercise or mobilisation	Based on 15 RCTs

Oakley et al 2020

Oakley et al (2020) (QS: AQ) conducted an SR exploring current literature on use of the Chiropractic Bio Physics[®] (CBP[®]) non-surgical approach to increasing lumbar lordosis in the treatment of low back disorders. This technique is a form of lumbar extension traction. The review identified two randomized and one non-randomized trials involving 120 intervention patients and 102 controls. Trials demonstrated increases in radiographically measured lordosis of 7–11°, over 10–12 weeks, after 30–36 treatments.



Randomised trials demonstrated traction treated groups mostly maintained lordosis correction, pain relief, and disability after 6-months follow-up. The non-randomized trial showed lordosis and pain intensity were maintained with periodic maintenance care for 1.5 years. Importantly, control/comparison groups had no increase in lumbar lordosis. Randomized trials showed comparison groups receiving physiotherapy less the traction had temporary pain reduction during treatment that regressed towards baseline levels as early as 3-months after treatment. Both RCTs demonstrated that rehabilitation programs that included lordosis restoration by LET show better long-term (6-month) outcomes versus patients receiving 'cookie-cutter' physiotherapy treatments that included hot packs (15 minutes) and interferential therapy (20 minutes) as well as infrared radiation (15 minutes) and exercises for the quadratus lumborum and hamstring muscles.

Study	SIGN rating	Conclusions	Strength of evidence
Oakley et al 2020	AQ	Chiropractic Bio Physics [®] (CBP [®]) traction had a positive effect on pain and disability in the long term	Based on 2 RCTs and one non-RCT

B. Randomised Controlled Trials (Level II Evidence)

Eleven RCTs not included in the previously reported systematic reviews that examined the effect of chiropractic treatment on non-specific low back pain were identified.

Study	SIGN rating	Objective	Intervention	Result
Bishop et al 2010	HQ	To determine if full CPG- based study care (SC) leads to greater improvement in functional outcomes than family physician-directed usual care (UC) in the treatment of acute mechanical low back pain	Lumbar spinal manipulative therapy (SMT) using conventional side posture, high-velocity, low-amplitude techniques and CPG-based care	Compared to family physician- directed usual care, full CPG-based treatment including chiropractic SMT is associated with significantly greater improvement in condition-specific functioning
Clinical p	ractice guide	line (CPG) -based care, includi	ng chiropractic spinal manipulatio	on, improved disability levels
Goertz et al 2013	AQ	To assess changes in pain levels and physical functioning in response to standard medical care (SMC) versus SMC plus chiropractic manipulative therapy (CMT) for the treatment of low back pain (LBP)	Treatments consisted of HVLA manipulation as the primary approach in all cases, with ancillary treatments at the doctor's discretion	 Mean Roland-Morris Disability Q scores decreased in both groups during the course of the study, but adjusted mean scores were significantly better in the SMC plus CMT group than in the SMC group at both week 2 and week 4 Mean numerical rating scale pain scores were also significantly better in the group that received CMT Adjusted mean back pain functional scale scores were significantly higher (improved) in the SMC plus CMT group than in the SMC-only group at both weeks 2 and 4
• Lumbar r	nanipulation	plus usual care is better than	usual care alone in the short term	1
Goertz et al 2018	AQ	To assess changes in pain levels and physical functioning in response to standard medical care (SMC) versus SMC plus chiropractic	Treatments consisted of HVLA manipulation as the primary approach in all cases, with ancillary treatments at the doctor's discretion	 Scores at week 6 were statistically significant in favour of usual medical care plus chiropractic care compared with usual medical care



		manipulative therapy (CMT) for the treatment of low back pain (LBP)		 alone overall for low back pain intensity, disability and satisfaction Odds ratios at week 6 were also in favour of usual medical care plus chiropractic care overall for perceived improvement and self- reported pain medication use
• Lumbar r	maninulation	nlus usual care is better than i	usual care alone un to week 6	
	nanipulation	To assoss the relative short		
Schulz et al 2019	HQ	and long term effective short and long term effectiveness of adding spinal manipulative therapy (SMT) or a supervised exercise program (SEP) to a home exercise program (HEP), compared to HEP alone, for adults 65 years of age and older with low back pain	All participants received 12 weeks of care in one of three treatment groups: 1) Home Exercise Program (HEP); 2) Supervised Exercise (SEP) + HEP; or 3) Spinal Manipulative Therapy (SMT) + HEP	 Primary analysis showed group differences in pain over 1 year were small and not statistically significant Pain severity was reduced by 30 to 40% after treatment in all 3 groups, with the largest difference (eight percentage points) favouring SMT and home exercise over home exercise alone
 Adding s 	pinal manipul	ation or supervised rehabilitat	tive exercise to home exercise alo	one does not appear to improve pain
or disabil	lity in the sho	rt or long term for older adult	<u>s with chronic low b</u> ack pain, but	did enhance satisfaction with care
Vavrek et al 2014	AQ	To compare short term effects of a side-lying, thrust spinal manipulation (SM) procedure and a non-thrust, flexion-distraction SM procedure in adults with sub-acute or chronic low back pain over 2 weeks	This was a prospective controlled trial with three arms: 1) thrust SM in a side-lying posture; 2) non-thrust SM in a prone posture; and 3) waitlist control	 Improvements in disability, LBP intensity, Fear-Avoidance Beliefs Questionnaire (work subscale) & 36 Item Short Form Health Survey (physical health summary measure) for the two SM groups were significantly greater than for the control group There was no difference in any outcome between the 2 SM groups
Side-lving	g. thrust spina	al manipulation (SM) procedur	e and a non-thrust. flexion-distra	action SM procedure had a similar
effect on	patient pain	and I BP-related disability	,,	
Kongsted et al 2021	LQ	To investigate the potential impact of pain monitoring on low back pain (LBP) intensity, activity limitation and pain control, between patients with weekly pain monitoring over 12 months and patients with follow-ups at 2 weeks, 3 months and 12 months	Adults seeking care for LBP were enrolled at first visit to a chiropractor and followed up with surveys after 2 weeks, 3 months and 12 months	 LBP intensity (0 - 10) was slightly lower at 12 month follow-up in the SMS group than the control group No relevant between-group differences were observed for activity limitation or ability to control pain
 Less freq 	uent pain mo	nitoring did not demonstrate	any negative effects compared to	o weekly pain monitoring
Eklund et al 2018	НQ	To assess the effectiveness of maintenance care (MC) on pain trajectories for patients with recurrent or persistent LBP	Maintenance control (i.e. clinician-controlled) vs patient-controlled symptom-guided treatment	 MC resulted in a reduction in the total number of days per week with bothersome LBP compared with symptom-guided treatment During the 12 month study period, the MC group (n = 163, 3 dropouts) reported 12.8 (95% CI = 10.1, 15.5; p = <0.001) fewer days in total with bothersome LBP compared to the control group (n = 158, 4 dropouts) and received 1.7 (95% CI = 1.8, 2.1; p = <0.001) more treatments
MC was	s more effecti	ve than symptom-guided trea	tment in reducing the total numb	per of days over 52 weeks with
bothers	some non-spe	cific LBP, but it resulted in a h	igher number of treatments	· ·
Dougherty et al 2014	HQ	To explore the use of a modified clinical prediction rule (mCPR) for spinal manipulative	SMT (HVLA spinal manipulation and/or flexion distraction therapy or mobilisation) + advice on	There were no differences in outcomes between groups in response to the treatment, given the lack of significant treatment x time interactions. The mCPB x



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		therapy (SMT) in	heat/ice vs active exercise	treatment x time interactions were			
		patients with chronic low	therapy incl. directional	not significant. Differences in			
		back pain	preference exercises, lumbar	outcomes between treatment			
			stabilisation, general flexibility	groups were the same for positive			
			& specific training exercises	and negative in the mCPR groups			
The stu	dv found no e	evidence that a modification of	f the original CPR can be used to	identify chronic LBP patients more			
likely to	benefit from	1 SMT		····			
Haas et al 2014	AQ	To identify the dose- response relationship between visits to a chiropractor for spinal manipulation and chronic low back pain (CNSLBP) outcomes and to determine the efficacy of manipulation by comparison with a light massage control	Spinal manipulative therapy was performed at the assigned number of visits, and a brief light massage control was performed at non-SMT visits to control provider attention and touching the participants	At 12 weeks, the greatest differences from the no- manipulation control were found for 12 sessions (8.6 pain and 7.6 disability points, p < 025); at 24 weeks, differences were negligible			
• Overall, 2	12 visits yield	ed the most favourable results	s, but this was not well distinguish	ned from other dose levels			
			CC was delivered by a team of	IC was significantly superior to CC			
			chiropractors allowed to utilize	over the 1-year period for pain relief.			
		To evaluate	any non-proprietary treatment	The short-term profile (weeks 4 to			
		the relative clinical	under their scope of practice.	12) favoured IC, but this was not			
		effectiveness of 12 weeks of	IC was delivered by a team of	statistically significant. IC was more			
Bronfort et	AO	monodisciplinary	six different provider types:	effective for disability improvement,			
al 2022	7.02	chiropractic care (CC), versus	acupuncturists, chiropractors,	satisfaction and low back symptom			
		multidisciplinary integrative	psychologists, exercise	frequency, but not for medication			
		care (IC), for adults with sub-	therapists, massage therapists,	use, quality of life, leg symptom			
		acute and chronic LBP	and primary care physicians,	frequency, fear avoidance beliefs,			
			with case managers	self-efficacy, active pain coping or			
			coordinating care delivery.	kinesiophobia			
Multidi	sciplinary inte	egrative care (IC) was more eff	ective than monodisciplinary chir	opractic care (CC) for pain severity			
and free	quency, disab	ility and satisfaction, but not f	or medication use, quality of life,	leg symptom frequency, fear			
avoidar	nce beliefs, se	If-efficacy, active pain coping of	or kinesiophobia, in adults with s	ub-acute and chronic LBP			
		To investigate whether	Chiropractic care included	Differences in mean change			
		chiropractic care influences	clinical evaluation SM	between groups were statistically			
Vining at al		strength balance and/or	education and self-	significant in favour of chiropractic			
	AQ	endurance in active-duty	management advice about daily	for LBP-related disability, pain			
2020		United States military	activities that benefit and/or	intensity and interference and fear-			
		nerconnel with I RP	negatively impact symptoms	avoidance behavior compared to			
		personner with LDP	inegatively impact symptoms.	waitlist control			
Active-o	duty military	personnel receiving chiropract	ic care exhibited improved streng	gth and endurance, as well as			
reduced	reduced LBP intensity and disability, compared with a waitlist control						

C. Observational Studies (Level III Evidence)

Six cohort studies were identified that reviewed the effect of chiropractic treatment on non-specific low back pain.

Study	SIGN rating	Study design	Objective	Intervention	Result
Gedin et al 2019	LQ	Prospective observational study (n=138)	To explore patient- reported outcomes (PROs) for LBP patients seeking chiropractic care in Sweden	The diagnosis and chiropractic treatment was determined by the treating chiropractor using standard clinical procedures,	Significant improvements over the four weeks were reported for all PROs by acute LBP patients on NPRS, ODI -13.5, EQ VAS, EQ-5D index, and for three out of four PROs for patients with chronic LBP



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				not a pre-defined	
				treatment protocol,	
				thus reflecting usual	
				chiropractic care	
 Patients w initiating c 	ith acute and hiropractic c	l chronic back pain r are	reported statistically si	gnificant improvement	s in PROs four weeks after
				No standardisation of	
			To investigate	treatment methods or	Based on NPRS values, 13.4% of
			recurrence rate and	numbers was	subjects were categorised as
			prognostic factors in	performed. Instead,	nettorn significantly differed
Knecht		Prospective	a large population of	requested to use their	from fast recovery in terms of
et al	AQ	cohort	patients with LBP up	usual treatment	duration of complaint
2017		(n=722)	to one year after	method, because the	
			chiropractic care	aim of the study was to	Recurrence & chronicity
			using standardised	assess outcomes of	with respect to duration of
			definitions	routine chiropractic	with respect to duration of
				practice	complaint
 Recurrence predictor f 	e rate was lo or recurrenc	w in this LBP patien [.] e.	t population. The dura	tion of complaint befor	e treatment was the main
			To investigate		
				Standardisation of	There were significant
			outcomes and	treatment method or	improvements in mean scores
		Prospective	prognostic factors in	treatment number	for pain and disability at 1 week,
Peterson et	AQ	cohort	patients with acute	was not sought.	1 month, and 3 months,
al 2012		(n=495)		There were no	although these change scores
			undergoing	specific treatments	were significantly greater in the
			trootmont	excluded	acute group
			treatment		
 Patients with improved 	n chronic and	l acute back pain bo	th reported good outc	omes, and most patien	ts with radiculopathy also
					The adjusted likelihood of an ADE
					occurring in an outpatient setting
			To evaluate the		within 12 months was 51% lower
			association		among recipients of chiropractic
		Retrospective	between utilisation		services compared to non-
Whedon et	AQ	cohort	of chiropractic	Standard chiropractic	recipients (OR 0.49; P = .0002).
al 2018a		(n=19,150	services and	care	The reported ADEs were
		(20)200			nonspecific with regard to drug
			adverse drug event		category in the majority of
			(ADE)		incidents that occurred in both
					cohorts
Among Ne	w Hampshire	e adults with office v	visits for low back pain	, the adjusted likelihoo	d of an ADE was significantly
lower for r	ecipients of	chiropractic services	s as compared to non-r	recipients	
			To evaluate the		
					The adjusted likely and of full
		Detres estine	botwoon utilisation		The adjusted likelihood of filling a
Whedon et		Retrospective	of chiropractic	Standard chiropractic	prescription for an opioid
al 2018b	AQ			care	analgesic was 55% lower among
		(n=13,384)	proceription opioid		recipients compared with non-
			medications		recipients
			medications		
	w Hampshir	adults with office s	visits for I BP the likelik	hood of filling a proserie	ntion for an opioid analgosic was
significant	ly lower for r	ecipients of services	s delivered by Doctors	of Chiropractic compar	red with non-recipients
<u> </u>				Compared cost	
			To assess the cost	outcomes for patients	In general, providers in Cohort 2
Whedon et		Retrospective	comparison	of two cohorts of	were found to be significantly
al 2020	AQ	cohort	between two	chiropractors within	associated with lower costs for
		(n=25,621)	models of	the health care	patient care as compared to
			chiropractic delivery	system:	Cohort 1



	1						
				for patients	Cohort 1) a general		
				undergoing acute	network of providers,		
				or sub-acute care	and Cohort 2) a		
				episodes for LBP	network providing		
					conservative		
					evidence-based care		
					for rapid resolution		
					of pain		
٠	Utilisation of a	a clinical n	nodel characterised	by a patient-centered	approach and standar	dised, best-practice clinical	
	protocols may	offer low	er cost when comp	ared to non-standardi	sed approaches to chird	opractic care	
•	Components	of the star	ndardised clinical m	odel included:			
	(1) lead with	n evidence	e-based quality care				
	(2) use a coi	mprehens	ive history and inta	ke process			
	(3) apply sha	ared decis	ion-making with th	e patient to identify m	easurable treatment go	bals	
	(4) address	identified	biopsychosocial fac	tors	-		
	(5) compreh	nensive ex	am				
	(6) conserva	ative use c	of plain film imaging				
	(7) active care exercises						
	(8) clinic process established for referrals and coordination of care						
	(9) home instructions						
	(10) patie	ent educa	tion to empower se	lf-efficacy			
	(11) wellness and prevention instructions.						
	· · ·						
1							

D. Case Report/Case Series studies (Level IV Evidence)

Three case series studies were identified that explored the effect of chiropractic treatment on non-specific low back pain.

Study	Study type (n=)	Patient	Intervention	Result
Long et al 2022	Pre-post case series (n=40) feasibility study	40 veterans with chronic LBP at one Veterans Health Administration facility	Pragmatic multimodal chiropractic care including some form of thrust or non- thrust spinal manipulation and other interventions such as education, rehabilitative exercise, stretching and self- management advice based on factors unique to each case, including participant goals and preferences	 The mean number of chiropractic visits was 4.5 (range 1–7) Clinically important improvements on the Roland-Morris Disability Questionnaire [mean change (SD): 3.6 (6.1)] and on PROMIS® pain interference [mean change (SD): 3.6 (5.6)] were reported
Corcoran et al 2017	Retrospective case series (n=70)	To determine if female US veterans had clinically significant improvement in LBP after chiropractic management	The type of manual therapy chosen was at the discretion of the provider and included spinal manipulative therapy (SMT), spinal mobilisation, flexion-distraction therapy and/or myofascial release	 The mean number of chiropractic treatments was 7.9 Statistical significance was found for the Back Bournemouth Questionnaire outcomes The mean raw score improvement was 12.4 points (P = .001), representing a 27.3% change from baseline with 47% of courses of care meeting or exceeding the minimum clinically important difference



Wirth et al 2019	Case series (n= 46)	To describe the trajectories and outcomes of patients with chronic LBP referred from the spine surgery division to the chiropractic teaching clinic	Standard chiropractic care	 The proportion of patients reporting overall improvement significantly increased from 23% after 1 week to 47% after 1 month, when it stabilised (56% after 3 and 6 months, 44% after 12 months) Reduction in bio-psycho-social impairment was of higher importance for overall improvement than pain reduction
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9. Lumbar - Disc Herniation

A. Observational Studies (Level III Evidence)

One cohort study was identified that reviewed the effect of chiropractic treatment on patients presenting with lumbar disc herniation.

Study	SIGN rating	Study design	Objective	Intervention	Result
Leemann et al 2014	LQ	Prospect- ive cohort (n=148)	To evaluate patients with LBP and leg pain due to MRI-confirmed disc herniation who were treated with HVLA spinal manipulation in terms of their short, medium and long term outcomes	The specific lumbar spinal manipulation was dependent upon whether disc herniation was intraforaminal or paramedian as seen on the MRI. All SMT procedures were HVLA side posture thrusts	Significant improvement for all outcomes at all time points was reported. At 3 months, 90.5% of patients were 'improved' with 88.0% 'improved' at 1 year. Although acute patients improved faster at 3 months, 81.8% of chronic patients reported 'improvement' with 89.2% 'improved' at 1 year
 A large perce 	ntage of acut	a and import	tantly, chronic lumbar dic	c hornistion nationts treato	d with chiropractic spinal

• A large percentage of acute and, importantly, chronic lumbar disc herniation patients treated with chiropractic spinal manipulation reported clinically relevant improvement

B. Case Report/Case Series studies (Level IV Evidence)

One case series was identified that explored the effect of chiropractic treatment on patients presenting with lumbar disc herniation.

Study	Study design	Objective	Intervention	Result
Shokri et al 2018	Prospective case series (n=20)	To investigate the effect of lumbar and sacroiliac joint (SIJ) manipulation on pain and functional disability in patients with lumbar disc herniation (LDH) concomitant with SIJ hypomobility	A standardized, single, HVLA lumbar and SIJ manipulation. Patients received five sessions of manipulative therapy on alternate days, and the outcomes were reassessed after the 1st and 5th sessions and at a 1-month follow-up. All patients received both lumbar and SIJ manipulations in each treatment session	A significantly greater mean improvement in back and leg pain was observed in the 5th sessions and 1 month after SMT. Mean changes in ODI in the 5th session and 1 month after treatment also showed significant improvement



10. Lumbar – Spinal Stenosis

A. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that assessed the effect of chiropractic treatment on lumbar spinal stenosis.

Study	SIGN rating	Objective	Intervention	Result
Cambron et al 2014	AQ	To assess the feasibility of recruiting older adults with lumbar spinal stenosis (LSS) into a clinical trial that used different dosages of flexion-distraction (F-D) manipulation	F-D care included mobilisation and traction, depending on subject's symptoms Patients in group 1 had a total of 8 treatment visits, those in group 2 had a total of 12 visits, and those in group 3 had a total of 18 visits. The fourth group (placebo group) received a total of 8 visits	The 2 higher dosage groups (12 and 18 visits) tended to produce more change than the lower dosage group; however, there was little difference between the 12- and 18-visit dosages

• 12 treatments of F-D mobilisation appeared to have the same effect as 18 treatments

• There were no statistically significant differences between groups on the outcome measures of self-reported pain and disability

11. Thoracic – Non-Specific Thoracic Spine Pain

A. Randomised Controlled Trials (Level II Evidence)

Two RCTs were identified that examined the effect of chiropractic treatment on non-specific thoracic pain.

Study SIGN Objective		Intervention	Result			
Branco and Moodley 2016	AQ	To determine effectiveness of either chiropractic spinal manipulative therapy to the thoracic spine or stretch and strengthening exercises versus the combined treatment of chiropractic spinal manipulative therapy to the thoracic spine in conjunction with stretch and strengthening exercises	Group 1 (n =10) received chiropractic spinal manipulative therapy to the thoracic spine. Group 2 (n= 10) received chiropractic spinal manipulative therapy to the thoracic spine as well as stretch and strengthening exercises. Group 3 (n=10) received stretch and strengthening exercises	The study showed that all three treatment protocols for Groups 1, 2, and 3 were effective. However, Group 1 did not show great improvement in their postural kyphosis, while Group 3 showed a relatively good improvement in posture and Group 2 showed the best results with regards to improvement of posture. In conclusion, Groups 2 and 3's treatment protocols could be used effectively to treat postural kyphosis, but Group 2's treatment protocol, consisting of chiropractic spinal manipulative therapy to the thoracic spine in combination with stretch and strengthening exercises, yielded the best results		
• Chiropractic spinal manipulative therapy to the thoracic spine in combination with stretch and strengthening exercises was more effective than either treatment alone in reducing pain and improving kyphosis						
Crothers et al 2016	HQ	To determine the efficacy of SMT and Graston technique [®] (GT) compared to sham therapy for the	People with non- specific thoracic pain were randomly allocated to one of three groups: SMT,	Results of the intention to treat analyses revealed no time by group interactions, indicating no statistically significant between-group differences in pain or disability at 1 week, 1 month, 3 months, 6		



	treatment of non-	GT, or a placebo (de-	months, or 12 months. There were
	specific thoracic spine	tuned ultrasound).	significant main effects of time (p < 0.01)
	pain	Each participant	indicating improvements in pain and
		received up to 10	disability from baseline among all
		supervised treatment	participants regardless of intervention
		sessions at	
		chiropractic student	
		clinic over a 4 week	
		period	
Chiropractic spinal manipulat	ive therapy or Graston Techr	nique to the thoracic spi	ine was no better than sham ultrasound
in reducing pain and improvi	ng kyphosis		

12. Thoracic – Chest Wall Pain

A. Randomised Controlled Trials (Level II Evidence)

Three RCTs were identified that examined the effect of chiropractic treatment on thoracic chest wall pain.

Study SIGN Ot rating		Objective	Intervention	Result		
Stochkendahl et al 2012a	AQ	To evaluate the relative effectiveness of 2 treatment approaches for acute musculoskeletal chest pain: (1) chiropractic treatment that included spinal manipulation and (2) self- management as an example of minimal intervention	 115 consecutive patients with acute chest pain and no clear medical diagnosis at initial presentation were included. 4 weeks of chiropractic treatment or selfmanagement, with posttreatment questionnaire follow-up 4 and 12 weeks later 	Both groups experienced decreases in pain, self-perceived positive changes, and increases in Medical Outcomes Study Short Form 36-Item Health Survey scores. Observed between-group significant differences were in favor of chiropractic treatment at 4 weeks regarding the primary outcome of self-perceived change in chest pain and at 12 weeks with respect to the primary outcome of numeric change in pain intensity. Adverse events, affecting 44 patients, were transient and benign in nature, most commonly in the form of locally increased tenderness, headache, or fatigue. No serious adverse effects lasting longer than 24 hours were reported.		
Chiropractic	treatment was	more effective than s	self-management for redu	ucing acute chest pain in the medium term		
Stochkendahl et al 2012b	AQ	To assess whether benefits observed at 4 and 12 weeks would be sustained after 1 year. In addition, self- reported consequences of acute musculoskeletal chest pain at 1-year follow-up	115 consecutive patients with acute chest pain and no clear medical diagnosis at initial presentation were included. They had 4 weeks of chiropractic treatment or self-management, with post-treatment questionnaire follow-up 52 weeks later	Both groups experienced decreases in pain, positive global self-perceived treatment effect, and increases in the 36-Item Short Form Health Survey scores. No statistically significant differences were observed between groups at the 1 year follow-up, and the study could not deduce a common trend in favour of either intervention		
Chiropractic treatment was no more effective than self-management for reducing acute chest pain in the long terr						
Stochkendahl et al 2016	AQ	To assess whether primary sector health care in the form of chiropractic care is cost-effective compared with self-	115 consecutive patients with acute chest pain and no clear medical diagnosis at initial presentation were included.	Mean costs were €2183 lower for the chiro group but this was not statistically significant (95% CI –4410.5 to 43.0). The incremental cost-effectiveness ratio suggested that chiropractic care was cost- effective with a probability of 97%, given a		



			management in	4 weeks of chiropractic	threshold value of €30,000 per QALY gained.		
patients with		treatment or self-	In both groups, there was an increase in				
			musculoskeletal	management, with	health-related QOL and the mean increases		
			chest pain	post-treatment	were similar over the 12-month evaluation		
				questionnaire follow-up	period. Mean differences in QALYs between		
				52 weeks later	the groups were negligible		
	• Chiropractic treatment was no more cost-effective than self-management for reducing acute chest pain in the long term.						
	This appears to be the same study as Stochkendahl et al 2012b, but reported in a different journal 4 years later						

13. Thoracic – Thoracic Outlet Syndrome

A. Case Report/Case Series studies (Level IV Evidence)

One case study was identified that explored the effect of chiropractic treatment on thoracic outlet syndrome (TOS).

Study	Study type (n=)	Patient	Intervention	Result
Shreeve and La Rose 2011	Case study (n=1)	A 60-year-old man experienced arrhythmia when he turned his head to the left and had these symptoms for 7 years. The patient attributed his symptoms to TOS	High-velocity, low amplitude manipulations (adjustments) were applied to the patient's O/C1	 The patient's symptoms improved after one visit and demonstrated resolution upon evaluation at the third visit. In the year following initial presentation, the patient had minor recurrent short- lived episodes of arrhythmia that abated with the atlas manipulation/adjustment

14. Thoracic – Scheuermann's Kyphosis Syndrome

A. Case Report/Case Series studies (Level IV Evidence)

One case study was identified that explored the effect of chiropractic treatment on Scheuermann's kyphosis syndrome.

Study	Study Type (n=)	Patient	Intervention	Result
Boysen and Silverman 2012	Case study (n=1)	An 18-year-old male with idiopathic thoracic paraspinal and pelvic pain of more than 6 weeks' duration	Combination of chiropractic adjustments and postural exercise - 3 times a week for 8 weeks	 Eight weeks later, thoracic films showed 88° T1 through T11 indicating no substantial change from previous study Digital posture films showed improvement in anterior head carriage, retraction of shoulders and posterior translation of the thorax relative to the pelvis Authors did not report on pain or function



15. Pelvis – Sacroiliac Joint Pain

A. Case Controlled Trials (Level III Evidence)

One case controlled study was identified that examined the effect of chiropractic treatment on sacroiliac joint (SIJ) pain.

Study	Participants	Intervention	Result		
Kulter et al al. 2020	33 patients diagnosed with SIJ dysfunction (20 males, 13 females; mean age 36.3±9.7 years; range, 18 to 60 years) and 30 healthy volunteers (20 males, 10 females; mean age 36.4±12.2 years; range, 20 to 57 years)	Manipulation was applied to the patients once a week for a duration of four weeks	 The VAS pain score was decreased significantly after treatment in the patient group. After treatment, 78% of patients (n=26) recovered from SIJ dysfunction After the manipulation therapy, a significant decrease in VAS score was detected in those who had a negative SIJ dysfunction test (p=0.01) 		
 Chiropractic treatment was effective in reducing pain due to SIJ dysfunction compared to treatment in patients without any pain or SIJ dysfunction 					



Part 2: Lower Limb Conditions

The following section explores the evidence for the effectiveness and safety of chiropractic-specific interventions for the management of musculoskeletal conditions and injuries involving the lower limbs. This includes general lower limb, hip, knee, ankle and foot conditions.

A total of 29 studies were included in Part 2: Lower Limb Conditions

Systematic reviews - Level I evidence

One SR was found in this review that investigated the effectiveness of chiropractic interventions for the management of musculoskeletal conditions and injuries related to lower limb conditions. Appendix 6 presents the findings from the SRs included in this review.

Randomised controlled trials – Level II Evidence

A total of 8 relevant RCTs that were not included in the SR were identified in this review. Appendix 7 presents the data extraction from the RCTs included in this review.

Part 2: Lower Limb Conditions

3.3

Cohort/Case series/Case studies – Level III, IV Evidence

One cohort study (Level III evidence) and 19 case/series/case reports (Level IV evidence) were identified in this review. The findings are discussed within the body of the review.

	CD	РСТ	Cohort	Case
	35		Conort	reports
Нір				
Non-specific hip pain		1		
Hip Osteoarthritis		3		4
Femoro-acetabular Impingement (FAI)				1
Proximal Hamstring Tendinopathy				1
Knee				
Non-specific Knee Pain				1
Patellofemoral pain Syndrome (PFPS)	1	1		1
Knee Osteoarthritis (OA)		1	1	4
Cruciate Ligament ruptures				2
Postoperative lateral retinacular				1
release				-
Foot/Ankle				
Recurrent Ankle Sprain		1		
Hallux abducto valgus		1		1
Plantar fasciitis				1
Tarsal tunnel syndrome				1
Achilles tendinopathy				1
Total	1	8	1	19


1. Hip - Non-Specific Hip Pain

A. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that explored the effectiveness of chiropractic management for hip pain.

Unfortunately, the study authors did not provide any information on diagnosis for the hip pain, only that it was self-reported hip pain amongst a cohort of chiropractic students.

Study	SIGN rating	Objective	Intervention	Result	
Kazemi et al 2021	AQ	To determine whether manipulative therapy of the hip joint can increase range of motion (ROM) and/or decrease pain in individuals experiencing self-reported symptomatic hip pain	Subjects received a drop- piece hip manipulation (DPHM) or an alternative treatment, followed by measurement of active and passive ROM and pain	 Statistically significant improvements in numeric pain scale (NRS) and passive abduction were observed for the manipulation group when compared to the alternative treatment No significant change was observed for all other hip ranges 	
Manipulative therapy of the hip may reduce pain and improve hip abduction ROM in the short term					

2. Hip - Hip Osteoarthritis

A. Systematic Reviews (Level I Evidence)

Part 2: Lower Limb Conditions

3.3

Only one systematic review (Sampath et al 2016) was identified that included chiropractic management of hip pain secondary to hip osteoarthritis (OA). This review explored whether manual therapy, exercise therapy or a combination was beneficial for people with hip OA in terms of reduced pain, improved physical function and improved quality of life. The review identified seven trials (7 trials; n= 886 participants). However, only one trial involved provision of manual therapy from a chiropractor (Poulsen et al 2013), with the remaining treatments delivered by physiotherapists. As the RCT by Poulsen et al (2013) was identified in this search it will be presented in the RCT section below.

B. Randomised Controlled Trials (Level II Evidence)

Three (3) RCTs were identified that explore the effectiveness of chiropractic management for hip osteoarthritis

Study	SIGN rating	Objective	Intervention	Result	
Brantingham et al 2012	HQ	To assess short term effectiveness of full kinematic chain manual and manipulative therapy (MMT) plus exercise compared with targeted hip MMT plus exercise for symptomatic mild to moderate hip OA	Participants in the experimental group received full kinematic chain MMT plus exercise while those in the comparison group received targeted hip MMT plus exercise	No statistically significant differences were found between the 2 groups for any of the pain and function outcome measures	
• The full kinematic chain manual and manipulative therapy (MMT) plus exercise approach does not appear to have any benefit over targeted hip MMT plus exercise for symptomatic mild to moderate hip OA					



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Poulsen et al 2013	HQ erany plus pa	To investigate the effectiveness of a patient education (PE) program with or without the added effect of chiropractic manual therapy (CMT) compared to a minimal control intervention (MCI)	The PE was taught by a physiotherapist involving five sessions. The CMT was delivered by a chiropractor involving 12 sessions and the MCI included a home stretching program	 In the combined group (PE + CMT), a clinically relevant reduction in pain severity was achieved. No difference was found between the PE and MCI groups At 12 months, not including patients receiving hip surgery the statistically significant difference favouring PE + CMT was maintained 	
control int	ervention alo	ne	better outcomes for reducing par		
Thorman et al 2010	LQ	To explore the short- term effects of chiropractic care on pain and function in patients with hip osteoarthritis	Patients received chiropractic care, on average 4.4 (SD ±1.0) treatments over 3 weeks Chiropractic care was pragmatic and based on the analysis of different functions, e.g. mobility, tenderness, muscle tension and tone, and each patient's relative symptoms. Techniques were tailored to optimise hip function in each individual patient and could include high- velocity low-amplitude adjustments to the hip, spine, and lower extremities, as well as soft-tissue or myofascial techniques, arthrokinematics stabilising exercises for the hip, or a combination of these	 The chiropractic group showed a clinically and statistically significant improvement in self-rated hip pain, and clinically important (but not statistically significant) improvements in hip OA function in daily living and hip-related quality of life scores The waiting list controls had no statistically significant improvements in any outcome measured There were no statistically significant differences between the groups 	
• There were no statistically significant differences between chiropractic or usual care on pain and function in patients with					

hip OA – although this may reflect low subject numbers

C. Case Report/Case Series studies (Level IV Evidence)

Four case series or case reports were identified that explored the effectiveness of chiropractic management for hip osteoarthritis.

Study	Study type (n=)	Patients	Intervention	Result
Brantingham et al 2010	Pre-post Case Series (n=18)	18 patients with hip OA who did not qualify for RCT due to low baseline Western Ontario & McMaster Osteoarthritis Index scores	Axial manipulation to the affected hip with modified Thomas and active assisted stretch, was combined with full kinetic chain treatment or manipulative therapy to the spine, knee, ankle, or foot	 In patients with lower WOMAC scores, a highly organized HOA treatment appears to have resulted in significant changes in the Overall Effectiveness Therapy Tool, WOMAC, Harris Hip Scale, and range of motion
De Luca et al 2010	Case series (n=4)	Four subjects, 2 men and 2 women from 54 to 69 years old	Long-axis traction pulls and pre/post adjustment stretching of the symptomatic hip, with additional manipulation and mobilization of the lumbar spine, sacroiliac, knee, and ankle joints	 Improvements in pain and function (WOMAC scores) and increases in hip range of motion were seen after chiropractic management
Strunk and Hanses 2011	Case study (n=1)	70-year-old female patient with hip OA	Chiropractic treatment primarily consisted of hip and spinal manipulation, mobilization, and passive	 Significant decrease on the Lower Extremity Functional Index and improvements in left hip internal rotation and in Timed Up and Go and



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			stretching. The patient was seen 16 times over a 12-week period	One Leg Standing Test times. The Patient Global Impression of Change scale indicated that the patient was 'very much better'
Howell 2012	Case study (1)	A 49-year-old registered nurse/ college instructor presented with a 5 year history of left hip OA and pain, recent right hip pain and occasional low back stiffness	Ultrasound, soft tissue and myofascial therapy, mobilisations, acupuncture and home advice	 Increased ranges of motion, decreased pain, as well as improvements in golf driving distance and endurance were seen post-treatment.

3. Hip - Femoro-Acetabular Impingement (FAI)

A. Case Report/Case Series studies (Level IV Evidence)

One case series was identified that explored the effectiveness of chiropractic management for femoroacetabular impingement (FAI).

Study	Study Type (n=)	Patients	Intervention	Result
Jarosz 2012	Case series (n=3)	Three patients, two male and one female aged from 31 to 42 years old with hip FAI	A multi-modal management approach for each patient addressing entire kinetic chain (cervical and thoracic spine, lumbopelvic-hip complex, and lower extremity). Each patient received pre- manipulative myofascial release (MFR) and active release soft tissue techniques (ART) applied to the psoas, iliacus and TFL musculature. The soft tissue release techniques were followed by long-axis traction HVLA to the involved hip, utilizing a drop-piece table. Post- manipulative post-isometric relaxation (PIR) and proprioceptive neuromuscular facilitation contract-relax-antagonist- contract (PNF-CRAC) stretching protocols were employed to promote hip abduction, external rotation and extension. Patient 1 received 10 treatment sessions over 20 weeks, patient 2 received seven treatment sessions over 11 weeks, Patient 3 received 13 treatment sessions over 26 weeks	 All three patients reported subjective improvements in hip pain and function Objectively, all three patients had improvements in resisted muscle testing, hip flexor mobility, PHE testing and hip flexion range of motion



4. Hip – Proximal Hamstring Tendinopathy

A. Case Report/Case Series studies (Level IV Evidence)

One case series was identified that explored the effectiveness of chiropractic management for proximal hamstring tendinopathy.

Study	Study Type (n=)	Patients	Intervention	Result
White 2012	Case series (n=3)	Three female runners with proximal hamstring pain	Graston Instrument-Assisted Soft Tissue Mobilisation, lumbopelvic manipulation, and electrical muscle stimulation with ultrasound. Active exercise focused on hamstring stretching and strengthening, gluteal strengthening, and proprioceptive training	All three patients had resolution of hamstring pain after an average of 13 treatments and were able to continue competing without restriction

5. Knee – Non-Specific Knee Pain

A. Case Report/Case Series studies (Level IV Evidence)

One case report was identified that explored the effectiveness of chiropractic management for nonspecific knee pain.

Study	Study Type (n=)	Patient	Intervention	Result
Bucek 2020	Case report (n=1)	A female patient presented to a chiropractic clinic with ongoing anteromedial knee pain whenever she walked	The patient received 5 treatments focusing on the pelvic imbalance and reduced muscle strength discovered in her initial evaluation. Chiropractic manipulation of the sacroiliac joint, kinesiology taping, and gluteus medius exercises were administered	 Resolution of her knee pain after 5 treatments over the course of 10 days The patient reported no pain while walking nor while performing other activities of daily living

6. Knee – Patellofemoral Pain Syndrome (PFPS)

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the use of chiropractic treatment for the management of patellofemoral pain syndrome.

Espí-López et al 2017

Espí-López et al (2017) (QS: AQ) conducted a systematic review exploring the effectiveness of manual therapy combined with physical therapy in the treatment of Patellofemoral Pain Syndrome (PFPS). This review included all clinical trials involving adult patients (≥18 years old) diagnosed with PFPS by an experienced practitioner, based on clinical examination (pain and orthopaedic tests) with any level of



physical activity, and if they included any manual therapy techniques and physical therapy approaches. Of the 5 studies reported only one involved chiropractic care only (Brantingham et al 2009). Brantingham et al (2009) assessed short-term and mid-term outcomes of 2 different chiropractic interventions, one involving a local treatment group (manipulative therapy, soft tissue treatment, and local knee stretching and strengthening exercises) and the second a full kinetic chain group (lumbosacral, sacroiliac and lower-extremity manipulative therapy). Intervention was applied 1 to 3 times per week for 2 to 6 weeks; participants received a total of 6 sessions each. Both interventions improved knee function in the short-term (immediately after treatment) and the mid-term (2 months) follow-ups. In the local treatment group, pain significantly decreased in the mid-term but not short term (post-treatment), whereas in the full kinetic chain group, pain significantly decreased in both the short and mid-term (2 months after treatment). A few patients reported mild adverse reactions (i.e. 1 in local treatment group, 3 in the full kinetic chain group group) such as stiffness, soreness, and weakness after treatment. There were no reports of serious adverse reactions.

Study	SIGN rating	Conclusions	Strength of evidence
Espí-López	40	The different combinations of manual therapy and physical therapy programs analysed in this review (4 out of 5 were not provided by chiropractors) suggested that giving more emphasis to proximal stabilization and full kinetic chain treatments in PFPS may help better alleviation of symptoms.	Based on 5 RCTs
et al 2017	ΛQ	A full chiropractic kinetic chain group intervention provided significant improvements in patient pain and function up to 2 months	Based on 1 RCT
		A full chiropractic kinetic chain group intervention was more effective than local chiropractic treatment in reducing patient pain and improving function up to 2 months	Based on 1 RCT

B. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that focused on the effect of chiropractic management on PFPS.

Study	SIGN Rating	Objective	Intervention	Result	
Hains and Hains 2010	LQ	To measure the efficacy of myofascial manual therapy (ischemic compression) directly to the knee for chronic patellofemoral pain syndrome.	The experimental group received 15 sessions of manual ischemic compression applied to peri-patellar and retro-patellar regions. The control group received 15 sessions of manual ischemic compression on trigger points over the hip muscles.	 The experimental group showed a significant reduction in pain that was maintained at 30 days and 6 months Patellar grinding scores improved only in the experimental group 	
 Manual ischemic compression applied to peri-patellar and retro-patellar regions by a chiropractor was effective in reducing pain in patients with PFPS up to 6 months 					



C. Case Report/Case Series studies (Level IV Evidence)

One case report was identified that explored the effectiveness of chiropractic management for PFPS.

Study	Study Type (n=)	Patient/s	Intervention	Result
Jarosz 2010	Case study (n=1)	26-year-old male professional basketball player presented with right anterior knee pain of 2-years duration	Treatment consisted of (1) chiropractic mechanically assisted adjusting techniques (MAT) to the left knee utilising an Activator Adjusting Instrument [™] and a portable drop-piece mechanism, (2) soft tissue therapy employing deep tissue effleurage and myofascial release techniques, and (3) a specific rehabilitation program aimed at strengthening the vastus medialis obliquus (VMO), transversus abdominis (TA) and gluteus maximus musculature, and stretching of hypertonic musculature	This case had a positive response to chiropractic treatment

7. Knee - Knee Osteoarthritis (OA)

A. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that focused on the effect of chiropractic management on knee OA.

Study	SIGN rating	Objective	Intervention	Result
Dwyer et al 2015	HQ	To examine the methodological integrity, sample size requirements, and short-term preliminary clinical outcomes of manual and manipulative therapy (MMT) in addition to a rehabilitation program for symptomatic knee osteoarthritis (OA)	Participants with knee OA were randomised to 3 groups: MMT alone, training in rehabilitation followed by a home rehabilitation program alone, or MMT plus the same rehabilitation program. In the MMT treatment group, 6 sessions were provided to participants over the 4-week treatment period. The treatment comprised joint mobilisation (grades 1-4) and joint manipulation (grade 5; high-velocity, low-amplitude, thrust-type manipulation) of the affected kinematic chain (knee, hip, foot, and spine)	 Significant changes in pain and function scores from baseline to week 5 were found for all groups, with a greater change in scores for MMT and MMT plus rehabilitation Between-group comparison did not reveal statistically significant differences between group scores at week 5 for any of the outcome measures No adverse events or complications were reported
 No significant difference manual therapy, h 	erence in outc ome rehabilit	come (self-reported pain, ation or both together	stiffness, and physical functionin	g and ROM) at week 5 between



B. Observational Studies (Level III Evidence)

One retrospective cohort study was identified that focused on the effect of chiropractic management on knee OA.

Study	SIGN Rating	Study Type (n=)	Population	Intervention	Result
Albano 2017	LQ	Retrospective cohort (n=25)	25 patients with local knee pain/OA with either acute (n=8) or chronic (n=17) presentations	Cox flexion distraction decompression	 For all patients, a change was observed in the mean VAS scores from 7.7 to 1.8. The mean number of treatments was 5.3 over an average of 3 weeks Acute patient mean VAS scores dropped from 8.1 to 1.1 within 4.8 treatments over 2.4 weeks Chronic patient mean VAS scores dropped from 7.5 to 2.2 within 5.4 treatments over 3.3 weeks No adverse events were reported.

C. Case Report/Case Series studies (Level IV Evidence)

Three case studies and one case series were identified that focused on the effect of chiropractic management on knee OA.

Study Type (n=) Patient /s		Intervention	Result	
Jarosz and Ames 2010	Case study (n=1)	60-year-old woman with left knee pain and swelling - medial meniscus tear and knee OA	Treatment involved therapeutic ultrasound; rest, ice, compression, and elevation protocol; soft tissue therapy using effleurage and lymphatic drainage; chiropractic mechanically assisted adjusting techniques to the left knee using a handheld mechanical thrusting instrument; sports taping applied to assist facilitation of the vastus medialis obliquus; and a specific rehabilitation program aimed at strengthening this musculature	Monitoring was done at the initial consultation and at the sixth and 12th treatments. The patient reported being able to walk, swim, and ride a bicycle asymptomatically. Her pain score at the concluding visit was 16.7%, indicating low- intensity pain
Stevenson et al 2016	Case study (n=1)	20 year old female with bilateral chronic knee pain > 2 years. A clinical examination and radiographic imaging revealed chondromalacia and the early stages of knee OA	The patient received 4 treatments with the MyoKinesthetic (MYK) system over 2 weeks. Treatments 1 through 3 were directed at the S1 nerve root; the fourth treatment was directed at the L4 nerve root	The patient reported a decrease in pain and an increase in function during the course of 4 treatments, which were administered over 14 days and in accordance with MYK guidelines
Karmali 2017	Karmali 2017Case study (n=1)47 year-old female office worker with intermittent right knee pain inferolateral to the right patella for eight months due to knee OAYoung 2019Case series (n=3)Medical records were reviewed for three patients with knee OA		A conservative chiropractic treatment plan was implemented in addition to two successive intra-articular and subpatellar platelet-rich plasma injections	The patient reported no pain after sixteen weeks and 93.75% functionality six months after the second injection
Young 2019			Standardised multimodal intervention including education, exercise, and manual therapy	1 subject met the threshold for clinically significant improvement in pain & 2 subjects for function. No adverse events were reported.



8. Knee - Cruciate Ligament Ruptures

A. Case Report/Case Series studies (Level IV Evidence)

Two case studies were identified that focused on the effect of chiropractic management on knee cruciate ligament ruptures.

Study	Study Type (n=)	Patient/s	Intervention	Result
Fernandez and Pugh 2012	Case study (n=1)	A 32-year-old male with isolated ruptured PCL	A multimodal treatment approach over the course of 8 weeks consisting of chiropractic lumbopelvic manipulation, physiotherapy, and an exercise program emphasising eccentric muscle action	Successful return to pre-injury functional status. This case highlights a multidisciplinary approach through the utilisation of chiropractic, physiotherapy, and exercise therapies
Solecki and Herbst 2011	Case study (N=1)	A 25-year-old male with ruptured ACL, bucket-handle tear of the medial meniscus and full- thickness tear within the posterior horn of the lateral meniscus. Patient had ACL repair	Postoperative care included a 12- week functional chiropractic rehabilitation program along with Active Release Technique, Graston Technique, and Kinesio Taping	Following treatment, patient recorded 0/10 on Numeric Pain Scale, improvement on Patient Specific Functional and Pain Scales, returned to play with no complications and had complete restoration of range of motion and lower extremity muscle strength. At 1-year follow-up, the patient reported no pain and was fully functional

9. Knee – Postoperative Lateral Retinacular Release

A. Case Report/Case Series studies (Level IV Evidence)

One case study was identified that focused on the effect of chiropractic management on knee postoperative lateral retinacular release.

Study	Study Type (n=)	Patient /s	Intervention	Result
Solecki and Hostnik 2012	Case study (n=1)	A 26-year-old male ice hockey goalie presented 1 month after having lateral retinaculum release surgery for his left knee with residual mild discomfort and edema in his left knee	The patient was treated using a multimodal approach of both passive and active chiropractic care focusing on the restoration of full range of motion, increased proprioception, balance, strength, and endurance to return the patient to competitive ice hockey	After 14 weeks of care the patient was able to return to ice hockey training with no residual symptoms



10. Foot/Ankle - Recurrent Ankle Sprain

A. Randomised Controlled Trials (Level II Evidence)

Two RCTs were identified that focused on the effect of chiropractic management on ankle sprain.

Study	SIGN rating	Objective	Intervention	Result	
Lubbe et al 2015	HQ	To compare chiropractic manipulative therapy (CMT) plus rehabilitation to rehabilitation alone for recurrent ankle sprain with functional instability (RASFI) to determine short-term outcomes	Each participant was randomly allocated to receive rehabilitation alone or CMT plus rehabilitation. All participants undertook a daily rehabilitation program over the course of the 4- week treatment period. The participants receiving CMT had 6 treatments over the same treatment period	 This study showed that the patients with RASFI who received CMT plus rehabilitation showed significant short-term reduction in pain and the number of joint restrictions in the short-term but not disability when compared with rehabilitation alone No adverse events or complications (defined as persistent severe stiffness, pain, or disability) were reported 	
 Chiropractic-delivered manual therapy plus rehabilitation is more effective short term compared to rehabilitation alone 			tion is more effective in reduci	ng pain but not disability in the	
Joseph et al 2010	LQ	To compare use of HVLA manipulation and muscle energy technique (MET) mobilisation in the treatment of chronic ankle sprains	 Group 1: received HVLA ankle axial elongation manipulation. Six treatments were given over three weeks with post-visit measurements after the fourth and sixth treatments Group 2: received MET, as described by Greenman, to the ankle joint 	∇ Both HVLA manipulation and MET mobilisation significantly improved balance, ROM and function while decreasing short term pain	
Both chiropractic manipulation and muscle energy techniques equally improved balance, range of motion and function while decreasing short term pain					

11. Ankle/Foot - Hallux Abducto Valgus

A. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that focused on the effect of chiropractic management on symptomatic hallux abducto valgus.

Study	SIGN rating	Objective	Intervention	Result
du Plessis et al 2011	HQ	To test an innovative protocol of manual and manipulative therapy (MMT) and compare it to standard care of a night splint(s) for symptomatic mild to moderate HAV	 The Brantingham protocol: graded mobilisation of the involved hallux/1st MTPJ; judicious manipulation of the involved hallux/1st MTPJ; post-treatment cold therapy Additional mobilisation/ manipulation of foot/ankle joints as indicated 	 There were no statistically or clinically meaningful differences (MCID < 20%) between the two groups based on outcome measure scores
Chiropractic-delivered manual therapy using the Brantingham protocol was no more effective than night splinting for symptomatic hallux abducto valgus				



B. Case Report/Case Series studies (Level IV Evidence)

One case series was identified that focused on the effect of chiropractic management on symptomatic hallux abducto valgus.

Study	Study Type (n=)	Patient /s	Intervention	Result
Brantingham and Cassa 2015	Case series (n=3)	3 patients, a 32-year-old man, a 55-year-old woman, and a 49- year-old woman, with great toe pain of 8, 1, and 2 years, respectively. Each had a palpable exostosis, a benign outgrowth of bone projecting outward from the bone surface, and decreased dorsiflexion with a hard end-feel	Manual manipulative therapy with exercise, the Brantingham protocol, was used with patients receiving 6, 9, and 12 treatments over 6 weeks	Each patient had an increase in ROM that surpassed the minimal clinically important change, an increase in overall therapy effectiveness and a decrease in foot functional index that surpassed the minimal clinically important difference. Most importantly for the patients, each reported a decrease in both usual and worst pain on VAS that exceeded the minimal clinically important difference of 20 to 30 mm

12. Foot/Ankle - Plantar Fasciitis

A. Case Report/Case Series studies (Level IV Evidence)

One case study was identified that focused on the effect of chiropractic management on plantar fasciitis.

Study	Study Type (n=)	Patient /s	Intervention	Result
Dos Santos et al 2016.	Case study (n=1)	A 44-year-old patient reported heel pain, with a diagnosis of plantar fasciitis, for approximately 1 year	The patient underwent 10 sessions of hip strengthening and manual manipulative therapy over a period of 3 months	Improvement in pain intensity (baseline score = 6 vs final score = 1) and an increase in the pressure-pain threshold (initial score = 2.6 vs final score = 7.1)

13. Foot/Ankle - Tarsal Tunnel Syndrome

A. Case Report/Case Series studies (Level IV Evidence)

One case study was identified that focused on the effect of chiropractic management on tarsal tunnel syndrome.

Study	Study Type (n=)	Patient /s	Intervention	Result
Hudes 2010	Case study (n=1)	61 year-old female presenting with plantar and dorsal foot pain and burning sensation of 6 months duration	A course of high velocity, low-amplitude adjustments using a toggle board to the cuboid and the talonavicular joint and fascial stripping was added to orthotic therapy	Improvement of pain reported on the Verbal Rating Scale was noted with a complete resolution of the condition at the conclusion of treatment. No pain was reported on a ten month follow-up with the patient



14. Foot/Ankle - Achilles Tendinopathy

A. Case Report/Case Series studies (Level IV Evidence)

One case study was identified that focused on the effect of chiropractic management on Achilles tendinopathy.

Study	Study Type (n=)	Patient /s	Intervention	Result
Miners and Bougie 2011	Case study (n=1)	A 40-year-old male with intermittent bilateral Achilles pain of approximately 3.5 years duration	Active and passive tissue warm-up, followed respectively by soft tissue mobilisation using Graston Technique® and Active Release Techniques®, eccentric exercise & static stretching in combination with cryotherapy. The patient received nine sessions over an eight week period	Complete recovery from chronic Achilles tendinopathy



Part 3: Upper Limb Conditions

The following section explores the evidence for the effectiveness and safety of chiropractic-specific interventions for the management of musculoskeletal conditions and injuries involving the upper limbs. This includes general upper limb, shoulder, elbow and hand/wrist conditions.

A total of 29 studies were included in Part 3: Upper Limb Conditions.

Systematic reviews

A total of 5 SRs were found in this review that investigated the effectiveness of chiropractic interventions for the management of musculoskeletal conditions and injuries related to the upper limb. Appendix 6 presents the findings from the SRs included in this review.

3.3 Part 3: Upper Limb Conditions

Randomised controlled trials

One relevant RCT that was not included in the five SRs was identified in this review. Appendix 7 presents the data extraction from the RCTs included in this review.

Cohort/Case series/Case studies – Level III, IV Evidence

Nine case/series/case reports (Level IV evidence) were identified in this review The findings are discussed within the body of the review.

	SR	RCT	Cohort	Case reports
General Upper Limb	1			
Shoulder				
General	2			
Adhesive Capsulitis	1			2
Myofascial pain		1		
Labral (SLAP) lesion				1
Elbow				
Lateral epicondylopathy				3
Medial epicondylopathy				1
Radial Nerve Entrapment				
Wrist/Hand				
Carpal Tunnel Syndrome	1			
De Quervain's stenosing tenosynovitis				1
Ulnar nerve compression				1
Total	5	1	0	9



1. Upper Limb - General Upper Limb

A. Systematic Reviews (Level I Evidence)

Brantingham et al (2013)

Brantingham et al (2013) (QS: AQ) explored the evidence for manual and manipulative therapy (MMT), including chiropractic management, for common upper extremity pain and disorders. While the authors failed to differentiate between the different providers in their conclusions, they did provide details in the data extractions on who provided the treatments. They identified 35 RCTs, 4 controlled trials and 32 case series, reports and/or single-group pre-test post-test prospective case series. Of these, 4 RCTs, 1 retrospective case series and 7 case studies were explicitly related to chiropractic care. They concluded that there was fair (B) level of evidence to support MMT to specific joints and the full kinetic chain, combined generally with exercise and/or multimodal therapy, for lateral epicondylopathy, carpal tunnel syndrome and temporomandibular joint disorders, in the short term. Specific results related to chiropractic manual therapy (CMT) are outlined below.

	Study	SIGN rating	Conclusions	Strength of Evidence
			For shoulder impingement syndrome Multimodal therapy helped with reducing pain and improving function in 6 treatments	Based on 1 x case study (n=2) (Krenner 2005)
			For shoulder adhesive capsulitis CMT improved pain and function	Based on 1 x retrospective case series (n=50) (Murphy 2012)
	Brantingham et al 2013	AQ	For neurogenic shoulder pain CMT improved pain and function in 12-18 treatments	Based on 2 x case studies (n=2) (Charles 2011, Daub 2007)
			For lateral epicondylitis CMT effective in reducing pain and improving function but not as effective as ultrasound.	Based on 1 x RCT (Langen- Peters 2003)
			ART effective in reducing pain and improving function but no more effective than usual care	Based on 1 x RCT (Blanchette 2011)
			CMT improved pain and function after 7 treatments	Based on one case study (n=1) (Radpasand 2009)



For carpal tunnel syndrome Graston instrument-assisted mobilisation effective but no better than manual soft tissue mobilisation (STM) for pain/function	Based on 1 x RCT (Burke 2007)
CMT of the soft tissues and bony joints of the upper extremities and spine (3 treatments / week for 2 wks, 2 treatments / week for 3 wks and one treatment / week for 4 wks), ultrasound over the carpal tunnel and nocturnal wrist supports were no better than usual care	Based on 1 x RCT (Davis 1998)
CMT and ART improved pain and function in 8 - 15 treatments	Based on 3 x case studies (De Leon et al 2002, Cradt et al 2011, both n = 1; and George et al 2006, n = 5)

2. Shoulder Pain - General

A. Systematic Reviews (Level I Evidence)

Two SRs were found that explored the evidence associated with chiropractic treatment for general shoulder pain.

One systematic review was identified that explored the effectiveness of manipulative therapy for shoulder pain. Brantingham et al (2012) identified 23 RCTs, 5 CTs, and 7 single-group pre-test/post-test designs that explored this topic. The authors reported that this review was an expansion of a previous systematic review (McHardy et al 2008) which explored the evidence for chiropractic treatment of upper extremity conditions and disorders. Unlike McHardy et al, who limited their evidence review of chiropractic treatment to treatment by chiropractors, Brantingham et al (2012) included all manual therapy treatments (including physiotherapy, osteopathy, medical practitioners etc) and unfortunately failed to report in their review who provided the treatment.

Minkalis et al 2017,

Minkalis et al 2017 (QS: HQ) conducted an SR exploring the effectiveness of manual therapy, in particular thrust manipulation, for shoulder pain. They also included all forms of manual therapy, and in the 4 RCTs and 2 clinical trials they identified, one RCT was undertaken by chiropractors (Munday et al 2007). This study included two groups: Group A (n = 15): detuned ultrasound, Group B (n = 15): thrust manipulation (AC joint or GH joint; if necessary, scapula or ribs) with 8 treatments over 3 weeks. This study found that CMT was more effective than sham ultrasound for pain.



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Study	SIGN rating	Conclusions	Strength of evidence
Minkalis et al 2017	HQ	No clinical trials of thrust manipulation for non- surgical shoulder conditions other than subacromial impingement syndrome were found. There is limited evidence to support or refute thrust manipulation as a solitary treatment for this condition. Studies consistently reported pain reduction, but active treatments were comparable to shams. High-quality studies of thrust manipulation with safety data, longer treatment periods and follow-up outcomes are needed	Based on 4 RCTs and 2 CTs (not chiropractor- specific; 5 studies done by physios)
		Thrust manipulation by chiropractors was better than sham ultrasound for pain	Based on 1 RCT (done by chiropractors)

Pribicevic et al 2010

Pribicevic et al 2010 (QS: LQ) conducted an SR exploring the effectiveness of manipulative therapy for the treatment of shoulder pain. This review included chiropractic manipulative only studies, as well as a review of all forms of manual therapy. The review found 4 RCTs, 4 case series and 22 case reports, of which 1 RCT, 4 case series and 22 case reports were chiropractic-specific. The authors concluded that the evidence for chiropractic management of shoulder pain is limited to low level evidence in the form of case reports, case series and one small controlled trial. They concluded there was a need for more well-designed trials investigating multi-modal chiropractic management for shoulder pain.

Study	SIGN rating	Conclusions	Strength of evidence
Pribicevic et al 2010	LQ	The SR demonstrated favourable outcomes for all patients treated with a number of varying chiropractic treatment approaches that incorporated a multimodal approach to management in terms of reduction/elimination of pain levels, range of motion of the shoulder restoration and return to pre-treatment levels of activities, including work-related and sport	Based on 22 case reports, 4 case series and 1 RCT
		The evidence for chiropractic management of shoulder pain is limited to low level evidence in the form of case reports and case series and one small controlled trial. There is need for more well-designed trials investigating multimodal chiropractic management for shoulder pain	Based on 22 case reports, 4 case series and 1 RCT

3. Shoulder Pain - Adhesive Capsulitis

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the evidence associated with chiropractic treatment for adhesive capsulitis.

de Almeida et al 2016

de Almeida et al 2016 (QS: LQ) conducted an integrative review exploring the effectiveness of chiropractic in patients with shoulder adhesive capsulitis (frozen shoulder). Despite the title indicating



the review was focused on reporting chiropractic treatment, it actually included all manual therapies. Of the three RCTs identified, two were undertaken by physiotherapists, with only one RCT reporting a study of an intervention performed by a chiropractor (Fink et al 2012). This study compared a fascial distortion model of care to classical manual therapy in 60 frozen shoulder patients. Treatment was provided for 2 weeks, 2 times a week, during 20 minutes. Six weeks after the end of treatment there was improvement in function and pain in both groups, but significantly more in the fascial distortion model group than in the classical manual therapy group. While the patients thought the fascial distortion model treatment more uncomfortable than the classic manual therapy, there were no serious adverse effects.

Study	SIGN rating	Conclusions	Strength of evidence
de Almeida et al 2016	LQ	Fascial distortion model more effective than classic manual therapy for pain, function and strength	Based on 1 RCT

B. Case Report/Case Series studies (Level IV Evidence)

One case series and one case report examined the effectiveness of chiropractic for adhesive capsulitis. The case report involved a patient with symptoms mimicking adhesive capsulitis but was determined by the therapist to be a derangement syndrome.

Study	Study Type (n=)	Patient/s	Intervention	Result
Murphy et al 2012	Case series (n=50)	50 consecutive patients who presented to a private chiropractic practice with frozen shoulder syndrome	The One-to-Zero (OTZ) Tension Adjustment System: OTZ Tension Adjustment aims to correct occipito-atlantal articular dysfunction (CO-C1 chiropractic subluxation)	 The median number of days under care was 28 days (range 11 to 51 days). The median change in Numeric Pain Rating Scale score was -7 (range 0 to -10). Of the 50 cases, 16 resolved completely (100% improvement), 25 showed 75% to 90% improvement, 8 showed 50 %to 75% improvement, and 1 showed 0% to 50% improvement
Remsburg 2019	Case study (n=1)	59-year-old retired female with history of multiple hereditary exostoses (MHEs), mimicking adhesive capsulitis	McKenzie Method of mechanical diagnosis and therapy (MDT), thoracic manipulation, and instrument- assisted soft-tissue mobilisation over the shoulder	 After 5 visits in a 2-week period, subject reported no pain or limitations. Examination revealed right shoulder motion to be pain-free and equal to the left shoulder. On a follow-up phone call 2 weeks later, her DASH score was 0%



4. Shoulder Pain - Myofascial Pain

A. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that focused on chiropractic management of myofascial shoulder pain.

Study	SIGN rating	Objective	Intervention	Result	
Hains et al 2010	HQ	To evaluate the effect of 15 myofascial therapy treatments using ischemic compression on shoulder trigger points in patients with chronic shoulder pain	Forty-one patients received 15 experimental treatments, which consisted of ischemic compressions on trigger points located in the supraspinatus muscle, the deltoid muscle, and the biceps tendon. Eighteen patients received the control treatment involving 15 ischemic compression treatments of trigger points located in cervical and upper thoracic areas	• The experimental group had a significant reduction in their Shoulder Pain and Disability Index (SPADI) score compared with the control group (62% vs 18% amelioration). Moreover, the patients perceived percentages of amelioration were higher in the experimental group after 15 treatments (75% vs 29%). Finally, the control group subjects significantly reduced their SPADI scores after crossover (55%)	
Myofascial therapy using ischemic compression on shoulder trigger points may reduce the symptoms of patients experiencing chronic shoulder pain					

5. Shoulder Pain – Superior Labrum Anterior to Posterior (SLAP) Lesion

A. Case Report/Case Series studies (Level IV Evidence)

One case report examined the effectiveness of chiropractic for a SLAP lesion.

Study	Study Type (n=)	Patient/s	Intervention	Result
Blanchette et al 2015	Case study (n=1)	26 year-old recreational rock climber	Chiropractic treatment included soft tissue mobilisation & prescription of strengthening exercises of the serratus anterior and rotator cuff muscles for 4 sessions	The patient did not feel any pain and gradually resumed all his recreational activities

6. Elbow Pain – Lateral Epicondylopathy

A. Case Report/Case Series studies (Level IV Evidence)

Three case reports were identified that presented evidence on the effectiveness of chiropractic treatment for elbow pain.



Study	Study Type (n=)	Patient/s	Intervention	Result
Gliedt and Daniels 2014a	Case study (n=1)	A 41-year old- Caucasian male with generalised left elbow pain and swelling.	Two sessions of needle acupuncture and one treatment of Active Release Techniques® (ART) applied to the left elbow region	 The patient's outcomes indicated a quick resolution of subjective complaints and objective findings with the chosen treatment. Further research is needed to demonstrate safety, clinical effectiveness and cost effectiveness when compared to other treatments
Gliedt and Daniels 2014b	Case study (n=1)	A 48-year-old white man presented to a chiropractic clinic with a complaint of left lateral elbow pain that began 2 years previous with insidious onset	Treatment consisted of 5 sessions of Active Release Techniques® (ART) applied to the left elbow soft tissue over a duration of 3 weeks	 This patient with lateral epicondylitis responded favourably to chiropractic treatment using the application of ART, as demonstrated by reduced pain and increased functional outcomes
Papa 2012a	Case study (n=2)	 A 48-year old female with gradual onset of right lateral elbow pain over the course of 6 weeks A 47-year old female with gradual onset of left lateral elbow pain over the course of 4 weeks 	The conservative treatment approach consisted of activity modification, bracing, medical acupuncture with electrical stimulation, Graston Technique®, and rehabilitative exercise prescription	 Both patients attained resolution of their complaints, and at 8 month follow-up reported no recurrence of symptoms A combination of conservative rehabilitation strategies may be used by chiropractors to treat work-related lateral epicondylopathy and allow for individuals to minimize lost time related to this condition

7. Elbow Pain – Medial Epicondylopathy

A. Case Report/Case Series studies (Level IV Evidence)

One case report was identified that presented evidence on the effectiveness of chiropractic treatment for medial epicondylopathy.

Study	Study Type (n=)	Patient/s	Intervention	Result
Hudes 2011	Case study (n=1)	A 35 year old male presented with medial elbow pain of 4–6 weeks duration that worsened after playing squash	A course of fascial stripping techniques was initiated, including: cross friction massage, instrument-assisted fascial stripping to the medial epicondyle area and over the belly of the pronator teres muscle, ischemic compression of a trigger point in the pronator teres, active assisted compressions to the trigger point noted in the pronator teres, and mobilisations of the carpals, specifically the scaphoid Instructions were given to the patient regarding icing the elbow and daily eccentric exercises	 At a one year follow up, the patient reported complete resolution of symptoms with no recurrence. Four treatments occurred within one week. The patient was again followed up at 8 and 18 weeks after discontinuing treatment



8. Elbow Pain – Radial Nerve Entrapment

A. Case Report/Case Series studies (Level IV Evidence)

One case report was identified that presented evidence on the effectiveness of chiropractic treatment for radial nerve entrapment.

Study	Study Type (n=)	Patient/s	Intervention	Result
Jefferson- Falardeau and Houle 2019	Case study (n=1)	A 45-year-old man presented to a private chiropractic clinic with a throbbing pain 5 cm above the right lateral elbow epicondyle radiating onto the back of the lower arm and increasing after using a mouse when working on a computer	Chiropractic management was performed including myofascial therapy, spinal and proximal radio-ulnar joint adjustments, neural mobilisation and use of a splint	 After 7 days (2 treatments), the patient showed no elbow pain even if he worked on his computer using a mouse After a 2-year follow-up, no recurrence was reported

9. Wrist/Hand Pain – Carpal Tunnel Syndrome

A. Systematic Reviews (Level I Evidence)

One systematic review was identified that explored the use of chiropractic management of carpal tunnel syndrome.

Huisstede et al 2010

Huisstede et al 2010 (QS: HQ) reviewed the evidence for the effectiveness of non-surgical treatments, including chiropractic care, for carpal tunnel syndrome (CTS). Systematic reviews and/or RCTs were considered eligible for inclusion if they fulfilled all of the following criteria: (1) the study included patients with CTS, (2) CTS was not caused by an acute trauma or any systemic disease (such as osteoarthritis, rheumatoid arthritis, diabetes mellitus, or other connective tissue disease), (3) an intervention for treating the disorder was evaluated, and (4) results on pain, function or recovery were reported. There were no language restrictions. The search identified 53 RCTs of which only one (Davis et al, n=91) specifically related to chiropractic treatment. The authors reported that this low quality trial found no significant difference in hand function following chiropractic treatment (manual thrusts, myofascial massage and loading, ultrasound, and nocturnal wrist splint) versus medical treatment (ibuprofen and wrist splint) at 13 weeks of follow-up. They concluded that there was no evidence for the effectiveness of chiropractic therapy compared with medical treatment for CTS in the midterm. While an RCT by Burke et al (2007) exploring two manual therapy interventions for CTS was not included in this review as chiropractic treatment, the study was undertaken by chiropractors and undertaken in a chiropractic college. It reported on the use of Graston instrument-assisted soft tissue mobilisation (GISTM) versus STM administered with the clinician's hands. This study found support for the use of both techniques with no difference between the groups.



Study	SIGN rating	Conclusions	Strength of evidence
Huisstede et al	НО	There was no evidence for the effectiveness of chiropractic therapy compared with medical treatment for CTS in the midterm	Based on 1 RCT
2010	пц	Graston instrument-assisted soft tissue mobilisation (GISTM) was no more effective than STM administered with the clinician's hands	Based on 1 RCT

10. Wrist/Hand Pain – De Quervain's Stenosing Tenosynovitis

A. Case Report/Case Series studies (Level IV Evidence)

One case report was identified that presented evidence on the effectiveness of chiropractic treatment for De Quervain's stenosing tenosynovitis.

Study	Study Type (n=)	Patient/s	Intervention	Result
Papa 2012b	Case study (n=1)	A 32-year old female presenting with radial wrist pain of 4 months duration, diagnosed as De Quervain's stenosing tenosynovitis	The conservative treatment approach consisted of activity modification, Graston Technique and eccentric training	 The patient attained symptom resolution and at 6-month follow-up reported no recurrence of wrist pain The patient was seen twice a week for 4 weeks and then once per week for 4 weeks

11. Wrist/Hand Pain – Ulnar Nerve Compression

A. Case Report/Case Series studies (Level IV Evidence)

One case report was identified that presented evidence on the effectiveness of chiropractic treatment for ulnar nerve compression.

Study	Study Type (n=)	Patient/s	Intervention	Result
Illes and Johnson 2013	Case study (n=1)	A 41-year-old woman presented with hand weakness and numbness along the medial aspect of her right forearm and the 3 most medial fingers. The onset of symptoms presented suddenly, 3 weeks prior, when she woke up in the morning and assumed she had 'slept wrong'	Chiropractic care consisting of manipulative therapy, myofascial therapy and elastic therapeutic taping. Active home care included performing postural exercises and education about workstation ergonomics	• Over a series of 11 treatments, her symptoms resolved completely and she was able to perform work tasks without dysfunction



Part 4: General Musculoskeletal Conditions and Temporomandibular

Joint

The following section explores the evidence for the effectiveness and safety of chiropractic-specific interventions for the management of (1) general musculoskeletal conditions and injuries not covered elsewhere in the review, and (2) conditions and injuries affecting the temporomandibular joint (TMJ).

A total of 12 studies were included in Part 4 on general musculoskeletal conditions and the temporomandibular joint:

Systematic reviews

Five SRs were found that investigated the effectiveness of chiropractic interventions for the management of general musculoskeletal and TMJ conditions. Appendix 6 presents the data extraction from the SRs included in this review.

Randomised controlled trials

Part 4: General MS Conditions and TMJ

3.3

One relevant RCT that was not included in the five SRs was identified. Appendix 7 presents the data extraction from the RCTs included in this review.

Cohort/Case series/Case studies – Level III, IV Evidence

Three cohort studies (Level III evidence) and three case series/case reports (Level IV evidence) were identified. Their findings are discussed in the body of the review.

	SR	RCT	Cohort	Case reports
General musculoskeletal conditions				
General musculoskeletal conditions	1		3	1
Older adults	1			
Chiropractic Treatment approaches (Instrument assisted)	1			
Maintenance care	1			
Temporomandibular Joint				
Temporomandibular Joint	1	1		2
Total	5	1	3	3



1. General musculoskeletal conditions

A. Systematic Reviews (Level I Evidence)

One SR was found that investigated the use of chiropractic treatment for the management of general musculoskeletal conditions.

Ernst and Posadzki (2012)

Ernst and Posadzki (2012) (QS: AQ) presented a systematic review of controlled clinical trials exploring the use of chiropractic for the prevention and/or treatment of sports injuries. They identified 4 RCTs and 2 controlled clinical trials (CCT), of which 5 (3 RCTs and 2 CCTs) related specifically to the treatment of sports injuries. The remainder focused on the prevention of sports injuries. The authors reported that, overall, the methodological quality of the studies included in the review was poor. One RCT (Brantingham 2005, hallux abducto-valgus bunion, n=60, control: sham action potential therapy) and two CCTs (Pellow 2001, grade I or II ankle inversion sprains, control: sham ultrasound, n=30; Petersen 2003, metatarsalgia, n=40, control : sham ultrasound) suggested that chiropractic was an effective treatment for sports injuries. Two RCTs (Langen-Pieters 2003, lateral epicondylitis, n=14, control: ultrasound; Radpasand 2009, lateral epicondylitis, n=6, control: ultrasound) indicated that there was no difference between chiropractic and control groups (both involving ultrasound) in the treatment of sports injuries.

Study	SIGN rating	Conclusions	Strength of evidence
Frost and	d AQ AQ hallu meta	• The evidence is far from conclusive regarding the effectiveness of chiropractic manipulation for the prevention or treatment of sports injuries. Further rigorous research in this area thus seems warranted	Based on 3 RCTs and 2 CCTs
Posadzki (2012)		 Chiropractic treatment appeared an effective treatment for hallux abducto valgus bunion, ankle sprain and metatarsalgia compared to sham treatment 	Based on 1 RCT and 2 CCT
		• Chiropractic treatment appeared effective treatment for lateral epicondylitis; however, it was no better than ultrasound	Based on 2 RCTs

B. Observational Studies (Level III Evidence)

Three observational studies were identified that explored the effectiveness of chiropractic management for general musculoskeletal conditions.

Study	SIGN rating	Study Type (n=)	Population	Intervention	Result
Houweling et al 2015	AQ	Retrospective cohort study (n=719)	403 patients who had seen MDs and 316 patients who had seen Doctors of Chiropractic (DCs) as the initial health	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 Patients initially consulting MDs had significantly less reduction in their numerical pain rating score (difference of 0.32) and were significantly less likely to be satisfied with the care received (odds ratio = 1.79) and the



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• Spinal, hi they initia	p, and should ated care with	er pain patients h n DCs, when comp	nad clinically similar pa pared to those who in	ain relief, greater satisfa itiated care with MDs	 found for Patient's Global Impression of Change ratings Mean costs per patient over 4 months were significantly lower in patients initially consulting DCs (difference of CHF 368; US \$368) action levels, and lower overall cost if
Prater et al 2020	LQ	Prospective observational pilot study (n=35)	Community health centre patients	Two distinct interventions to address chronic pain: 1.Multidisciplinary chronic pain team consisting of a primary care physician (PCP), behavioural health consultant, clinical nurse and clinical pharmacist 2. Chiropractic team consisting of faculty professors and students from Logan University	 Participants of the chiropractic team (mean change –25.0, P = .01) and those completing the study before COVID-19 (mean change = -22.6, P < .01) were found to have significantly greater improvement at follow-up
 This obser chiropract 	rvational stud	ly within a commu	unity health centre ob pain team care	served improvements i	n spinal pain and disability with
Field & Newell 2016	HQ	Prospective observational study (n=8,222)	self-referring and NHS-referred patients undergoing chiropractic care	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 Patients with low back and neck pain presenting privately are more likely to report improvement within 2 weeks and to have slightly better outcomes at 90 days. However, these patients were more likely to be attending consultations beyond 30 days

C. Case Report/Case Series studies (Level IV Evidence)

One case series was identified that explored the effectiveness of chiropractic management for general musculoskeletal conditions.

Study	Study Type (n=)	Patient /s	Intervention	Result
Stomski et al 2019	Case series	Patients attending three Western Australian chiropractic teaching clinics	All patients received standard chiropractic care, and treatment was left to the discretion of the chiropractor	 Participants experienced clinically important improvement in pain. However, the skewed nature of the dataset precluded identifying whether students' person-centred care skills influenced such improvement



2. General musculoskeletal conditions – older adults

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the use of chiropractic treatment for the management of general musculoskeletal conditions in older adults.

<u>Hawk et al (2017)</u>

Hawk et al (2017) (QS: AQ) presented a systematic review of best practices in chiropractic care for older adults, defined as aged 65 years and older. They identified 3 RCTs, 2 cohort studies and 1 systematic review on treatment effectiveness (of which only 3 RCTs and 1 cohort study related to musculoskeletal conditions), plus 14 observational studies on safety. Of the treatment effectiveness RCTs, Dougherty et al (2014) found no significant improvement in pain compared with sham, but improvement in ODI at 12 weeks, and Learman et al (2013) and Enix et al (2015) found thrust manipulation improved pain but was no better than non-thrust manipulation or physical therapy in the management of low back pain in older adults. A cohort study by Weigel et al (2013) comparing 741 Medicare chiropractic users to 2,777 medical care users for low back pain reported that chiropractic slightly increased risk of decline in self-reported health and lower body function in chiropractic users (AOR 1.580 and 1.274 respectively). Among adult chiropractic patients, minor transient side effects (24-72 hours), usually muscle soreness or stiffness, were common. However, evidence indicated that serious adverse events were very rare. Among older adult chiropractic patients, studies indicated no evidence of higher risk for serious adverse events and no evidence for causation of strokes.

Study	SIGN rating	Conclusions	Strength of Evidence
Hawk et al		 Exercise and manipulation and mobilization contributed to general positive outcomes beyond pain reduction alone 	Based on 3 RCTs and 1 cohort study
	AQ	• Inconclusive evidence on the effectiveness of thrust CMT in the management of spinal pain in older adults compared to sham or other treatments	Based on 3 RCTs
(2017)		Chiropractic use increased risk for declines in self- reported health in chiropractic users	Based on 1 cohort study
		 Among older adult chiropractic patients, studies indicated no evidence of higher risk for serious adverse events and no evidence for causation of strokes 	Based on 14 observational studies



3. General musculoskeletal conditions – chiropractic treatment approaches (instrument assisted)

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the use of different chiropractic treatment approaches (i.e. instrument assisted) for musculoskeletal conditions

Huggins et al (2012)

Huggins et al (2012) (QS: AQ) presented a systematic review of the literature investigating clinical outcomes involving the use of the Activator Adjusting Instrument (AAI) or Activator Methods Chiropractic Technique (AMCT). They identified 8 studies including 3 RCTs, 1 clinical trial and 2 cohort studies, in which the intervention group or control group had AAI or AMCT. In the 8 clinical trials involving the use of the AAI, benefits were reported in patients with spinal pain and trigger points, although these results were not statistically significantly different when compared to the use of HVLA manual manipulation or trigger point therapy.

Study	SIGN rating	Conclusions	Strength of evidence
Huggins et al (2012)	AQ	 Use of Activator Adjusting Instrument (AAI) or Activator Methods Chiropractic Technique (AMCT) provided benefits in patients with spinal pain and trigger points Use of AAI or AMCT appeared no more effective than the use of HVLA manual manipulation or trigger point therapy 	Based on 3 RCTs, 1 clinical trial and 2 cohort studies

Karmali et al (2019)

Karmali et al (2019) (QS: AQ) presented a systematic review of the evidence on the effects of instrumentassisted soft tissue mobilization (IASTM) on pain intensity in the treatment of musculoskeletal conditions. They identified 5 RCTs and 1 CCT trial, in which the Graston technique[®] was reported as being the specific technique utilized in all studies. The studies explored the use of IASTM for lateral epicondylitis (Blanchette 2011; 10 treatments (2 x per week for 5 weeks)), patellofemoral pain (Brantingham et al 2009; 6 treatments (1-3 x per week for 2 – 6 weeks)), carpal tunnel syndrome (Burke et al 2007; 10 treatments (2 x per week for 4 weeks 1 x per week for 2 weeks)), non-specific thoracic pain (Crothers et al 2016; 10 treatments over 3-4 weeks), low back pain (Lee et al 2016; treatment over 4 weeks) and ankle instability (Schafer et al 2012; 8 treatments (2 x per week for 4 weeks)). Five of 6 studies compared IASTM to a non-IASTM group. Five studies demonstrated a statistically and clinically significant (p<0.05) reduction in pain within the IASTM groups, with 4 of the six demonstrating a significant improvement in the IASTM compared to a non-IASTM treatment.



Study	SIGN rating	SIGN rating Conclusions	
Karmali et al	II AQ	The results of this review indicated that most included studies of IASTM appeared to demonstrate clinically meaningful change with respect to pain intensity for musculoskeletal conditions	Based on 5 RCTs and 1 CCT
(2019)		Instrument-assisted soft tissue mobilization (IASTM) appeared more effective than controls for reducing pain intensity in the treatment of musculoskeletal conditions.	Based on 3 RCTs and 1 CCT

4. General musculoskeletal conditions – Maintenance care

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the use of maintenance chiropractic treatment for the management of general musculoskeletal conditions.

Axen et al (2019)

Axen et al (2019) (QS:AQ) presented a systematic review update of the literature investigating the clinical usefulness and cost-effectiveness of chiropractic maintenance care. They identified 14 studies including 3 RCTs, 4 surveys, 4 cohort studies, 1 workshop and 1 interview. Eight studies collected their data from chiropractors (Axen 2008, Axen 2009, Moller 2009, Malmqvist 2009, Sandnes 2010, Hansen 2010, Axen 2013, Myburgh 2013) who either estimated their responses or consulted their patient files. Four studies collected their data from patients (Senna 2011, Mattel 2011, Eklund 2018, Maiers 2018), one study collected data from both chiropractors and their patients (Bringsli 2012), and one study used workers' compensation claims data (Cifuentes 2011). The authors reported that no studies were found which explored the cost-effectiveness of maintenance care. Of the four RCTs, disparate results were found with two reporting positive results for pain and disability (Senna 2011, Eklund 2018) and two reporting no significant benefits for pain in patients with neck and back pain (Martel 2011, Maieres 2018). In one study, patients who received maintenance care had better outcomes than those who received shortterm treatment or short-term sham treatment (Senna 2011). Two studies compared two types of maintenance care with or without exercises (Martel 2011), or different length of follow-up treatments (Maieres 2018), and found no difference of outcomes between groups. One multicentre trial found a considerable difference in the number of bothersome days, favouring the maintenance care group to the one which was encouraged to 'call when needed' (Eklund 2018). Despite the inconsistency in evidence, the authors concluded that maintenance care can be considered an evidence-based method to perform secondary or tertiary prevention in patients with previous episodes of low back pain who report a good outcome from the initial treatments. However, even these authors noted that these results should not be interpreted as an indication for maintenance care for all patients who receive chiropractic treatment.



Study	SIGN rating	Conclusions	Strength of evidence
Axen et al (2019)	AQ	 No studies were found which explored the cost-effectiveness of maintenance care Four studies investigating the effect of chiropractic maintenance care were identified, with disparate results on pain and disability over 12 months in patients with neck and back pain 	Based on 4 RCTs

5. Temporomandibular joint disorders

A. Systematic Reviews (Level I Evidence)

One SR was found that explored the use of chiropractic treatment for the management of temporomandibular joint (TMJ) disorders.

Brantingham et al (2013)

Brantingham et al (2013) (QS: AQ) reviewed the evidence for manual and manipulative therapy (MMT), including chiropractic management, for upper extremity and temporomandibular pain disorders. While the authors failed to differentiate between the different providers in their conclusions, they did provide details in their data extraction tables on the professionals who gave the treatments. They identified 5 trials and 5 case series reports on management of TMJ disorders of which one (1) RCT (Varrie 2003) and 3 case series (Alcantara 2002, DeVocht et al 2003 and 2005, Houle et al 2009) involved chiropractic management. They concluded that there was fair (B) level of evidence for MMT to specific joints and the full kinetic chain, combined generally with exercise and/or multimodal therapy, for TMJ disorders in the short term.

Study	SIGN rating	Conclusions	Strength of evidence
Brantingham et al 2013	AQ	 CMT effective in reducing pain and improving function in TMJ but no more effective than exercise or in combination with exercise 	Based on 1 RCT and 3 case series

B. Randomised Controlled Trials (Level II Evidence)

One RCT was identified that focused on the effect of chiropractic management on TMJ disorders.

Study	SIGN Rating	Objective	Intervention	Result
DeVocht et al 2013	AQ	To determine the feasibility of conducting a larger trial to evaluate chiropractic treatment of temporomandibular disorders (TMDs)	80 participants randomised into one of the following four groups, all of which included a comprehensive self-care program: reversible interocclusal splint therapy (RIST), Activator Method Chiropractic Technique (AMCT).	The adjusted mean change in current pain over six months, as assessed on the 11-point numerical rating scale, was 2.0 (95 percent confidence interval, 1.1-3.0) for RIST, 1.7 (0.9-2.5) for self-care only, 1.5



only. (0.7-2.5) for sham AMCT.

Activator Method Chiropractic Technique appeared to be no more effective than sham treatment in reducing pain

C. Case Report/Case Series studies (Level IV Evidence)

Two case series were identified that explored the effectiveness of chiropractic management for TMJ disorders.

Study	Study Type (n=)	Patient/s	Intervention	Result
Pavia et al 2015	Retrospective cohort (n=14)	14 patients with signs and symptoms of TMD were selected for this case series, 13 female and 1 male. The average age was 42.6 ± 14.5 years	Activator Methods using international protocols relative to the temporomandibular joint	 The resulting average showed a reduction in the patients' pain scores from the initial visit of 8.3 ± 1.6 to the last visit at 1.4 ± 1.1 with an 80.9% ± 15.4% improvement The average number of visits was 13.6 ± 8.2
Rubis et al 2014	Case study (n=1)	A 38-year-old female patient presented for chiropractic care with a chief concern of jaw pain, tinnitus, headaches, and neck and shoulder soreness of 8 months' duration	Chiropractic care consisted of Activator treatment to the pelvis and the thoracic and cervical spine. Manual manipulation of the temporomandibular joint was performed along with a soft tissue technique intraorally on the lateral pterygoid. Postisometric relaxation in the head and neck region was also done. The patient was treated 6 times over 3 weeks	 At the end of treatment, the patient had a pain rating of 0/10, maximum mouth opening of 49 mm, no tender points on the follow- up Kinnie-Funt, and increased cervical range of motion



		d Risk						
	The following section explor management of musculoske	es the evidence for the safe letal conditions and injuries	ety of chiropract	ic interventions	for the			
	A total of 15 studies were in	cluded in section 3.4: safety	y and risk.					
3.4 Safety and Risk	Systematic reviews A total of 13 SRs were found management of musculoske SRs included in this review. Randomised controlled trial One relevant RCT that was n extraction from the RCTs inc Cohort/Case series/Case stud One case series/case report the body of the review.	ated the safety of s. Appendix 6 pro as identified. Ap entified in this re	of chiropractic ir esents the data opendix 7 preser eview. The findir	nterventions for the extraction from the nts the data ngs are discussed in				
	SR RCT Cohort Case r							
	General	3	1		1			
	Cervical	5						
	Thoracic	2						

1. Safety - General

A. Systematic Reviews (Level I Evidence)

Three SRs were found that explored safety and risk associated with the use of chiropractic care.

13

Total

1

0

1

Carnes et al 2010

Carnes et al (2010) (QS: AQ) presented a systematic review and meta-analysis on the incidence and risk of adverse events with manual therapies, including all forms of treatment. The review identified eight prospective cohort studies (n=22,833; all including chiropractors and 1 including physiotherapists and osteopaths) and 31 manual therapy RCTs (9/31 specifically related to chiropractic interventions,



n=587/2301). While the review identified the studies involving chiropractors only, it did not extract the specific rate of adverse events per provider type. The incidence estimate of proportions for minor or moderate transient adverse events after all manual therapy was approximately 41% (CI 95% 17–68%) in the cohort studies and 22% (CI 95% 11.1–36.2%) in the RCTs; for major adverse events ~0.13%. The pooled relative risk (RR) for experiencing adverse events with exercise, or with sham/passive/control interventions compared to manual therapy was similar, but for drug therapies greater (RR 0.05, CI 95% 0.01–0.20) and less with usual care (RR 1.91, CI 95% 1.39–2.64).

Study	SIGN rating	Conclusions	Strength of evidence
Carnes et al (2010)	AQ	The incidence estimate of proportions for minor or moderate transient adverse events after all forms of manual therapy was between 41% and 22% Chiropractic specific data was not provided	Based on 8 cohort studies and 31 RCTs

<u>Ernst 2010</u>

Ernst (2010) (QS: LQ) presented a systematic review of case reports in which chiropractic spinal manipulation was followed by death. The review identified 23 case reports published since 1934 that described 26 fatalities. Most of the victims were relatively young, with 14 patients below the age of 40 years. There was a slight majority of female patients. The type of complication associated with death frequently related to a vascular accident leading to thrombosis and cerebral infarction. The time between treatment and death ranged from 1 hour to 58 days; in 10 cases, it was 1 day or less. The authors reported that the published information was often incomplete with many other fatalities unpublished.

Study	SIGN rating	Conclusions	Strength of evidence
Ernst 2010	LQ	 Numerous deaths have been associated with chiropractic neck manipulations There are reasons to suspect that under-reporting is substantial and reliable incidence figures do not exist The risks of chiropractic neck manipulations by far outweigh their benefits 	Based on 23 case reports

Gorrell et al 2016a

Gorrell et al (2016a) (QS: AQ) presented a systematic review exploring the reporting of adverse events following spinal manipulation in randomized clinical trials, including all forms of manipulative therapy. The review also sought to explore whether the quality of reporting has improved since publication of the 2010 Consolidated Standards of Reporting Trials (CONSORT) statement. The review identified 368 articles in which adverse events were reported in 140 (38.0%) articles. There was a significant increase in the reporting of adverse events post-CONSORT. As the authors noted, RCTs may not be the optimal design to



collect data on rare (i.e. major) adverse events as they often exclude patients who are at more risk, and there is often a delay between the intervention and the onset of an adverse event. The findings support the literature that concludes that while mild and moderate adverse events are relatively common, major events are extremely rare. The frequency of the practitioner providing SMT was as follows: chiropractor 77 (55.0%), physiotherapist 42 (30.0%), osteopath 11 (7.9%), naturopath 6 (4.3%), medical practitioner 4 (2.9%), manual therapist 3 (2.1%), physiatrist 1 (0.7%), and unknown in 15 (10.7%) articles. The frequency of regions treated was reported as: cervical spine 67 (47.9%), thoracic spine 66 (47.1%), lumbar spine and sacroiliac joints 66 (46.4%), and unknown (poorly defined) in 26 (18.6%) articles.

Study	SIGN rating	Conclusions	Strength of evidence
Gorrell et al 2016a	AQ	 Adverse events were reported in 38.0% of studies While mild and moderate adverse events are relatively common, major events are extremely rare Although there has been an increase in reporting adverse events since the introduction of the 2010 CONSORT guidelines, the current level should be seen as inadequate and unacceptable 	Based on 368 RCTs

B. Randomised Controlled Trials (Level II Evidence)

One RCT was found that explored safety associated with the use of chiropractic care.

Study	SIGN rating	Objective	Intervention	Result
Walker et al 2013b	AQ	To establish the short-term effectiveness of chiropractic therapy for spinal pain compared with a sham intervention and explore the predictors of chiropractic treatment satisfaction	183 adults with spinal pain (chiropractic, n = 92; sham, n = 91). Two treatments were provided with approximately 1 week between treatments	 Thirty-three percent of the sham group and 42% of the usual care group reported at least 1 adverse event Common adverse events were increased pain (sham 29%; usual care 36%), muscle stiffness (sham 29%; usual care 37%), and headache (sham 17%; usual care 9%) The relative risk (RR) was not significant for adverse event occurrence (RR = 1.24; 95% CI: 0.85–1.81), occurrence of severe adverse events (RR = 1.9; 95% CI: 0.98–3.99), adverse event onset (RR = 0.16; 95% CI: 0.02–1.34), or adverse event duration (RR =1.13; 95% CI: 0.59–2.18) No serious adverse events were reported
Adverse e	events were c	ommon with chiropractic trea	atment (42%), but seve	ere adverse events were rare

C. Case Report/Case Series studies (Level IV Evidence)

Study	Objective	Intervention	Result
Hartnett et al 2021	To evaluate the relationship between	Cases with chiropractors as defendants	Forty-eight cases involving chiropractic management in the United States were reported. Of these, 93.8% (n = 45) featured allegations involving spinal manipulation. The defense (practitioner) was victorious in 70.8% (n = 34) of



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	chiropractic spinal	were identified.	cases, with a plaintiff (patient) victory in 20.8% (n [10)
	manipulation and	Relevant medicolegal	(mean payment \$658,487- \$697,045) and settlement in
	medical malpractice	characteristics	8.3% (n = 4) (mean payment \$596,667 - \$402,534).
	using a legal database.	were obtained,	Overaggressive manipulation was the most frequent
	The legal database	including legal outcome	allegation (33.3%; 16 cases). A majority of cases alleged
	VerdictSearch was	(plaintiff/	neurological injury of the spine as the reason for litigation
	queried using the terms	defense verdict,	(66.7%, 32 cases) with 87.5% (28/32) requiring surgery. C5-
	'chiropractor' OR	settlement), payment	C6 disc herniation was the most frequently alleged injury
	'spinal manipulation'	amount, nature of	(32.4%, 11/34, 83.3% requiring surgery) followed by C6-C7
	under the classification	plaintiff claim, and type	herniation (26.5%, 9/34, 88.9% requiring surgery). Claims
	of 'Medical	and location of alleged	also alleged 7 cases of stroke (14.6%) and 2 rib fractures
	Malpractice'	injury.	(4.2%) from manipulation therapy.
	between 1988 and		
	2018.		

2. Safety - Cervical

A. Systematic Reviews (Level I Evidence)

Five systematic reviews focused on the evidence associated with adverse events following chiropractic treatment to the cervical spine.

Kranenburg et al 2017

Kranenburg et al (2017) (QS: AQ) conducted an SR of the associations between adverse events and cervical spine manipulation, mobilization and patient characteristics. They identified 144 studies, reporting on 227 cases. Manipulation was the most frequently reported technique (95.2%), with 62.6% of the cases involving a non-specified manipulation (i.e. impulse and/or direction was not specified), 26.9% a rotation manipulation, 2.6% a traction manipulation and 3.1% another type of manipulation. The majority of patients with reported major AEs were treated by chiropractors (65.6%), 5.3% by non-clinicians, 4.8% by osteopaths, 3.1% by physical therapists and 2.6% by other medical professions (e.g. general practitioners). The most commonly reported type of AE was cervical arterial dissection (CAD) (57% of the cases). The most frequently reported specific type of AE was the vertebral artery dissection. Of all vertebral artery dissections (53 cases), 65.9% were female and 30 male cases (36.15%). The majority of symptoms (84.5%) had an onset within 1 week. Overall, in 2.6% symptoms started within 1-2 weeks and in 1.8% took more than 2 weeks.

Study	SIGN rating	Conclusions	Strength of evidence
Kranenburg et al 2017	AQ	 Highest risk of AE related to manipulation (95.2%), with 62.6% of the cases involving a non-specified manipulation, 26.9% a rotation manipulation, 2.6% a traction manipulation and 3.1% another type of manipulation. The majority of patients with reported major AE were treated by chiropractors (65.6%), 5.3% by non-clinicians, 4.8% by osteopaths, 3.1% by physical therapists, 2.6% by other medical professions (e.g. general practitioners) 	Based on 227 case studies

Carlesso et al 2010

Carlesso et al (2010) (QS: HQ) conducted an SR investigating adverse events associated with the use of cervical manipulation and mobilisation for the treatment of neck pain in adults. The authors excluded case



studies. While the review included all professions the authors identified 6 chiropractic specific RCTs out of the 14 included RCTs, and 2 chiropractic specific case series out of the 3 included case series. The adverse events were initially grouped into major - death, stroke or permanent neurological deficits; and minor - transient neurological symptoms, increased neck pain/stiffness, headache, radiating pain, fatigue or other. The two pooled estimates for minor AEs related to all chiropractic spinal manipulation (CSM) were for transient neurological symptoms [RR 1.96 (95% CI: 1.09-3.54) p < 0.05]; and increased neck pain [RR 1.23 (95% CI: 0.85-1.77) p > .05]. Data related specifically to chiropractic CSM reports frequencies of AEs ranging from 0.7-90% for neurological symptoms, neck pain and headache, (Evans et al 2003, Rubinstein et al 2007, Thiel et al 2007) and risk ratios (95% CI) from 0.83 (0.39 - 1.76, Bronfort et al 2001), 1.13 (0.47 - 2.69, Haas et al 2003), 1.31 (1.12-1.52, Hurwitz et al 2004) to 1.50 (0.18-12.5, Strunk and Hondras 2008).

Study	SIGN rating	Conclusions	Strength of Evidence
Carlesso et al 2010	HQ	No definitive conclusions can be made due to a small number of studies, weak association, moderate study quality, and notable ascertainment bias	Based on 6 RCTs and 2 case series

Church et al 2016

Church et al (2016) (QS: LQ) conducted an SR/MA exploring the relationship between chiropractic care and cervical artery dissection (CAD). They identified 6 case control studies that reported on 2511 dissections/VBA strokes. They included 5 of the studies in their meta-analysis. The authors reported that the quality of the published literature was very low. While their analysis showed an association between chiropractic neck manipulation and cervical artery dissection, they felt that this relationship may be explained by the high risk of bias and confounding in the available studies, and in particular by the known association of neck pain with CAD and with chiropractic manipulation. Despite the results of their review, they felt that there was no convincing evidence to support a causal link (based on Hills guidelines for causality) between chiropractic manipulation and CAD.

Study	SIGN rating	Conclusions	Strength of Evidence
Church et al 2016	LQ	 The meta-analysis revealed a small association between chiropractic care and dissection (OR 1.74, 95% CI 1.26-2.41) The quality of the body of evidence according to GRADE criteria was "very low" 	Based on 6 case control studies

Fernando et al 2022

Fernando et al (2022) (QS: LQ) conducted an SR exploring the evidence related to spontaneous intracranial hypotension (SIH) secondary to chiropractic manipulation (CSMT). They identified 12 case studies reporting on 13 cases. The mean age was 41.6 + 7.8 years [range, 29 - 54] and ten patients (83.3%) were female. All patients presented with orthostatic headache while 5 patients had vomiting (41.7%). Axial tension (n = 6, 50%) and rotation (n = 8, 66.7%) were the most common mechanisms of CSMT. The median



time from CSMT to symptom onset was 24 hours [range, 0 – 168 hours]. However, not all studies specified the onset of symptoms after CSMT. Only 8 patients had cranial MRI.

Study	SIGN rating	Conclusions	Strength of evidence
Fernando et al 2022	LQ	A history of CSMT must be actively sought in all patients presenting with spontaneous intracranial hypotension	Based on 12 case studies

Haynes et al 2012

Haynes et al (2012) (QS: AQ) conducted an SR of the evidence on risk of stroke from neck manipulation. While the SR included all practitioners, there were two chiropractic-specific case control studies among the five reported on. Both chiropractic studies found a strong measured association within one week of the stroke for those aged < 45 years: 4 cases (3.6%) compared with 4 controls (0.9%), OR crude = 3.94 (95% CI = 0.99-15.78), Rothwell et al 2001; and 25 cases (24.5%) vs 27 controls (6.6%), OR crude = 3.11 (95% CI = 1.16-8.35), Cassidy et al 2008.

Study	SIGN rating	Conclusions	Strength of evidence
Haynes et al 2012	AQ	Conclusive evidence seems to be lacking for a strong association between neck manipulation and stroke, but also appears to be absent for no association	Based on 2 case control studies

3. Safety - Low Back

A. Systematic Reviews (Level I Evidence)

Three systematic reviews were identified that explored the risk of adverse events associated with chiropractic treatment of the low back.

Hebert et al 2015

Hebert et al (2015) (QS: AQ) conducted an SR to explore serious adverse events following lumbo-pelvic spinal manipulative therapy (SMT) and describe the case details. The review included SMT applied to the lumbar spine or pelvis by any type of provider (e.g. chiropractic, medical, physical therapy, osteopathic, layperson). They identified 77 cases (in 41 studies). Of the 50 cases reporting clinician type, 40 (80%) identified the SMT provider as a Doctor of Chiropractic/chiropractor; 3 (6%), an osteopath; 2 (4%), a medical doctor or physician; and 5 (10%), another type of health care provider or nonprofessional. The most commonly reported adverse events were signs and symptoms consistent with cauda equina syndrome (29 cases, 38% of total) and lumbar disk herniation (23 cases, 30% of total). Additional adverse events consisted of fracture (7 cases, 9%), hematoma or haemorrhagic cyst (6 cases, 8%), or other serious adverse events (12 cases, 16%) including neurologic or vascular compromise, soft tissue trauma, muscle abscess formation, and disrupted fracture healing.



Study	SIGN rating	Conclusions	Strength of evidence
Hebert et al 2015	AQ	The evidence is unclear. The anecdotal nature of the cases does not allow for causal inferences between SMT and the events identified in the review	Based on 41 case studies

Paige et al 2017

Paige et al (2017) (QS: HQ) conducted an SR exploring the association of spinal manipulative therapy with clinical benefit and harm for acute low back pain. Whilst the review included all practitioners, SMT was provided by physical therapists in 13 studies, chiropractors in 7 studies, medical doctors in 5 studies, and osteopathic physicians in 3 studies. Unfortunately, the authors failed to report the effectiveness of SNP according to the practitioner involved. Five studies that specifically involved chiropractors were included in the review of adverse events. Adverse events were reported by between 42% to 56% of patients.

Study	SIGN rating	Conclusions	Strength of evidence
Paige et al 2017	HQ	Among patients with acute low back pain, spinal manipulative therapy was associated with modest improvements in pain and function at up to 6 weeks, with transient minor musculoskeletal harms. However, heterogeneity in study results was large	Based on 7 studies

Rubinstein et al 2019

Rubinstein et al (2019) (QS: HQ) conducted an SR exploring the benefits and harms of spinal manipulative therapy (SMT) for the treatment of chronic low-back pain (LBP). Whilst the review included all practitioners, there were 16 chiropractic specific RCTs among the 47 reported studies. The review focused on the effects of both spinal manipulation (i.e. high-velocity low-amplitude (HVLA) techniques) as well as mobilisation (i.e. low velocity low-amplitude (LVLA) techniques). Approximately half of the studies examined reported adverse and serious adverse events, but in most of these it was unclear how and whether these events were registered systematically. The findings from the studies are reported below.

Study, sample size	Adverse events reported (for SMT or control group)
Bronfort 2011, N=301	All adverse events were transient in nature, required little or no change to activity levels, and were considered non-serious; 6 (2%) were treated with rescue pain medication during treatment period: severe back pain, acute flareup of low back and buttock pain, neck pain, and inability to sleep because of pain. 4 (1%) reported similar adverse events, but declined rescue medication
Bronfort 1996, N=174	NSAID group: 2 (4%) developed severe nausea & vomiting and subsequently discontinued the study; 8 (16%) developed substantial nausea & dyspepsia and 1 (2%) severe tinnitus SMT + exercise groups: 1 (2%) discontinued exercise because she did not tolerate it well and 7 (14%) developed muscle soreness & stiffness, including neck pain following exercise - these symptoms gradually abated and did not prevent them from completing the study; 1 (1%) developed symptoms of a myocardial infarction unrelated to exercise; overall, both strengthening and stretching exercise and SMT



Dougherty 2014,	243 adverse events were reported during the study: 55% in the exercise group and
n=181	45% in the SMT group. Of the 110 events reported in the SMT group, the DSMB
	judged 14 as definitely or probably associated with SMT. The majority of adverse
	events consisted of musculoskeletal soreness and resolved within the study period.
	During the study period 10 serious adverse events were reported (5 in the control
	group and 5 in the SMT group); the DSMB judged none of the serious adverse events
	to be associated with the study intervention
Gudavalli 2006	Not reported
Haas 2014, N=400	3 (1%) reported seeking care for symptomatic relief of low-back pain exacerbation
	related to the study; 1 (1%) lost several days of work followed by complete
	resolution during the treatment phase; 1 (1%) dropped out after an exacerbation
	associated with lifting a child; no serious adverse events were reported
Hondras 2009, N=240	20 (8%) reported an adverse event, all resolved within 6 days, and none
	required referral for outside care. Adverse events in the SMT groups consisted of
	soreness or stiffness. One participant reported a dermatologic rash in the medication
	group; no serious adverse events were reported
Hsieh 2002, N=206	23 (12%) reported adverse event: in total 17 (11%) in the control groups
	(combined), 6 (12%) in the SMT group; adverse events were limited to transient
	exacerbations of symptoms, except for one case of constant tinnitus in a control
	group; 2 (4%) claimed SMT had aggravated their condition; no serious adverse events
	were reported
Muller 2005, N=115	6% in the medication group experienced an adverse event; no serious adverse events
	were reported
UK BEAM trial 2004,	No serious adverse events were reported
N=1334	
Walker 2013 N=183	30 (33%) in the sham group and 39 (42%) in the SMT group reported at least 1
Walker 2013, 11-103	adverse event: common adverse events were increased nain (sham 29%: SMT 36%)
	muscle stiffness (sham 29%: SMT 37%) and headache (sham 17%: SMT 9%). The
	relative risk (RR) was not significant for adverse event occurrence (RR = $1.24 \cdot 95\%$ Cl·
	(,,,,,,,
	adverse event onset (RR = 0.16 ; 95% CI: $0.02-1$ 34) or adverse event duration (RR =
	1.13; 95% CI: 0.59-2.18); no serious adverse events were reported
Xia 2016. N=192	No serious adverse events were reported

Study	SIGN rating	Conclusions	Strength of evidence
Rubinstein et al 2019	HQ	• The evidence suggests that chiropractic management for low back pain is associated with minor adverse events	Based on 10 RCTs
		• The evidence suggests that chiropractic management for low back pain was rarely associated with serious adverse events	Based on 10 RCTs

4. Safety - Thoracic

A. Systematic Reviews (Level I Evidence)

Two systematic reviews were identified that that explored the safety of the use of chiropractic treatment for the management of thoracic pain.


Puentedura and O'Grady 2015

Puentedura and O'Grady (2015) (QS: AQ) retrospectively analysed all available documented case reports describing patients who had experienced severe adverse events (AE) after receiving thrust joint manipulation (TJM) to their thoracic spine. The review included all forms of manual therapy, not just chiropractic, and identified ten cases, reported in 7 case reports. Of the 10 cases, seven involved chiropractors.

Study	SIGN rating	Conclusions	Strength of evidence
Puentedura and O'Grady (2015)	AQ	Ten cases, reported in 7 case reports, were reviewed. Cases involved females (8) more than males (2), with mean age being 43.5 years (SD=18.73, Range = 17 -71). The most frequent AE reported was injury (mechanical or vascular) to the spinal cord (7/10), with pneumothorax and hematothorax (2/10) and CSF leak secondary to dural sleeve injury (1/10) Of the 10 adverse events, 7 related to chiropractors, 1 to an osteopath, 1 to a physical therapist and 1 to a lay person	Based on 7 case reports

Heneghan et al 2020

Heneghan et al (2020) (QS: AQ) presented a systematic review on reported thoracic adverse events (AEs) following SMT to the thoracic spine, and secondly on patient characteristics to inform further research for safe practice. They included all forms of manual therapy and identified 15 single case studies and 4 case series, which reported 21 unique thoracic AEs involving the spinal cord tissues [nonvascular (n = 7), vascular (n = 6)], pneumothorax or hemothorax (n = 3), fracture (n = 3), esophageal rupture (n = 1), rupture of thoracic aorta (n = 1), partial pancreatic transection (n = 1). Reported outcomes included full recovery (n = 8), permanent neurological deficit (n = 5), and death (n = 4). Of the thoracic AEs, 15 involved chiropractors, 2 physical therapists, 1 osteopath and 1 lay person. The authors reported that although causality cannot be confirmed, serious thoracic AEs including permanent neurological deficit and death have been reported following SMT.

Study	SIGN rating	Conclusions	Strength of evidence
Heneghan et al 2020	AQ	Although causality cannot be confirmed, serious thoracic AEs including permanent neurological deficit and death have been reported following SMT Of the 21 thoracic AEs reported in the literature, 15 involved chiropractors, 2 physical therapists, 1 osteopath and 1 lay person	Based on 15 case studies and 4 case series



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4. Evidence statements

1. Primary research questions

Primary research question 1: How effective is chiropractic in the management of musculoskeletal conditions?						
Evidence statement		PICOT framework	Volume & type of evidence			
There is variable evidence, in terms of volume, strength, quality and consistency, that chiropractic is effective in the management of musculoskeletal conditions:	Ρ	Patients with musculoskeletal conditions				
• The vast majority of the evidence on effectiveness focuses on effectiveness over		Chiropractic interventions	Based on 430 studies			
 The published evidence on effectiveness covers a wide range of study designs. For a number of conditions, the only available evidence comes from lower-level 	С	-	(including 52 systematic reviews, 152 RCTs, 95 cohort			
	ο	Pain & function	studies and 131 case			
studies (e.g. case studies/observational studies)			reports)			
 The strength and volume of evidence available varies significantly over the different injury types/conditions and body sites. 	т	Short to long term				

Primary research question 2: How safe is chiropractic in the management of musculoskeletal conditions?

Evidence statement		PICOT framework	Volume & type of evidence
There is usually a wideness is to use of usly use at somethy and some istance, that	Р	Patients with musculoskeletal conditions	Based on 430 studies
There is variable evidence, in terms of volume, strength, and consistency, that chiropractic treatment is safe in the management of musculoskeletal conditions. The risk of adverse event, either minor or major, varies significantly over the different injury types/conditions and body sites	Т	Chiropractic interventions	(including 52 systematic reviews, 152 RCTs, 95 cohort studies and 131 case reports)
	С	-	
	ο	Safety	
	т	Short to long term	



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2. Secondary research questions

Secondary question 1: How clinically effective and safe is chiropractic for the treatment of different injuries, conditions and body sites? CERVICAL

	Evidence statement		PICOT framework	Level of evidence
	There is consistent moderate evidence that chiropractic	Ρ	Acute & subacute NSNP	Consistent moderate
	interventions may reduce pain and improve range of motion	Т	Chiropractic interventions	Based on 2x HQ (including 1x RCT each) and 1x LQ
	(ROM) in the short term in patients presenting with	С	-	
Non-specific	nonspecific neck pain	0	Pain & ROM	RCT (2x AQ. 1x HQ and 1x
(NSNP): acute		т	Short term	LQ)
& subacute	There is limited moderate evidence that chiropractic	Ρ	Acute & subacute NSNP	
	 intervention is as effective as mobilization or use of an activator instrument in reducing pain and improving range of motion in the short term in patients presenting with acute or subacute nonspecific neck pain There is consistent moderate evidence that chiropractic intervention is as effective as physical therapy, or dry needling, in reducing pain and improving function in the 	I	Chiropractic interventions	Limited moderate Based 2x AQ RCT
		С	Mobilization or use of an activator instrument	
		0	Pain & ROM	
		т	Short term	
Non-specific		Ρ	Chronic NSNP	Consistent moderate
neck pain		Т	Chiropractic interventions	Based on 1x LQ (involving 4 RCT) and 1x HQ SR (involving
(NSNP): chronic		С	Physical therapy or dry needling	
	short term in patients presenting with chronic nonspecific	0	Pain & function	1 x RCT) and 2x AQ and one
	песк раш	т	Short term	LQ RCI
	There is consistent strong evidence that chiropractic	Ρ	Chronic NSNP	Consistent strong
	manipulative therapy is as effective as mobilization, physical	I	Chiropractic manipulative therapy	Based on one LQ SR (with 4 included RCTs), one HQ SR
	therapy, or dry needling, in reducing pain and improving	С	Mobilization, physical therapy or dry needling	



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Non-specific	function in the short term in patients presenting with chronic		Pain & function
neck pain	попѕресітіс песк раіп	т	Short term
chronic		Ρ	Chronic NSNP
	There is limited evidence that chiropractic manipulative	I	Chiropractic manipulative therapy
	therapy may reduce pain, improve range of motion or reduce disability in the long term in patients precenting with	С	-
	chronic nonspecific neck pain	0	Pain, ROM & disability
		т	Long term
	There is inconsistent weak evidence that chiropractic		Acute, subacute or chronic WAD
	management may reduce pain and improve function in patients with acute, subacute or chronic whiplash associated disorder	Т	Chiropractic management
		С	-
Whiplash		0	Pain & function
associated		т	Not reported
disorder	There is limited weak evidence that a chiropractic multimodal	Ρ	Acute, subacute or chronic WAD
(WAD)	approach including mobilization, information/ instruction,	Т	Chiropractic management, multimodal
	unsupervised and supervised cROM exercise may reduce pain and improve function in patients with acute, subacute or chronic whiplash associated disorder		-
			Pain & function
			Not reported
		Ρ	Cervical pain due to facet dysfunction
Cervical pain	There is limited weak evidence that chiropractic interventions	I	Chiropractic interventions
due to facet	may reduce pain and improve range of motion in the short/medium term in patients with cervical pain due to facet	С	-
dysfunction	dysfunction		Pain & ROM
	,	т	Short to medium term



(with two included RCTs) and two AQ & one LQ RCT

Limited evidence

Inconsistent weak Based on 1 x AQ SR (involving 2x studies)

Limited weak

Limited weak

Based on 1 HQ RCT

Based on 1 x AQ SR (involving 2x studies)

		Ρ	Cervical spond
	There is limited weak evidence that chiropractic interventions	I	Chiropractic in
Cervical	may improve pain and disability in the short/medium term in natients with cervical spondylosis	с	-
spondylosis		ο	Pain & disabili
		т	Short to mediu
	There is limited you weak avidence that chiranzatic	Р	Cervical radicu
Cervical	interventions may improve pain and function in the	I.	Chiropractic in
radiculopathy	short/medium term in patients with cervical radiculopathy	С	-
	from cervical disk herniation (CDH)		Pain & functio
		т	Short to mediu
			Cervicogenic h
	There is consistent strong evidence that chiropractic	Т	Chiropractic in
	Interventions may reduce headache pain, intensity and frequency in the short/medium term for natients with	С	-
	cervicogenic headaches	0	Headache pair
Cervicogenic		т	Short to mediu
neadache	There is inconsistent moderate evidence that chiropractic manipulation is as effective as laser, massage or physical therapy in reducing headache pain intensity and frequency in		Cervicogenic h
			Chiropractic in
			Laser, massage
	the short/medium term for patients with cervicogenic headaches	ο	Headache pair
	neauaches	т	Short to media
	There is consistent strong evidence of a relationship between	Ρ	Neck pain
	minor adverse events and chiropractic treatment for neck	Т	Chiropractic tr
	pain		-

Cervical spondylosis	
Chiropractic interventions	Limited weak
-	Based on 1 AQ and 1 x LQ
Pain & disability	RCTs and 2x case series
Short to medium term	
Cervical radiculopathy from CDH	
Chiropractic interventions	Limited very weak
-	Based on 1 case series
Pain & function	
Short to medium term	
Cervicogenic headache	Consistent strong - Based
Chiropractic interventions	on 1x HQ (involving 5x
-	RCIs) and 3x AQ SRs
Headache pain, intensity & frequency	studies/ 3x RCTs / 1x RCT
Short to medium term	respectively) and 1 HQ RCT
Cervicogenic headache	Inconsistent moderate
Chiropractic interventions	Based on 1x HQ (involving
Laser, massage or physical therapy	2x RCTs) and 3x AQ SRs
Headache pain, intensity & frequency	(including 3x RCTs / 1x RCT
Short to medium term	respectively
Neck pain	Consistent strong
Chiropractic treatment	Based on 2 x LQ and 1x HQ
-	SRs



		O T	Minor adverse events Short to medium term	
		P I	Neck pain Chiropractic treatment	Inconsistent weak Based on 2 x LQ (inc. 6x
Safety	There is inconsistent weak evidence of a relationship between serious adverse events and chiropractic treatment for neck pain	c O	- Serious adverse events	case control studies/ 12x case studies), 2x AQ (including 2 case control / 227 case studies) and 1x HQ (inc. 6x RCT and 2x case series) SR
		т	Short to medium term	
		Р	Neck pain	
	There is limited weak evidence of a relationship between minor adverse events and chiropractic treatment for neck pain	I	Chiropractic treatment	Limited weak Based on 1x AQ (including 8 cohort studies and 31x RCTs) SR
		С	-	
		ο	Minor adverse events	
		т	-	

THORACIC				
	Evidence statement		PICOT framework	Level of evidence
Non-specific thoracic spine pain	There is inconsistent weak evidence that chiropractic interventions may have an effect on pain and function for patients with non-specific thoracic pain	Ρ	Non-specific thoracic spine pain	
		I	Chiropractic interventions	Inconsistent weak
		С	-	Based on 1 AQ and 1 x HQ RCT
		0	Pain and function	
		т	-	
		Ρ	Chest wall pain	



Chest wall	There is inconsistent weak evidence that chiropractic		Chiropractic interventions	
	interventions may have an effect on pain and function for	С	-	Inconsistent weak
pain	patients with chest wall pain in the short term (4 weeks) but	0	Pain and function	Based on 3x AQ RCT
	no better than self-management in the long term	т	Short term (+), long term (-)	
		Ρ	Thoracic outlet syndrome	
	There is limited very weak evidence of effectiveness of chirapractic management for treating symptoms in theresis	Т	Chiropractic interventions	Limited very weak
	outlet syndrome	С	-	Based on 1 x case study
Thoracic		0	Symptoms	bused off i A cuse study
outlet		т	Short term	
syndrome			Thoracic outlet syndrome	
	There is no evidence of effectiveness of chiropractic care versus usual care or no care for thoracic outlet syndrome	I.	Chiropractic interventions	
		С	Usual care or no care	No evidence
		0	-	
		т	-	
		Р	Scheuermann's kyphosis syndrome	
	There is limited very weak evidence of effectiveness of chiropractic management for postural signs in Scheuermann's kyphosis syndrome	Т	Chiropractic interventions	Limited very weak
		С	-	Based on 1 x case study
Scheuer- mann's kyphosis syndrome		0	Posture	bused off i A cuse study
		т	Short term	
		Ρ	Scheuermann's kyphosis syndrome	
	There is no evidence of effectiveness of chiropractic care	- E	Chiropractic interventions	
	versus usual care or no care for Scheuermann's Kyphosis	С	Usual care or no care	
	Syndrome		-	
		т	-	



		Ρ	Thoracic pain	Limited weak
		I	Chiropractic treatment	Based on 2x AQ
Safety	There is limited weak evidence of a relationship between adverse events and chiropractic treatment for thoracic pain	С	-	(including 7 case reports/ 15 case studies and 4 case series) SR
		ο	Adverse events	
		т	-	

LUMBAR					
	Evidence statement		PICOT framework	Level of evidence	
		Ρ	NSLBP	Consistent strong	
Non-specific low back pain (NSLBP)		Т	Chiropractic interventions	Level of evidenceConsistent strong (Based on 5x AQ (including 4 RCT and 2 observational studies / 3x RCT / 1 RCT / 15x RCT/2x RCTs and 1x non-RCT respectively) and 4 x HQ SRs (including 2x 	(Based on 5x AQ (Including 4 RCT and 2 observational
	There is consistent strong evidence that chiropractic interventions may reduce pain and improve function in the short/medium term for patients with non-specific low back pain	С	-		
		ο	Pain & function	non-RCT respectively) and	
		т	Short to medium term	4 x HQ SRS (Including 2x RCT / 12x RCT / 6x RCT/ 16x RCT respectively), 11x RCTs, 8x observational studies, and 1x case study	
	There is inconsistent strong evidence that chiropractic	Ρ	NSLBP	Inconsistent strong	
	intervention is no more effective than massage, exercise	Т	Chiropractic interventions		



	therapy, medical care or physical therapy in reducing pain and improving function in the short/medium term for patients	с	Massage, exercise therapy, medical care or physical therapy	Based on 2x AQ (including 3x RCT / 15x RCT
	with non-specific low back pain	0	Pain & function	respectively) and 3 x HQ
		т	Short to medium term	RCT/ 16x RCT respectively), and 1x AQ and 1x HQ RCT
		Ρ	NSLBP	
	There is inconsistent weak evidence for the effectiveness of	I	Chiropractic interventions	Inconsistent weak
	chiropractic interventions on pain and function in the long	С	-	Based on 1x HQ (including
	term for patients with non-specific low back pain	0	Pain & function	16x RCT) SR and 1 AQ RCT
		т	Long term	
	There is inconsistent weak evidence that chiropractic interventions may reduce pain and improve function in the short/medium term for patients with disc herniation	Ρ	Disc herniation	
Disc		Т	Chiropractic interventions	Inconsistent weak
herniation		С	-	Based on 1x observational
		0	Pain & function	studies and 1 x case study
		т	Short to medium term	
		Р	Spinal stenosis	
	There is limited weak evidence that chiropractic interventions	I	Chiropractic interventions	Limited weak
Spinal stenosis	may reduce pain and improve function in the short/medium	С	-	Based on 1 AQ RCT
	term for patients with spinal stenosis	0	Pain & function	
		т	Short to medium term	
		Ρ	Sacroiliac joint pain	Limited weak
Sacroiliac joint	There is limited weak evidence of effectiveness of chiropractic	I	Chiropractic interventions	Pasad on 1 case control
pain	management for sacroiliac joint pain	С	-	study
		0	Pain & function	study



		т	Short term	
		Ρ	Sacroiliac joint pain	
	There is no evidence of effectiveness of chiropractic	I.	Chiropractic interventions	No evidence
	management versus usual care or no care for sacroiliac joint pain	С	Usual care or no care	Based on 1 case-control
		0	-	study
		т	-	
		Ρ	Low back pain	Consistent moderate
	There is consistent moderate evidence of a relationship between minor adverse events and chiropractic treatment for low back pain	I	Chiropractic treatment	Based on 1 x AQ (including
		С	-	41 case studies) and 2x HQ
		ο	Minor adverse events	(including 7 case studies/10
Safety		т	Short to medium term	RCTs) SR
		Ρ	Low back pain	
	There is limited weak evidence of a relationship between	I	Chiropractic treatment	Limited weak
	serious adverse events and chiropractic treatment for low	С	-	Based on 1 x AQ and 2x HQ
	back pain.	0	Serious adverse events	SR
		т	Short to medium term	

SPINAL PAIN IN GENERAL					
Spinal pain in general	Evidence statement		PICOT framework Level of eviden		
		Ρ	General spinal pain	Consistent strong	



		I	Chiropractic interventions	hterventions 5x SRs) and 2x HQ SR (involving 7x RCTs and 25x
	There is consistent strong evidence that chiropractic	С	-	
	interventions may be effective for general spinal pain	0	Pain	comparative studies respectively), 1x AQ RCT
		т	Short to medium term	and 5x cohort studies
		Ρ	General spinal pain	Consistent moderate
-	There is consistent moderate evidence that chiropractic	Т	Chiropractic interventions	Consistent moderate Based on 2x HQ SR (including 7x included RCTs + 25x comparative studies respectively) and 1x AQ
	intervention is no more effective for general spinal pain than	С	Usual care or sham treatment	
	usual care or sham treatment	0	Pain	
		т	Short to medium term	RCT

LOWER LIMB					
	Evidence statement		PICOT framework	Level of evidence	
		Р	Non-specific hip pain		
Non-specific hip		PICOT framework P Non-specific hip pain I Chiropractic management I Chiropractic management I - I Pain I Short term I Short term I Chiropractic management I Short term I Chiropractic management I Short term I Chiropractic management	Chiropractic management	Limited weak	
pain	There is limited weak evidence of effectiveness of chiropractic management for non-specific hip pain		Based on 1 RCT		
		0	Pain	bused off I field	
		т	Short term		
		Р	Hip osteoarthritis	Consistent weak	
Hip osteoarthritis	There is consistent weak evidence of effectiveness of	I	Chiropractic management		
	chiropractic management for pain and function in patients	С	-	Based on 3 RCT (2x HQ, 1xLQ), 2 x case series and 2 x case studies	
	with hip osteoarthritis	0	Pain and function		
		т	Short term		



		Ρ	FAI	
	There is limited you work avidence of effectiveness of	Т	Chiropractic management	Limited very weak
	chiropractic management for FAI	С	-	Based on 1 x case series
		0	Pain and function	
		т	Short term	
Femoro-		Р	FAI	
acetabular	There is no ovidence of effectiveness of chirepractic care	I	Chiropractic management	
impingement	versus usual care or no care for FAI	С	Usual care or no care	No evidence
		0	-	
		т	-	
	There is limited very weak evidence of effectiveness of chiropractic management for proximal hamstring tendinopathy	Ρ	Proximal hamstring tendinopathy	
		I.	Chiropractic management	Limited very weak
		С	-	Based on 1 x case study
Proximal		0	Pain	,
hamstring		т	Short term	
tendinopathy		Ρ	Proximal hamstring tendinopathy	
	There is no evidence of effectiveness of chiropractic care	Т	Chiropractic management	
	versus usual care or no care for proximal hamstring	С	Usual care or no care	No evidence
	tenunopathy	0	-	
		т	-	
		Р	Non-specific knee pain	
Non-specific	chiropractic management for non-specific knee pain	I.	Chiropractic management	Limited very weak
knee pain		С	-	Based on 1 x case study
		0	Pain	
		т	Short term	



	P Non-specific knee pain			
	There is no evidence of effectiveness of chiropractic care	Т	Chiropractic management	
	versus usual care or no care for non-specific knee pain	С	Usual care or no care	No evidence
		0	-	
		т	-	
		Ρ	PFPS	Limited weak
	There is limited weak evidence of effectiveness of	Т	Chiropractic management	Paced on 1x AQ (including
	chiropractic management for PFPS	С	-	1 x RCT) SR. 1X LO RCT and
		ο	Pain and Function	1 x case study
		т	Short to medium term	
Patellofemoral	There is limited very weak evidence of effectiveness of full chiropractic kinetic chain group intervention and myofascial manual therapy for PFPS	Ρ	PFPS	
		I	Full chiropractic kinetic chain group intervention and myofascial manual therapy	Limited very weak Based on 1x AQ (including 1 x RCT) SR, 1X LQ RCT
(PFPS)		С	-	
		0	-	
		т	Short term	
		Ρ	PFPS	
	There is no evidence of effectiveness of chiropractic care	Т	Chiropractic management	
	versus usual care or no care for PFPS	С	Usual care or no care	No evidence
		0	-	
		т	-	
	There is appriate at work an idea of offectives and of	Ρ	Knee osteoarthritis	
	chiropractic management for pain and function in patients	I.	Chiropractic management	Consistent weak
	with knee osteoarthritis	С	-	
		0	Pain and function	



		т	Short to medium term	Based on 1x HQ RCT, 1x cohort study, 1x case series and 3 x case studies
Knee	There is limited very weak evidence that chiropractic	Ρ	Knee osteoarthritis	
osteoarthritis	management is no more effective than home rehabilitation	I	Chiropractic management	Limited very weak
	program on self-reported pain, stiffness, and physical	С	Home rehabilitation	Based on 1x HO RCT
	functioning and ROM in the short term for patients with	0	Pain, stiffness, function and ROM	
	knee osteoarthritis	т	Short term	
		Ρ	Knee osteoarthritis	
	There is no evidence of effectiveness of chiropractic care	- I	Chiropractic management	
	versus usual care or no care for pain and function in patients with knee osteoarthritis	С	Usual care or no care	No evidence
		ο	-	
		т	-	
	There is limited very weak evidence of effectiveness of chiropractic management for knee cruciate ligament	Ρ	Knee cruciate ligament ruptures	Limited very weak
		I	Chiropractic management	
		С	-	Based on 1 x case study
		0	Function	
Knoo crucioto		т	Short term	
ligament		Ρ	Knee cruciate ligament ruptures postoperatively	
ruptures	chiropractic management for knee cruciate ligament	Т	Chiropractic management	Limited very weak
	ruptures postoperatively	С	-	Based on 1 x case study
		0	Pain and Function	
		т	Short to medium term	
		Ρ	Knee cruciate ligament ruptures including postoperatively	No evidence



	There is no evidence of effectiveness of chironractic care	Т	Chiropractic management	
	versus usual care or no care for knee cruciate ligament	С	Usual care or no care	
	ruptures, including postoperatively	ο	-	
		т	-	
		Р	Retinacular release, post-op rehab	
	There is limited very weak evidence of effectiveness of	I.	Chiropractic management	Limited very weak
	chiropractic management in postoperative rehabilitation of	С	-	Based on 1 x case study
Post-operative	knee lateral retinacular release	0	Pain and function	
knee lateral		т	Short to medium term	
retinacular		Ρ	Retinacular release, post-op rehab	
release	There is no evidence of effectiveness for chiropractic care versus usual care or no care in postoperative rehabilitation of knee lateral retinacular release	I	Chiropractic management	
		С	Usual care or no care	No evidence
		ο	-	
		т	-	
		Ρ	Recurrent ankle sprain	
	There is limited weak evidence of effectiveness of	I	Chiropractic management	Limited weak
	chiropractic management for reducing pain in patients with recurrent ankle sprain	С	-	Based on 1 x HQ and 1x AQ
		ο	Pain	RCT study
Recurrent ankle		т	Short term	
sprain		Ρ	Recurrent ankle sprain	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	Limited weak
	versus usual rehabilitation in reducing disability in patients	С	Usual rehabilitation	Based on 1 x HO RCT
	with recurrent ankle sprain over the short term	0	Disability	
		т	Short term	
		Ρ	Hallux abducto valgus	



	There is limited weak evidence of effectiveness of	I.	Chiropractic management	Limited weak	
	chiropractic management for reducing pain in patients with	С	-	Based on 1 x HO BCT and 1	
	symptomatic hallux abducto valgus	0	Pain	x case series	
Hallux abducto		т	Short term		
valgus	There is limited you work avidence that chiranzastic	Ρ	Hallux abducto valgus		
(bunions)	management is no more effective than usual care splinting	Т	Chiropractic management	Limited very weak	
	in reducing pain in patients with symptomatic hallux	С	Usual care splinting	Based on 1 x HQ RCT and 1	
	abducto valgus	0	Pain	x case series	
		т	Short to medium term		
		Ρ	Plantar fasciitis		
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with plantar fasciitis	Т	Chiropractic management	Limited weak Based on 1 x case study	
		С	-		
		0	Pain and disability	based on 1 x case study	
Plantar fascilitis		т	Short term		
		Ρ	Plantar fasciitis		
	There is no evidence of effectiveness of chiropractic care	Т	Chiropractic management		
	versus usual rehabilitation for reducing pain and disability in	С	Usual rehabilitation	No evidence	
	patients with plantar fasciltis	0	Pain and disability		
		т	-		
		Ρ	Tarsal tunnel syndrome		
		Т	Chiropractic management	Limited week	
Tarsal tunnel	chiropractic management for reducing pain and disability in	С	-	Based on 1 x case study	
syndrome	patients with tarsal tunnel syndrome	0	Pain and disability	based off I A case study	
		т	Short term		
		Ρ	Tarsal tunnel syndrome		



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	There is no evidence of effectiveness of chironractic care	I.	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in	С	Usual rehabilitation	No ovidonco
	patients with tarsal tunnel syndrome	0	Pain and disability	NO EVIDENCE
		т	-	
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with Achilles tendinopathy	Р	Achilles tendinopathy	
		I.	Chiropractic management	Limited weak Based on 1 x case study
		С	-	
		0	Pain and disability	
Achilles		т	Short term	
tendinopathy	There is no evidence of effectiveness of chiropractic care	Ρ	Achilles tendinopathy	
		I.	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in	С	Usual rehabilitation	No evidence
	patients with Achilles tendinopathy	0	Pain and disability	
		т	-	

UPPER LIMB

	Evidence statement		PICOT framework	Level of evidence
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with shoulder pain	Ρ	Shoulder pain	Limited weak
General shoulder pain		I	Chiropractic management	Based on 1 x LQ (including 22 case reports, 4 case series and 1 RCT) and 1 x HQ (including 1x RCT) SR
		С	-	
		0	Pain and disability	
		т	Not reported	
		Ρ	Shoulder pain	Limited very weak
		1	Chiropractic management	,



	There is limited very weak evidence that chiropractic	С	Sham ultrasound	Based on 1x HQ (including
	management is more effective than sham ultrasound for	0	Pain and disability	1x RCT) SR
	reducing pain and disability in patients with shoulder pain	т	Not reported	
		Ρ	Shoulder pain	Based on 1 x LQ (including 22 case reports, 4 case
	There is no evidence of effectiveness of chiropractic care	Т	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in	С	Usual rehabilitation	series and 1 RCT) and 1 x
	patients with shoulder pain	0	Pain and disability	HQ (including 1x RCT) SR
		т	Not reported	
		Ρ	Adhesive capsulitis	Limited weak
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with shoulder adhesive capsulitis	Т	Chiropractic management	Based on 1x LQ (including 1x RCT) SR and 1x case series and 1x case study
		С	-	
		0	Pain and disability	
		т	Not reported	
	There is limited very weak evidence that a fascial distortion model of care is more effective than standard chiropractic management for reducing pain and disability in patients with shoulder adhesive capsulitis	Ρ	Adhesive capsulitis	Limited very weak Based on 1x LQ (including 1x RCT) SR
		Т	Fascial distortion model of care	
Adhesive		С	Chiropractic management	
capsulitis		0	Pain and disability	
		т	Short to medium term	
		Ρ	Adhesive capsulitis	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	Based on 1x LQ (including 1x RCT) SR and 1x case series and 1x case study
	versus usual rehabilitation for reducing pain and disability in	С	Usual rehabilitation	
		0	Pain and disability	
		т	-	
		Р	Shoulder myofascial pain	



	There is limited weak evidence of effectiveness of chiropractic management involving ischemic compressions		Chiropractic management (ischemic compressions on shoulder muscle trigger points)		
	on shoulder muscle trigger points, compared to cervical and upper thoracic trigger point treatment, for reducing pain and	с	Cervical and upper thoracic trigger point treatment	Limited weak	
Shoulder	disability in patients with shoulder myofascial pain	0	Pain and disability	Based on 1 X HQ RCI	
myofascial pain		т	Short to medium term		
		Ρ	Shoulder myofascial pain		
	There is no evidence of effectiveness of chiropractic	I	Chiropractic management		
	management versus usual rehabilitation for reducing pain	С	Usual rehabilitation	No evidence	
	and disability in patients with shoulder myorascial pain.	0	Pain and disability		
		т	-		
		Ρ	SLAP lesions		
	There is limited weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with SLAP lesions	I	Chiropractic management	Limited weak	
		С	-	Based on 1 x case study	
Superior labrum		ο	Pain and disability		
anterior and		т	Short term		
posterior (SLAP)		Р	SLAP lesions		
lesions	There is no evidence of effectiveness of chiropractic	I	Chiropractic management		
	management versus usual rehabilitation for reducing pain	С	Usual rehabilitation	No evidence	
	and disability in patients with SLAP resions	0	Pain and disability		
		т	-		
Lateral elbow	There is limited weak evidence of effectiveness of	Ρ	Lateral elbow epicondylopathy		
epicondyl-	chiropractic management for reducing pain and disability in	Т	Chiropractic management		
opathy	patients with lateral elbow epicondylopathy	С	-	Based on 3 x case study	
		0	Pain and disability		



		т	Short term	
		Ρ	Lateral elbow epicondylopathy	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in	С	Usual rehabilitation	No evidence
	patients with lateral elbow epicondylopathy	ο	Pain and disability	
		т	-	
		Ρ	Medial elbow epicondylopathy	
	There is limited weak evidence of effectiveness of	Т	Chiropractic management	Limited weak
	chiropractic management for reducing pain and disability in	С	-	Based on 1 x case study
Medial elbow	patients with medial elbow epicondylopathy	0	Pain and disability	
epicondyl-		т	Short term	
opathy	There is no evidence of effectiveness of chiropractic care versus usual rehabilitation for reducing pain and disability in patients with medial elbow epicondylopathy	Ρ	Medial elbow epicondylopathy	
		I	Chiropractic management	
		С	Usual rehabilitation	No evidence
		Ο	Pain and disability	
		т	-	
		Ρ	Radial nerve entrapment	
	There is limited very weak evidence of effectiveness of	Т	Chiropractic management	Limited very weak
	chiropractic management for reducing pain and disability in	С	-	Based on 1 x case study
Radial nerve entrapment	patients with radial herve entrapment	Ο	Pain and disability	
		т	Short term	
	There is no evidence of effectiveness of chiropractic care	Ρ	Radial nerve entrapment	
	versus usual rehabilitation for reducing pain and disability in	I	Chiropractic management	No evidence
	patients with radial nerve entrapment	С	Usual rehabilitation	
		0	Pain and disability	



		т	-	
	There is limited very weak evidence that chiropractic	Р	Carpal tunnel syndrome	
		Т	Chiropractic management	Limited very weak
	management is effective for reducing pain and disability in	С	-	Based on 1x HQ (including
	patients with carpai tunnel syndrome	0	Pain and disability	1x RCT) SR
		т	Short to medium term	
	There is limited you weak evidence that chiropractic	Ρ	Carpal tunnel syndrome	
Carpal tunnel	management is no more effective than usual care for	I.	Chiropractic management	Limited very weak
syndrome	reducing pain and disability in patients with carpal tunnel	С	Usual care	Based on 1x HQ (including
	syndrome	0	Pain and disability	1x RCT) SR
		т	Short to medium term	
	There is limited very weak evidence of effectiveness of chiropractic management for reducing pain and disability in patients with de Quervain's stenosing tenosynovitis	Р	De Quervain's stenosing tenosynovitis	
		I	Chiropractic management	Limited very weak
		С	-	Based on 1 x case study
De Quervain's		0	Pain and disability	
stenosing		т	Short term	
tenosynovitis		Р	De Quervain's stenosing tenosynovitis	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in patients with de Quervain's stenosing tenosynovitis	С	Usual rehabilitation	No evidence
		Ο	Pain and disability	
		т	-	
Ulnar nerve	There is limited very weak evidence of effectiveness of	Ρ	Ulnar nerve compression	Line it and the second second
	chiropractic management for reducing pain and disability in	I	Chiropractic management	Limited very weak
compression	patients with ulnar nerve entrapment	С	-	Based on 1 x case study
		0	Pain and disability	



		т	Short term	
		Ρ	Ulnar nerve compression	
	There is no evidence of effectiveness of chiropractic care	I	Chiropractic management	
	versus usual rehabilitation for reducing pain and disability in patients with ulnar nerve entrapment	С	Usual rehabilitation	No evidence
		0	Pain and disability	
		т	-	

GENERAL MUSCULOSKELETAL & TEMPOROMANDIBULAR JOINT (TMJ) CONDITIONS					
	Evidence statement	PICOT framework		Level of evidence	
		Ρ	Sports-related musculoskeletal conditions		
	There is inconsistent weak evidence that chiropractic	I	Chiropractic management	Inconsistent weak	
	management reduces pain and improves function in sports- related musculoskeletal conditions There is consistent weak evidence that chiropractic management results in a better outcome than usual medical care for general musculoskeletal conditions	С	-	Based on 1x AQ (including	
General		0	Pain and function	3x RCTs and 2x CCTs) SR	
musculoskeletai		т	Short to medium term		
conditions		Ρ	General musculoskeletal conditions		
		Т	Chiropractic management	Consistent weak	
		С	Usual medical care	Based on 3x observational	
		0	General	studies	
		т	Short to medium term		
	There is inconsistent weak evidence that chiropractic	Ρ	Older patients with musculoskeletal conditions	Inconsistent weak	
Older adults	management reduces pain and improves function in older	I	Chiropractic management	Based on 1x AQ (including	
	patients with musculoskeletal conditions	С	-	study) SR	
		ο	Pain and function		



		т	Short to medium term	
		Ρ	General	
Chiropractic techniques	There is inconsistent weak evidence that chiropractic management using instrument-assisted soft tissue	I	Chiropractic management using instrument- assisted soft tissue mobilisation	Based on 2x AQ (including
(instrument	mobilisation is as effective as non-instrument-assisted soft	С	Non- instrument-assisted soft tissue mobilisation	3x RCTs, 1x clinical trial and 2x cohort studies/3 RCTs
		0	Pain	and 1 CCT respectively) SRs
		т	Short to medium term	
		Ρ	General	
	There is inconsistent weak evidence that maintenance care	I.	Maintenance care	Inconsistent weak
Maintenance	following chiropractic management is cost- or clinically effective in preventing pain and disability	С	-	Based on 1x AO (including
care		0	Cost- or clinical effectiveness in preventing pain and disability	4x RCTs) SR
		т	Short to medium term	
		Ρ	TMJ pain	Limited weak
	There is limited weak evidence that chiropractic management results in improved pain and function in patients with TMJ pain	Т	Chiropractic management	Based on 1x AQ (including 1x RCT and 3x case series) SR and 1x AQ RCT
		С	-	
		ο	Pain and function	
TMJ disorders		т	Short to medium term	
	There is limited weak evidence that chiropractic	Ρ	TMJ pain	Limited weak
	management is no more effective than sham treatment or	I.	Chiropractic management	Paced on 1x AO (including
	exercise in improving pain and function in patients with TMJ	С	Sham treatment or exercise	1x RCT and 3x case series)
	pain	0	Pain and function	SR and 1x AQ RCT
		т	-	
Safety		Р	Older patients	Consistent weak
			Chiropractic treatment	



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There is consistent weak evidence that chiropractic	С	-	Based on 1x AQ (including
management does not result in a higher risk of adverse	0	Adverse events	14x observational studies)
events in older patients with musculoskeletal conditions	т	Short to medium term	SK

Secondary research question 2: Are there any specific patient subgroups for which chiropractic is more, or less, effective?

Musculoskeletal neck & low back conditions in	There is inconsistent weak evidence that the greatest degree of improvement from chiropractic care is seen in patients with acute presentations	Inconsistent weak Based on one observational study (Peterson et al 2012)
general	There is limited very weak evidence that patients treated by conservative evidence-based care improved with lower costs than patients treated with non-standardized clinical approaches	Limited very weak Based on 1 x observational study
Chronic low back pain	There is limited weak evidence that a modified clinical prediction rule for spinal manipulative therapy was not able to predict which patients with chronic low back pain would experience an effect	Limited weak Based on one observational study

Secondary research question 3: Does effectiveness vary according to post-injury or recovery stage, e.g. sub-acute versus chronic?

Musculoskeletal conditions in general	There is inconsistent weak evidence that the greatest degree of improvement from chiropractic care is seen in patients with acute presentations	Inconsistent weak Based on one observational study (Peterson et al 2012)
Neck & low back conditions in general	There is inconsistent weak evidence that the greatest degree of improvement from chiropractic care is seen in patients with acute presentations	Based on the lack of evidence undertaken on chronic/sub- acute presentations



Secondary resear individual treatm	ch question 4: What evidence is there regarding the recommended length of treatment, ent sessions?	number of treatments and duration of
	 Most studies demonstrating effectiveness of chiropractic spinal manipulation compared to other modalities for NSNP used dosages of: 4-6 treatments over 1-2 weeks* 	*Miranda et al 2015, Gemmel and Miller 2010, Skargren et al 1998
Non-specific neck pain (NSNP)	or • 8-12 treatments over 3-4 weeks** There is no evidence on optimal duration of individual treatment sessions	 **Aki et al 2020, Leaver et al 2007, Vavrek, Haas & Peterson 2010, Haas et al 2004, Martel et al 2011
Cervicogenic headache	Most studies demonstrating effectiveness of chiropractic spinal manipulation compared to other modalities for cervicogenic headaches used dosages of 8-16 treatments over 6-8 weeks There is no evidence on optimal duration of individual treatment sessions	Haas et al 2010, Chaibi et al 2017, Haas et al 2018
Spinal pain in general	 There is limited weak evidence that most patients with neck or low back pain reach maximum therapeutic improvement at 3 months, but only a minority experience either: a rapid complete recovery or develop chronic severe pain Most report a trajectory of symptoms characterized by persistent or fluctuating pain of low or medium intensity The greatest improvement is seen in patients with worse baseline pain and function, who may have had more room for improvement 	Based on 2 observational studies



Non-specific low back pain	There is limited weak evidence that 12 visits yielded the most favourable results, but this was not well distinguished from other dose levels	Based on 1x RCT (Haas et al 2010)
	There is limited weak evidence that the proportion of patients reporting overall improvement from chiropractic intervention was no greater after 1 month compared to 6 months There is no evidence on optimal duration of individual treatment sessions	Based on 1x observational study (Wirth et al 2019)
Musculoskeletal conditions in general	There is no evidence for the recommended length of treatment, number of treatments and duration of each individual treatment session	

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6. Appendices

Appendix 1: Search Strategy, MEDLINE

#	Searches
1	Musculoskeletal Manipulations/
2	Chiropractic/
3	Manipulation, Chiropractic/
4	Manipulation, Spinal/
5	Manipulation, Orthopedic/
6	(chiropract* or ((manipulat* or adjust*) adj2 (cervical or spinal or spine or lumbar or orthopaedic* or orthopedic))).ti,ab,kf.
7	(hvla or high velocity low amplitude or high velocity thrust or high velocity technique).ti,ab,kf.
8	((dorsalgia or back ache or backache or back pain or backpain or lumbago or sciatica or coccyx or coccydynia or
	spondylosis or neck pain or neckpain) adj5 manipulat*).ti,ab,kf.
9	or/1-8
10	limit 9 to yr="2010 -Current"
11	comment/
12	editorial/
13	11 or 12
14	10 not 13



Appendix 2: SIGN Checklists

SIGN Critical Appraisal Tool for systematic reviews and meta-analyses





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1.9	Was the scientific quality of the included studies used appropriately?	Yes 🗆	No 🗆
1.10	Appropriate methods are used to combine the	Yes 🗆	No 🗆
	individual study findings.	Can't say □	Not applicable
1.11	The likelihood of publication bias was assessed	Yes 🗆	No 🗆
	appropriately.	Not applicable 🗆	
1.12	Conflicts of interest are declared.	Yes 🗆	No 🗆
SECTI	ON 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	What is your overall assessment of the methodological	High quality (++)	2
2.1	What is your overall assessment of the methodological quality of this review?	High quality (++)	2
2.1	What is your overall assessment of the methodological quality of this review?	High quality (++) □ Acceptable (+) □ Low quality (-)□	
2.1	What is your overall assessment of the methodological quality of this review?	High quality (++) Acceptable (+) Low quality (-) Unacceptable – re	⊐ eject 0 □
2.1	What is your overall assessment of the methodological quality of this review? Are the results of this study directly applicable to the patient group targeted by this guideline?	High quality (++) Acceptable (+) Low quality (-) Unacceptable – re Yes	⊐ eject 0 □ No □

SIGN Critical Appraisal Tool for controlled trials

SIG	Methodology Checklist 2: Controlled Trials											
Study	Study identification (Include author, title, year of publication, journal title, pages)											
Guidel	line to	ppic:	Key Question No:	Reviewer:								
Before	Before completing this checklist, consider:											
1.	 Is the paper a randomised controlled trial or a controlled clinical trial? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a controlled clinical trial questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+. Is the paper relevant to key question? Analyze using PICO (Patient or Papulation Intervention) 											
2.	Cor	nparison Outcome). IF NO REJECT (give reason below). If	F YES complete the ch	necklist.								
Reaso	on for	rejection: 1. Paper not relevant to key question \Box 2. Othe	r reason 🗆 (please sp	pecify):								
SECTI	ION 1	: INTERNAL VALIDITY										
In a w	ell co	onducted RCT study	Does this study	do it?								
1.1	The	e study addresses an appropriate and clearly focused	Yes 🗆 🛛 N	lo 🗆								
	que	5001.	Can't say 🗆									
1.2	The	assignment of subjects to treatment groups is randomised	I. Yes 🗆 🛛 🛛	lo 🗆								



			Can't say 🛛				
1.3	An adequate concealment method is used.		Yes 🗆	No 🗆			
			Can't say 🗆				
1.4	The design keeps subjects and investigators 'blind' abo	ut	Yes 🗆	No 🗆			
	treatment allocation.		Can't say ⊟				
1.5	The treatment and control groups are similar at the star	t of the	Yes 🗆	No 🗆			
	triai.		Can't say □				
1.6	The only difference between groups is the treatment un	der	Yes 🗆	No 🗆			
	investigation.		Can't say ⊟				
1.7	All relevant outcomes are measured in a standard, valid	d and	Yes 🗆 No 🗆				
	reliable way.		Can't say □				
1.8	What percentage of the individuals or clusters recruited each treatment arm of the study dropped out before the was completed?	into study					
1.9	All the subjects are analysed in the groups to which the	Yes 🗆	No 🗆				
	randomly allocated (often referred to as intention to trea analysis).	at	Can't say ⊟	Does not apply \Box			
1.10	Where the study is carried out at more than one site, re	sults are	Yes 🗆	No 🗆			
	comparable for all sites.		Can't say 🗆	Does not apply \Box			
SECTI	ON 2: OVERALL ASSESSMENT OF THE STUDY						
2.1	How well was the study done to minimise bias?	High qua	ılity (++)□				
	Code as follows:	Acceptat	ole (+)□				
		Low qua	lity (-)□				
		Unaccep	table – reject 0				
2.2	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?						
2.3	Are the results of this study directly applicable to the patient group targeted by this guideline?						
2.4	Notes. Summarise the authors' conclusions. Add any c study, and the extent to which it answers your question above.	omments and menti	on your own ass on any areas of	essment of the uncertainty raised			



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Appendix 3: Critical Appraisal Scores for Systematic Reviews

		Shekelle et al 2017	Kranenb- urg et al 2017	Bryans et al 2011	Carlesso et al 2010	Church et al 2016	Moore et al 2017	Podsadzi et al 2012	Haynes et al 2012	Miller et al 2010	Posadzki et al 2011
1.1	The research question is clearly defined and the inclusion/exclusion criteria must be listed in the paper. Does this study do it?	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
1.2	A comprehensive literature search is carried out	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
1.3	At least two people should have selected studies	Y	Y	N	Y	Y	Y	N	N	Y	Ν
1.4	At least two people should have extracted the data	Y	Y	N	Y	N	N	Y	N	N	Y
1.5	The status of publication was not used as an inclusion criterion	N	N	N	Y	N	N	N	N	N	Ν
1.6	The excluded studies are listed	N	N	Y	N	N	N	N	N	N	Ν
1.7	The relevant characteristics of the included studies are provided	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The scientific quality of the included studies was assessed and reported	Y	N	Y	Y	-	Y	Y	Y	Y	Y
1.9	Was the scientific quality of the included studies used appropriately?	Y	N	Y	N	N	N	N	Y	Y	Ν
1.10	Appropriate methods are used to combine the individual study findings	Y	Y	Y	Y	N	CS	CS	N	Y	CS
1.11	The likelihood of publication bias was assessed appropriately	Y	N	N	N	N	N	N	N	N	Ν
1.12	Conflicts of interest are declared	N	Y	Y	N	Y	Y	Y	Y	Y	Ν
2.1	What is your overall assessment of the methodological quality of this review?	HQ (++)	AQ (+)	AQ (+)	HQ (++)	LQ (-)	AQ (+)	AQ (+)	AQ (+)	HQ (++)	LQ (-)



		Shaw et al 2010	Silva et al 2012	Fernandez et al 2020	Fernando et al 2021	Andron- is et al 2017	Blanchette et al 2016	Goertz et al 2012	Hebert et al 2015	Oakley et al 2020	Paige et al 2017
1.1	The research question is clearly defined and the inclusion/exclusion criteria must be listed in the paper. Does this study do it?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.2	A comprehensive literature search is carried out	Y	Ν	Y	Y	Y	Y	Y	Y	Y	Y
1.3	At least two people should have selected studies	Y	Ν	N	N	N	Y	Y	Y	Y	Y
1.4	At least two people should have extracted the data	Ν	Ν	Ν	Ν	Y	Y	Ν	Ζ	Ν	Y
1.5	The status of publication was not used as an inclusion criterion	Ν	Ν	Ν	N	N	Ν	Ν	Ν	Ν	Ν
1.6	The excluded studies are listed	N	N	Ν	N	N	N	Y	Ν	N	Ν
1.7	The relevant characteristics of the included studies are provided	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The scientific quality of the included studies was assessed and reported	Y	Ν	Y	N	Y	Y	Y	Ν	Y	Y
1.9	Was the scientific quality of the included studies used appropriately?	Y	Ν	Y	N	Y	Y	Ν	Ν	Ν	Ν
1.10	Appropriate methods are used to combine the individual study findings	CS	CS	Y	Y	Y	Y	Ν	Y	CS	Y
1.11	The likelihood of publication bias was assessed appropriately	Ν	Ν	Y	N	N	Ν	Ν	Ν	Ν	Ν
1.12	Conflicts of interest are declared	N	N	Y	Y	Y	N	N	Y	Y	Y
2.1	What is your overall assessment of the methodological quality of this review?	AQ (+)	LQ (-)	HQ (++)	LQ (-)	AQ (+)	HQ (++)	AQ (+)	AQ (+)	AQ (+)	HQ (++)



		Parkinson et al 2013	Ernst 2012	Scholten- Peeters et al 2013	Dagenais et al 2015	Rubenstein et al 2018	Ruddock et al 2016	Shekelle et al 2017	Walker et al 2010	Yeganeh et al 2017
1.1	The research question is clearly defined and the inclusion/exclusion criteria must be listed in the paper. Does this study do it?	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.2	A comprehensive literature search is carried out	Y	N	Y	Y	Y	Y	Y	Y	Y
1.3	At least two people should have selected studies	Y	N	Y	Y	Y	Y	Y	Y	Y
1.4	At least two people should have extracted the data	Y	N	Y	Y	Y	Y	Y	Y	Y
1.5	The status of publication was not used as an inclusion criterion	N	N	N	N	Y	N	N	N	N
1.6	The excluded studies are listed	N	N	N	N	N	N	N	Y	N
1.7	The relevant characteristics of the included studies are provided	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The scientific quality of the included studies was assessed and reported	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.9	Was the scientific quality of the included studies used appropriately?	N	Y	Y	N	Y	N	Y	Y	N
1.10	Appropriate methods are used to combine the individual study findings	N	Y	Y	Y	Y	Y	Y	Y	Y
1.11	The likelihood of publication bias was assessed appropriately	N	N	N	N	N	N	Y	Y	N
1.12	Conflicts of interest are declared	N	Y	Y	Y	Y	Y	N	Y	N
2.1	What is your overall assessment of the methodological quality of this review?	AQ (+)	AQ (+)	HQ(++)	HQ (++)	HQ (++)	HQ (++)	HQ (++)	HQ (++)	AQ (+)



		Puentedura et al 2015	Heneghan et al 2020	Espí-López et al 2017	Brantingham et al 2013	Minkalis et al 2017	Pribicevic et al 2010	de Almeida et al 2016	Huisstede et al 2010
1.1	The research question is clearly defined and the inclusion/exclusion criteria must be listed in the paper. Does this study do it?	Y	Y	Y	Y	Y	N	Y	Y
1.2	A comprehensive literature search is carried out	Y	Y	Y	Y	Y	Y	N	Y
1.3	At least two people should have selected studies	Y	Y	Y	Y	Y	N	N	Y
1.4	At least two people should have extracted the data	N	Y	Y	N	Y	N	N	Y
1.5	The status of publication was not used as an inclusion criterion	N	Y	N	N	N	N	N	N
1.6	The excluded studies are listed	N	N	N	N	Y	N	N	N
1.7	The relevant characteristics of the included studies are provided	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The scientific quality of the included studies was assessed and reported	N	Y	Y	Y	Y	X	N	Y
1.9	Was the scientific quality of the included studies used appropriately?	N	Y	Y	N	N	N	N	Y
1.10	Appropriate methods are used to combine the individual study findings	Y	Y	Y	Y	Y	Y	Y	Y
1.11	The likelihood of publication bias was assessed appropriately	N	N	N	N	N	N	N	N
1.12	Conflicts of interest are declared	Y	Y	Y	Y	Y	Y	Y	Y
2.1	What is your overall assessment of the methodological quality of this review?	AQ (+)	HQ (++)	AQ (+)	AQ (+)	HQ (++)	LQ (-)	LQ (-)	HQ (++)



		Ernst and Posadzki 2012	Hawk et al 2017	Huggins et al 2012	Karmali et al 2019	lben et al 2019	Carnes et al 2010	Ernst 2010	Gorrell et al 2016
1.1	The research question is clearly defined and the inclusion/exclusion criteria must be listed in the paper. Does this study do it?	Y	Y	Y	Y	Y	N	Y	Y
1.2	A comprehensive literature search is carried out	Y	Y	Y	Y	N	Y	Y	N
1.3	At least two people should have selected studies	Y	Y	Y	Y	Y	Y	N	Y
1.4	At least two people should have extracted the data	Y	Ν	Y	Y	Y	N	N	Ν
1.5	The status of publication was not used as an inclusion criterion	Ν	Ν	N	N	N	N	N	Ν
1.6	The excluded studies are listed	N	Ν	N	N	N	N	N	N
1.7	The relevant characteristics of the included studies are provided	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The scientific quality of the included studies was assessed and reported	Y	Y	Y	Y	N	Y	N	Y
1.9	Was the scientific quality of the included studies used appropriately?	N	Ν	N	N	N	N	N	Ν
1.10	Appropriate methods are used to combine the individual study findings	Y	Y	Y	Y	Y	Y	Y	Y
1.11	The likelihood of publication bias was assessed appropriately	N	Ν	N	N	N	N	N	N
1.12	Conflicts of interest are declared	Y	Y	N	N	Y	Y	Y	Y
2.1	What is your overall assessment of the methodological quality of this review?	AQ (+)	AQ (+)	AQ (+)	AQ (+)	AQ (+)	AQ (+)	LQ (-)	AQ (+)



		Puentedura and O'Grady 2015	Heneghan et al 2020
1.1	The research question is clearly defined and the inclusion/exclusion criteria must be listed in the paper. Does this study do it?	Y	Y
1.2	A comprehensive literature search is carried out	Y	Y
1.3	At least two people should have selected studies	Y	Y
1.4	At least two people should have extracted the data	N	Y
1.5	The status of publication was not used as an inclusion criterion	N	Ν
1.6	The excluded studies are listed	N	N
1.7	The relevant characteristics of the included studies are provided	Y	Y
1.8	The scientific quality of the included studies was assessed and reported	N	Ν
1.9	Was the scientific quality of the included studies used appropriately?	N	Ν
1.10	Appropriate methods are used to combine the individual study findings	Y	Y
1.11	The likelihood of publication bias was assessed appropriately	N	N
1.12	Conflicts of interest are declared	Y	Y
2.1	What is your overall assessment of the methodological quality of this review?	AQ (+)	AQ (+)



Appendix 4: Critical Appraisal Scores for Controlled Trials

		Aki et al 2020	Chaibi et al 2019	Fan et al 2018	Gemmell and Miller 2010	Gorrell et al 2016	Haas et al 2010	Leaver et al 2010	Martel et al 2011
1.1	The study addresses an appropriate and clearly focused question	Y	Y	Ν	Y	Y	Y	Ν	Y
1.2	The assignment of subjects to treatment groups is randomised	Y	N	Y	Y	Y	Y	Y	Y
1.3	An adequate concealment method is used	Y	N	Y	Y	Y	Y	Y	Y
1.4	The design keeps subjects and investigators 'blind' about treatment allocation	N	Y	Ν	Ν	Ν	N	Y	Y
1.5	The treatment and control groups are similar at the start of the trial	Y	Ν	Y	Ν	Y	N	Ν	Ν
1.6	The only difference between groups is the treatment under investigation	Y	Y	Ν	Y	Y	Ν	Ν	Y
1.7	All relevant outcomes are measured in a standard, valid and reliable way	N	Y	Ν	Y	Y	Y	Ν	Y
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	20%	37%	??	13%	11%	10%	3%	1%
1.9	All the subjects are analysed in the groups to which they were randomly allocated (intention to treat analysis)	N	Ν	Ν	Y	Ν	Y	Y	Y
1.10	Where the study is carried out at more than one site, results are comparable for all sites	NR	NR	NR	NR	NR	NR	NR	NR
2.1	Are the results of this study directly applicable to the patient group targeted by this guideline?	Y	Y	Y	Y	Y	Y	Y	Y
2.2	What is your overall assessment of the methodological quality?	AQ (+)	AQ (+)	LQ (-)	AQ (+)	AQ (+)	AQ (+)	AQ (+)	HQ (++)

		Miranda et al 2015	Saayman et al 2011	Vernon et al 2015	Wei et al 2015	Bishop et al 2010	Cambron et al 2014	Dougherty et al 2014	Eklund et al 2018
1.1	The study addresses an appropriate and clearly focused question	Y	Y	Y	Y	Y	Y	Y	Y
1.2	The assignment of subjects to treatment groups is randomised	Ν	Y	Y	Y	Y	Y	Y	Y
1.3	An adequate concealment method is used	N	Y	Y	Y	Y	Y	Y	Y
1.4	The design keeps subjects and investigators 'blind' about treatment allocation	Ν	Ν	Y	Ν	Y	Υ	Y	Y
1.5	The treatment and control groups are similar at the start of the trial	Y	Y	Ν	Ν	Y	Ν	Y	Y
1.6	The only difference between groups is the treatment under investigation	Y	Y	Y	Y	Y	Y	Y	Y
1.7	All relevant outcomes are measured in a standard, valid and reliable way	Ν	Y	Y	Ν	Y	Y	Y	Y
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	NR	7%	13%	NR	20 %	8%	20%	2%
1.9	All the subjects are analysed in the groups to which they were randomly allocated (intention to treat analysis)	Ν	Y	Y	Ν	Y	Ν	Y	Y
1.10	Where the study is carried out at more than one site, results are comparable for all sites	NR	NR	NR	NR	NR	NR	NR	NR
2.3	Are the results of this study directly applicable to the patient group targeted by this guideline?	Y	Y	Y	Y	Y	Y	Y	Y
2.4	What is your overall assessment of the methodological quality?	LQ (-)	HQ (++)	HQ (++)	AQ (+)	HQ (++)	AQ (+)	HQ (++)	HQ (++)



		Goertz et al 2013	Goertz et al 2018	Haas et al 2014	Kongsted et al 2021	Nim et al 2020	Nim et al 2021	Schulz et al 2019	Vavrek et al 2014	Xia et al 2016
1.1	The study addresses an appropriate and clearly focused question	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.2	The assignment of subjects to treatment groups is randomised	Y	Y	N	N	Y	Y	Y	N	Y
1.3	An adequate concealment method is used	Y	Y	N	N	Y	Y	Y	N	Y
1.4	The design keeps subjects and investigators 'blind' about treatment allocation	Y	Y	Y	N	Y	Y	Y	Y	Y
1.5	The treatment and control groups are similar at the start of the trial	N	N	N	N	N	N	N	N	N
1.6	The only difference between groups is the treatment under investigation	N	N	Y	N	Y	Y	Y	Y	Y
1.7	All relevant outcomes are measured in a standard, valid and reliable way	Y	Y	Y	N	Y	Y	Y	Y	Y
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	20%	17%	15%	36%	7%	7%	2%	36%	11%
1.9	All the subjects are analysed in the groups to which they were randomly allocated (intention to treat analysis)	Y	Y	Y	Y	N	Ν	Y	Y	Y
1.10	Where the study is carried out at more than one site, results are comparable for all sites	NR	NR	NR	NR	NR	NR	NR	NR	NR
2.3	Are the results of this study directly applicable to the patient group targeted by this guideline?	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.4	What is your overall assessment of the methodological quality ?	AQ (+)	AQ (+)	AQ (+)	LQ (-)	AQ (+)	AQ (+)	HQ (++)	AQ (+)	HQ (++)



		Walker et al 2013	Branco and Moodley 2016	Crothers et al 2016	Stochken- dahl et al 2012a	Stochken- dahl et al 2012b	Stochken- dahl et al 2016	Kazemi et al 2021	Branting- ham et al 2012a	Poulsen et al 2013
1.1	The study addresses an appropriate and clearly focused question	N	Y	Y	Y	Y	Y	Y	Y	Y
1.2	The assignment of subjects to treatment groups is randomised	Y	N	Y	Y	Y	Y	Y	Y	Y
1.3	An adequate concealment method is used	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.4	The design keeps subjects and investigators 'blind' about treatment allocation	Y	N	Y	Y	Y	Y	Y	Y	Y
1.5	The treatment and control groups are similar at the start of the trial	N	N	N	N	N	N	N	N	N
1.6	The only difference between groups is the treatment under investigation	N	N	Y	Y	Y	Y	Y	Y	Y
1.7	All relevant outcomes are measured in a standard, valid and reliable way	Y	Y	Y	Y	Y	Y	N	Y	Y
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	9%	0%	39%	14%	22%	NR	0%	9%	14%
1.9	All the subjects are analysed in the groups to which they were randomly allocated (intention to treat analysis)	Y	N	Y	N	N	Ν	Ν	Y	Y
1.10	Where the study is carried out at more than one site, results are comparable for all sites	NR	NR	NR	NR	NR	NR	NR	NR	NR
2.3	Are the results of this study directly applicable to the patient group targeted by this guideline?	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.4	What is your overall assessment of the methodological quality?	AQ (+)	LQ (-)	HQ (++)	AQ (+)	AQ (+)	AQ (+)	AQ (+)	HQ (++)	HQ (++)



		Thorman et al 2010	Hains and Hains 2010	Dwyer et al 2015	Lubbe et al 2015	du Plessis et al 2011	Joseph et al 2010	Hains et al 2010	DeVocht et al 2013	Vining et al 2014
1.1	The study addresses an appropriate and clearly focused question	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.2	The assignment of subjects to treatment groups is randomised	N	N	Y	Y	Y	Ν	Y	Y	Y
1.3	An adequate concealment method is used	N	Y	Y	Y	Y	N	Y	Y	Y
1.4	The design keeps subjects and investigators 'blind' about treatment allocation	N	N	Y	Y	Y	N	Y	N	N
1.5	The treatment and control groups are similar at the start of the trial	N	N	N	N	N	Y	N	N	N
1.6	The only difference between groups is the treatment under investigation	N	Y	Y	Y	Y	Y	Y	Y	N
1.7	All relevant outcomes are measured in a standard, valid and reliable way	Y	N	Y	Y	Y	Y	Y	Y	Y
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	26%	8%	6%	9%	0%	NR	3%	35%	4%
1.9	All the subjects are analysed in the groups to which they were randomly allocated (intention to treat analysis)	N	Y	Y	Y	Y	N	Y	Y	Y
1.10	Where the study is carried out at more than one site, results are comparable for all sites	NR	NR	NR	NR	NR	NR	NR	NR	NR
2.3	Are the results of this study directly applicable to the patient group targeted by this guideline?	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.4	Overall assessment of methodological quality?	LQ (-)	LQ (-)	HQ (++)	HQ (++)	HQ (++)	LQ (-)	HQ (++)	AQ (+)	AQ (+)



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Appendix 5: Critical Appraisal Scores for Observational (Cohort) studies

		Ailliet et al 2017	Elder et al 2018	Hays et al 2019	Herman et al 2020	Herman et al 2021	Gedin et al 2019	Knecht et al 2017	Peterson et al 2012
1.1	The study addresses an appropriate and clearly focused question	Y	Y	Y	Y	Y	Y	Y	Y
1.2	The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation	Y	Y	Y	Y	Y	Y	Y	Y
1.3	The study indicates how many of the people asked to take part did so, in each of the groups being studied	Y	Y	N	N	N	N	N	N
1.4	The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1.5	What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed	N	13%	9%	9%	9%	44%	NR	2%
1.6	Comparison is made between full participants and those lost to follow up, by exposure status	N	N	Y	N	N	N	N	N
1.7	The outcomes are clearly defined	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable	Y	N	N	N	N	N	N	N
1.9	Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome	NA	N	N	N	N	N	N	N
1.10	The method of assessment of exposure is reliable	N	N	Y	Y	Y	Y	Y	Y
1.11	Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable	N	N	Y	N	N	Y	Y	Y
1.12	Exposure level or prognostic factor is assessed more than once	Y	Y	Y	Y	Y	Y	Y	Y
1.13	The main potential confounders are identified and taken into account in the design and analysis	N	N	N	N	N	N	N	N
1.14	Have confidence intervals been provided?	N	Y	N	N	N	N	Y	Y
2.1	How well was the study done to minimise the risk of bias or confounding?	LQ (-)	LQ (-)	AQ (+)	LQ (-)	LQ (-)	LQ (-)	AQ (+)	AQ (+)



		Whedon et al 2018	Whedon et al 2018b	Whedon et al 2020	Leemann et al 2013	Albano et al 2017	Houwelin g et al 2015	Prater et al 2020	Field & Newell 2016
1.1	The study addresses an appropriate and clearly focused question	Y	Y	Y	Y	Y	Y	Y	Y
1.2	The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation	Y	Y	Y	Y	Y	Y	N	N
1.3	The study indicates how many of the people asked to take part did so, in each of the groups being studied	Y	Y	Y	N	N	Y	N	Y
1.4	The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1.5	What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed	NA	NA	NA	22%	NA	NA	17%	NR
1.6	Comparison is made between full participants and those lost to follow up, by exposure status	NA	NA	NA	N	N	N	N	Ν
1.7	The outcomes are clearly defined	Y	Y	Y	Y	Y	Y	Y	Y
1.8	The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable	NA	NA	NA	Ν	NA	NA	Ν	Ν
1.9	Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome	NA	NA	NA	N	N	N	N	N
1.10	The method of assessment of exposure is reliable	Y	Y	Y	Y	Y	N	Y	Y
1.11	Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable	N	N	N	N	N	Y	Ν	Y
1.12	Exposure level or prognostic factor is assessed more than once	N	N	N	Y	Y	Y	Y	Y
1.13	The main potential confounders are identified and taken into account in the design and analysis	N	N	N	N	N	N	N	Y
1.14	Have confidence intervals been provided?	Y	Y	Y	Y	N	Y	Y	Y
2.1	How well was the study done to minimise the risk of bias or confounding?	AQ (+)	AQ (+)	AQ (+)	LQ (-)	LQ (-)	AQ (+)	LQ (-)	HQ (++)



		Rheichardt et al 2022
1.1	The study addresses an appropriate and clearly focused question	Y
1.2	The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation	Y
1.3	The study indicates how many of the people asked to take part did so, in each of the groups being studied	N
1.4	The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis	N/A
1.5	What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed	NA
1.6	Comparison is made between full participants and those lost to follow up, by exposure status	NA
1.7	The outcomes are clearly defined	Y
1.8	The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable	NA
1.9	Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome	NA
1.10	The method of assessment of exposure is reliable	N
1.11	Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable	N
1.12	Exposure level or prognostic factor is assessed more than once	N
1.13	The main potential confounders are identified and taken into account in the design and analysis	N
1.14	Have confidence intervals been provided?	Y
2.1	How well was the study done to minimise the risk of bias or confounding?	LQ (-)



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Appendix 6: Data Extraction Tables SRs

Part 1 : Spinal Conditions

Study	Methodology	Results	Appraisal
Authors Ernst E <u>Title</u> Chiropractic spinal manipulation: what does the 'best' evidence show? <u>Year</u> 2012 <u>Study type</u> Evidence review	Objective To summarise all Cochrane reviews of chiropractic spinal manipulation Number of studies N=5 Type of studies SR in Cochrane database Intervention/dosage Protocols of reviews were excluded, as were studies that did not focus specifically on chiropractic spinal manipulation The reviews assessed the effectiveness of spinal manipulation, any type of manual therapy and any type of treatment administered by chiropractors. Practitioner qualifications and background Chiropractors	Outcome measures Predetermined health outcome Effectiveness - None of the included SRs provided strong evidence that chiropractic spinal manipulation is an effective treatment - For back and neck pain, the conclusions were cautiously positive - For non-spinal conditions, the evidence failed to support the effectiveness of chiropractic - All SRs noted the poor quality of the primary studies. Adverse effects/safety - - Unfortunately, a recent analysis of these data showed that several RCTs failed to report adverse effects and the majority was not described in sufficient detail to allow replication.	SIGN critical appraisal grade: AQ (+)
Authors Scholten-Peeters GM, Thoomes E, Konings S, Beijer M, Verkerk K, Koes BW and Verhagen AP <u>Title</u> Is manipulative therapy more effective than sham manipulation in adults?: a systematic review and meta- analysis <u>Year</u> 2013 <u>Study type</u> SR	Objective to assess the efficacy of manipulative therapy compared to sham in adults with a variety of complaints Number of studies 19 Type of studies RCT Intervention/dosage Articles had to evaluate manipulative therapy compared to sham manipulative therapy in adults Practitioner qualifications and background SM was provided by a chiropractor, physical therapist, osteopath or physician.	Outcome measures - Fourteen studies examined pain, 13 of them used a VAS or NRS. - Six studies examined disability, and one study examined perceived (asthma) recovery. - Secondary outcomes ranged from quality of life, range of motion, headache frequency, to pulmonary function tests. - Eight studies reported on adverse events. - No studies reported on return-to-work. Effectiveness - - There is moderate level of evidence that manipulative therapy has a significant effect in adults on pain relief immediately after treatment (standardized mean difference [SMD] - 0.68, 95% confidence interval (-1.06 to -0.31) - There is low level of evidence that manipulative therapy has a significant effect in adults on pain relief (SMD - 0.37, -0.69 to -0.04) at short- term follow-up. - In patients with musculoskeletal disorders, we found moderate level of evidence for pain relief (SMD - 0.73, -1.21 to -0.25) immediate after treatment and low level of evidence for pain relief (SMD - 0.52, - 0.87 to -0.17) at short term-follow-up. - We found very low level of evidence that manipulative therapy has no statistically significant effect on disability and perceived (asthma) recovery. - Sensitivity analyses did not change the main findings. Adverse effects/safety No serious adverse events were reported in the manipulative therapy or sham group	SIGN critical appraisal grade: HQ (++)



Study	Methodology	Results	Appraisal
Authors	Objective	Outcome measures	SIGN critical
Dagenais S, O'Dane B,	Although chiropractors in the United States (US) have long	Cost effectiveness	appraisal
Haldeman S, and Manga	suggested that their approach to managing spine pain is less costly	Effectiveness	grade:
Р	than other health care providers (HCPs), it is unclear if available	 Overall, cost comparison studies from private health plans and WC plans reported that health care costs 	
<u>Title</u>	evidence supports this premise	were lower with chiropractic care.	HQ (++)
A systematic review	Number of studies	 In studies that also examined clinical outcomes, there were few differences in efficacy between groups, and 	
comparing the costs of	25 eligible studies, including 12 from private health plans, 6 from	health care costs were higher for those receiving chiropractic care.	
chiropractic care to	WC plans, and 7 that examined clinical outcomes	 The effects of adjusting for differences in sociodemographic, clinical, or other factors between study groups 	
other interventions for	Type of studies	were unclear.	
spine pain in the United	Only studies conducted in the US and published in English between	- The methods used in these studies differed widely, initiality their interpretation and generalizability	
States	1993 and 2015 were included.	Auverse enects/safety	
Year	Intervention/dosage	INK	
2015	Chiropractic care was most commonly compared to care from a		
Study type	medical physician, with few details about the care received.		
SR	At least one study group did not receive chiropractic care, or study		
	design otherwise allowed for comparison of chiropractic care to		
	another approach		
	Practitioner qualifications and background		
	care provided by a chiropractor, regardless of the interventions		
Authors	Objective	Outcome measures	SIGN critical
Shekelle et al	Key Question 2: What are the benefits and harms of spinal	Pain management, functional status, quality of life, opiate use, disability claims, return to work, health care utilization.	appraisal
<u>Title</u>	manipulation/chiropractic services for acute neck pain (less than 6	Studies measured pain using: Visual Analogue Scale (VAS). Numerical pain rate scale and Northwick Park Neck Pain	grade:
Effectiveness and Harms	weeks duration) compared to usual care or other forms of acute	Questionnaire.	
of Spinal Manipulative	pain management?	Effectiveness	HQ (++)
Therapy for the	Key Question 2A: What is the relationship between the use of spinal	Only 5 studies were identified of SMT compared to a non-SMT treatment group for patients with acute neck pain.	
Treatment of Acute	manipulation/chiropractic services for acute neck pain and the use	Although each study reported favorable results on at least one outcome, in total only 198 patients have been studied.	
Neck and Lower Back	or oplate medication?	Note of the included studies reported on the use of analgesic medications of optate medication as an outcome.	
Pail. A systematic	All Included studies (Convice) and Lumbar)	Auverse ellectossately Mild transient musiculeskeletal adverse events are common following SMT, although these may be equally common	
Vear	Cervical: 5 RCTs of SMT	Mind transferred models and a diverse events are common concerning simily attributed in these may be equally common following non-SMT manual therapy. Serious adverse events have been the subject of case reports but assessing	
2017	Type of studies	causality has proved challenging.	
Study type	Only randomized controlled trials (RCTs) were eligible for assessing		
Systematic review	benefits. Both RCTs plus observational studies were used for		
	assessing harms.		
	Intervention/dosage		
	Spinal manipulation by any provider type. Studies where spinal		
	manipulation was given alone or as part of a 'package' of therapies		
	were included. 'Chiropractic care' was considered as including SMT		
	for the great majority of patients.		
	Comparator: Other forms of management for acute pain, such as		
	analgesics, exercises, physical therapy, etcetera. Sham-controlled		
	STUDIES WERE INCLUDED.		
	Sivil included both thoracic and cervical spine thrust manipulation.		



Study	Methodology		Results		Appraisal				
Authors	Objective	Outcome measures			SIGN critical				
Silva et al	This study aimed at analyzing, by literature review, the action	Most analyzed studies have	e used the Oswestry's Functional Index adapte	ed to cervical pain, however McGill pain	appraisal				
Title	of chiropractic care to treat cervical pain.	questionnaire and visual a	nalog scales were also used.		grade:				
Effects of chiropractic	Number of studies	Other: SF-36 Questionnaire	e, Modified Von Korff Scale Questionnaire, Bo	urnemouth Questionnaire, Patient's Global					
care in patients with	6	Impression and Change Qu	uestionnaire		LQ (-)				
cervical pain: a	Type of studies	Effectiveness	iveness						
systematic review.	RCT	In most studies, manipulat	st studies, manipulation techniques have promoted pain relief in a faster and more prolonged way and pain was						
Year	Intervention/dosage	evaluated by Oswestry's Fi	unctional Index, by McGill Pain Questionnaire	and by Pain Visual Analog Scale. A larger number of					
2012	*See table	controlled randomized clin	nical trials involving chiropractic care is needed	d, as well as the use of more dependable evaluation					
Study type	Practitioner qualifications and background	methods, to prove its real	effects in the treatment of cervical pain.						
Systematic review	Not specified beyond chiropractic care.	Adverse effects/safety							
		Not specified							
		Studies	tudies Treatments Results						
		Hurwitz et al 2002	urwitz et al 2002 Chiropractic care x Hospital Cervical No difference between cervical manipulation						
			Mobilization	and mobilization groups.					
			N = 366 patients						
		Haas et al 2010	Chiropractic care (8 sessions) x	Manipulation group improvement with no					
			Chiropractic care (16 sessions) x Massage	significant difference between groups from 8 to					
			2 x a week for 8 weeks	16 weeks.					
		Leaver et al 2007	Chiropractic care (manipulation) x	Further clinical improvement for patients					
			Chiropractic care (mobilization)	submitted to spinal manipulation.					
			N: 182 volunteers						
			2 x a week for 2 weeks						
		Vavrek, Haas &	Chiropractic care x Conservative	Decreased cervical spine pain threshold and					
		Peterson 2010	N = 80 veluptoors	functional incapacity.					
			2 x a week for 4 weeks						
		Gemmell & Miller 2010	Chiropractic care (High Speed	Decreased pain threshold without significant					
		Genimen & Willer 2010	Manipulation) x Mobilization x Control	improvement difference between groups in the					
			N = 47 patients	sub-acute and chronic phases.					
			2 x a week for 3 weeks						
		Leaver et al 2010	Chiropractic care x Mobilization	Patients treated with neck manipulation did not					
			N = 182	have faster recovery as compared to those					
			2 x a week for 2 weeks	treated with neck mobilization					
Authors	Objective	Outcome measures			SIGN critical				
Miller et al	Our systematic review update assesses the effectiveness of	Pain, function/disability, qu	uality of life, global perceived effect, and patie	ent satisfaction for short-term (closest to 4 weeks) to	appraisal				
Title	manual therapy and exercise for neck pain with or without	long-term (closest to 12 m	onths) follow-up.		grade:				
Manual therapy and	radicular symptoms or cervicogenic headache on pain,	Effectiveness							
exercise for neck pain: a	function/disability, quality of life, global perceived effect, and	UT 1/ randomized controlle	ed trials included, 29% had a low risk of bias. I	Low quality evidence suggests clinically important	HQ (++)				
systematic review	patient satisfaction.	manual therapy and exerci	n pain (pSMD-0.87(95% CI:=1.69,=0.06)), func ise are compared to no treatment. High qualit	tion/disability, and global perceived effect when y evidence suggests greater short-term pain relief					



Study	Methodology			Results		Appraisal				
Year	Number of studies	[pSMD-0.50(95	% CI:-0.76,-0.24)] than exercise alone, bu	ut no long-term differences across multiple outcon	nes for					
2010	17	(sub)acute/chr	onic neck pain with or without cervicogen	ic headache. Moderate quality evidence supports	this treatment					
Study type	Type of studies	combination for	or pain reduction and improved quality of	life over manual therapy alone for chronic neck pa	in; and suggests					
Systematic review	RCTs	greater short-t	erm pain reduction when compared to tra	aditional care for acute whiplash. Evidence regardi	ng radiculopathy					
	Intervention/dosage	was sparse.	vas sparse.							
	Manual therapy, including manipulation or mobilisation	Adverse effect	s/safety							
	techniques, combined with exercise compared to: a placebo:	Side effects we	de effects were reported in 18% (3/17) of trials. All side effects were benign and transient and included cervical pain,							
	a wait list/no treatment control: an adjunct treatment (for	thoracic pain, h	horacic pain, headache, radicular symptoms, and dizziness. The rate of rare but serious adverse events such as stokes, or							
	example: mobilisation and exercise plus ultrasound versus	serious neurolo	rious neurological deticits could not be established from our review.							
	ultrasound): or another treatment	*Chiropractor	specific studies:		-					
	See table*	Study	Intervention	Comparison/ Control	Dosage					
	Bractitioner qualifications and background	Bronfort et	Spinal manipulation and low-	Spinal manipulation alone (SMT): technique: a.	Duration of					
	2/17 Chiroprostic interventions. Others included	al.(2001);	technology exercises (SMT/Ex):	chiropractic: manipulation, massage,	treatment: 11					
	3/17 Chiropractic interventions. Others included	Evans	technique: a. chiropractic:	described by Frymoyer, b. sham: sham	weeks, 20					
	physiotherapy, or were not specified.	etal.(2002)	manipulation, massage, described by	microcurrent therapy; frequency: 20 one hour	sessions					
			Frymoyer, b. cardiovascular exercises:	sessions over 3 months; dose: manipulation/	Duration of					
			warm-up on stationary bike, c.	massage 15 min, microcurrent 45 min; route:	follow up F2					
			stretching: light stretches as warm-	Repabilitation Exercise (MedV): technique: a	Tottow-up: 52					
			avarcisos d progrossivo resisted	cardiovascular oversises: warm-up on dual	WEEKS					
			exercises, d. progressive resisted	action stationary hike h stretching: light						
			shoulders described by Dyrssen et al:	stretches as warm-up c strengthening of neck						
			push-ups, dumbbell shoulder	and shoulders: using variable resistance						
			exercises: dynamic neck extension.	equipment: MedX equipment resistance for						
			flexion and rotation with variable	neck extension and rotation to fatigue:						
			weight attachment pulley system; e.	frequency = 20 one hour sessions over 11						
			sham: sham microcurrent therapy;	weeks; dose: 20 repetition max						
			frequency: 20 one hour sessions over	Co-intervention: home exercises including						
			11 weeks; dose: manipulation/	resisted rubber tubing for rotation and flexion;						
			massage 15 min, microcurrent 45	no concurrent treatment for neck pain by						
			min; route: cervical spine	other health care providers						
			Results							
			Cumulative advantage (six patient-orier	nted outcomes) - Reported results: favors SMT/Ex	over SMT;					
			Patient satisfaction (1e7, satisfied to dis	ssatisfied) Reported results: A clinically worthwhile	cumulative					
			advantage favoring manipulation/exerc	ise group over exercise & manipulation						
		Palmgren	(pragmatic, tailored to patient)	Advice: advice given on simple regular	Duration of					
		et al	Chiropractic care (chiro): technique:	exercise, done at own volition over 5 weeks	treatment: 5					
		(2006)	education, manipulation, myofascial	Co-intervention: information on anatomy,	weeks, 15 to					
			technique, exercise (spine stabilizing	physiology of spine, ergonomic principles,	25 sessions					
			for cervical region and	instruction on exercise and coping with pain,	Duration of					
			cervicothoracic junction); frequency:	explanation of future outlook	tollow-up:					
			3 to 5 sessions/week; dose: NR;		none					
			route: cervical spine							



Study	Methodology			Results			Appraisal
		Skargren et al (1998); Skargren et al (1997)	Physiotherapy (PT): technique: 1% manipulation, 25% mobilisation, 15% traction, 25% soft tissue treatment, 33% McKenzie treatment, 21% individual training, 15% transcutaneous electrical nerve stimulation/ultrasound/cold, 15% individual program, 6% relaxation training, 4% acupuncture, 1% instruction on individual training; frequency: mean 7.5 sessions over mean 6.4 weeks	Chiropractic (chiro): techniqu manipulation, 11% mobilisati 2% soft tissue treatment, 1% training, frequency: mean 5.6 mean 4.9 weeks; dose: NR; rc spine Co-intervention: 0–6 months chiropractic and physiotherap Chiro 5.2%, PT 6.7%	e: 97% on, 2% traction, individual sessions over ute: cervical of both by treatment:	Duration of treatment: 5– 6 weeks, 6 to 8 sessions Duration of follow-up: 52 weeks	
Authors Shaw et al Title A systematic review of chiropractic management of adults with Whiplash- Associated Disorders: recommendations for advancing evidence- based practice and research. Year	Objective A Participatory Action Research (PAR) approach was used to engage a chiropractic community of practice and stakeholders in a systematic review to address a general question: 'Does chiropractic management of WAD clients have an effect on improving health status?' Number of studies 27 Type of studies Level 4: Case-series, poor quality cohort and case control studies. Level 5: Expert opinion with explicit critical appraisal, and based on one of physiology, bench research, first principles	Outcome measu Primary: Pain an Secondary/Addit mental dullness, tenderness. Effectiveness There is a baselin management of consensus at this Adverse effects/ In the original pa Consequently, ri *Included Chiroo	Ires d cervical range of motion (cROM). cional: coping resources, life satisfaction, cognitive complaint, headache, self-effic ne of evidence that suggests chiropractic WAD. However, the level of this evidence s time. <u>'safety</u> opers of this review, side effects of variou sk profile(s) are not discussed in this revi practic specific studies	, absenteeism, disability, somati cacy, posture kinesthetic sensib c care improves cervical range o se relevant to clinical practice re us treatment modalities were no iew.	c complaints, lassit ility, kinesiophobia, f motion (cROM) ar mains low or draw: ot reported in detai	ude, depression, , strength and nd pain in the s on clinical il by investigators.	SIGN critical appraisal grade: AQ (+)
2010 Study type Systematic review	Intervention/dosage See table* <u>Practitioner qualifications and background</u> Not specified beyond chiropractic care.	Study Fitz-Ritson, 1995	Intervention (n = 15) prescribed standard unsupervised exercises (stretching/ isometric/isokinetic) and chiropractic therapy	Control (n = 15), subjects completed phasic exercises consisting of rapid eye-head-neck-arm movements and chiropractic therapy. Both groups exercised for a minimum of 4 times per week for 8 weeks	Outcomes At 8 weeks: – Disability (Y) At the end of tree groups showed in disability index so unsupervised pha group showing go improvement.	atment, both nproved neck cores, with the asic exercise reater	
Authors Moore et al <u>Title</u> A critical review of manual therapy use for	Objective The aim of this paper is to evaluate research studies on the prevalence of patient use of manual therapies for the treatment of headache and the key factors associated with this patient population.	Outcome measu Prevalence; prof evaluation of MT <u>Effectiveness</u> • While availabl	r <u>res</u> ile and motivations for MT use; concurre ⁻ treatment outcomes. le data was limited and studies had cons	ent use and order of use of head iderable methodological limitat	lache providers; an ions, the use of ma	d self-reported nual therapy	SIGN critical appraisal grade: AQ (+)
headache disorders:	Number of studies	appears to be	the most common non-medical treatme	ent utilized for the management	of common recurr	ent headaches.	



Study	Methodology			Results		Appraisal			
prevalence, profiles,	35	The most common r	reason for choosing thi	s type of treatment was seeking pain relief. While a high percen	ntage of these				
motivations,	Type of studies	patients likely contir	nue with concurrent m	edical care, around half may not be disclosing the use of this tre	eatment to their				
communication and self-	[#] See table	medical doctor.							
reported effectiveness	Intervention/dosage	The prevalence of ch	hiropractic use for thos	e with migraine ranged from 1.0 to 36.2% (mean: 14.4%) within	n the general				
Year	One of the most common physical therapy interventions for	population and from	n 8.9 to 27.1% (mean: 1	18.0%) within headache-clinic patient populations. The prevalen	nce of				
2017	headache management is manual therapy (MT), which we	chiropractic use for	those reported as head	dache ranged from 4 to 28.0% (mean: 12.9%) within the general	l population ;				
Study type	define here as treatments including 'spinal manipulation (as	ranged from 12.0 to	o 22.0% (mean: 18.6%)	within headache/pain clinic patient populations and from 1.9 to	o 45.5% (mean:				
Systematic review	commonly performed by chiropractors, osteopaths, and	9.8%) within chiropr	ractic patient population	ns					
	physical therapists), joint and spinal mobilization, therapeutic	• A limited number of	f reviewed papers (all fi	rom Italy) report on the source of either the referral or recomm	endation to MT				
	massage, and other manipulative and body-based therapies'	for headache treatm	nent . From these studi	es, referral from a GP to a chiropractor ranged from 50.0 to 60.8	8% (mean:				
	Practitioner qualifications and background	55.7%), while referra	ral from friends/relative	es ranged from 33.0 to 43.8% (mean: 38.7%) and self-recommer	ndation ranged				
	*Studies with Manual Therapy population/Chiropractic	from 0 to 16.7% (me	ean: 5.6%). Overall, the	highest proportion of referrals within these studies was from G	GPs to				
	population/profession	chiropractors for chi	ronic tension-type hea	dache (56.2%), cluster headache (50%) and migraine (60.8%).					
		• For chiropractic, pat	tient self-reporting of p	artially effective or fully effective headache relief ranged from 2	27.0 to 82.0%				
		(mean: 45.0%)	nean: 45.0%)						
		• When results are co	When results are combined across all MT professions the reporting of MT as either partially or fully effective ranged from						
		17.0 to 82.0% (mear	17.0 to 82.0% (mean 42.5%). In addition, one general population study provides findings for the self-reported						
		effectiveness for chi	effectiveness for chiropractic and physiotherapy at 25.6 and 25.1% respectively for those with primary chronic headache						
		and 38 and 38% res	and 38 and 38% respectively for those with secondary chronic headache .						
		Adverse effects/safety	dverse effects/safety						
		Not specified							
		Chiropractic studies							
		*Stu	tudy	[#] Study method					
		Ailli	liet et al 2010	Postal questionnaire by chiropractors					
		Bro	own et al 2014	Cross-sectional survey completed by patients					
		Che	erkin et al 2002	Practitioner completed questionnaire					
		Cou	ulter et al 2002	Patient questionnaires					
		Bro	own et al 2013	Cross-sectional general population survey questionnaire					
		Frei	ench et al 2013	Cross-sectional observational practitioner survey					
		Har	rtvigsen et al 2003	Questionnaire data collected by practitioners					
		Jack	kson P 2001	Postal questionnaire to chiropractors					
		Rub	binstein et al 2000	Retrospective patient questionnaires					
<u>Authors</u>	Objective	Outcome measures				SIGN critical			
Posadzki et al	This systematic review is aimed at critically evaluating the	Primary outcome meas	sures were heterogene	ous ranging from numeric rating scale, Modified Von Korff pain	and disability	appraisal			
<u>Title</u>	evidence for or against the notion that SM is effective in	scale, visual analog sca	ale, and diaries (percen	tage of days with headache, total duration of headache, days wi	ith school	grade:			
Spinal manipulations for	treating CGH.	absence due to headac	che, consumption of an	algesics, intensity of headache, headache intensity per episode,	, and number of				
cervicogenic headaches:	Number of studies	headache hours per da	ay).			LQ (-)			
a systematic review of	Studies = 9	Effectiveness							
randomized clinical	Participants = 607	Nine randomized clinic	cal trials (RCTs) met the	inclusion criteria. Their methodological quality was mostly poo	or. Six RCTs				
trials.	Type of studies	suggested that spinal n	manipulation is more ef	ffective than physical therapy, gentle massage, drug therapy, or	no intervention.				
<u>Year</u>	RCT	Three RCTs showed no	o differences in pain, du	ration, and frequency of headaches compared to placebo, man	ipulation,				



Study	Methodology	Results										
2011	Intervention/dosage	physical th	erapy, massage, o	or wait list controls. Adequate co	ontrol for placebo	effect was achieved in 2	1 RCT only, and this trial					
Study type	Frequency and duration of SM sessions varied across RCTs	showed no	benefit of spinal	manipulations beyond a placeb	o effect. The majo	rity of RCTs failed to pro	ovide details of adverse					
Systematic review	from 1 session only to 22 sessions	effects.										
	Most RCTs failed to describe SM technique in sufficient depth.	Three of th	e 6 RCTs that sug	gested SM to be effective were	conducted by chir	opractors. Three RCTs p	performed by non-					
	*See table	chiropracto	ors showed no eff	fect. This could either indicate a	degree of bias on	the side of chiropractor	rs, as noted previously					
	Practitioner qualifications and background	or mean th	or mean that chiropractors are better trained in SM and therefore more effective than other professions administering this									
	3x Chiropractor*, 2x physiotherapy, 1x rehabilitant, 3x	treatment.	reatment.									
	medical doctor.	Adverse ef	fects/safety									
		None of th	None of the Chiropractic RCTs provided adverse information.									
		*Chiroprac	tor specific studi	es								
		Study	Study Participants Intervention Control Primary outcome measure Main result									
		Haas (2004)	Haas (2004) N=24 (1) 1; (2) 3; (3) 4 sessions of HLVA thrusts/week plus up to 2 physical modalities/session (chiropractor) None – 3 parallel groups Pain disability More sessions tended to gener better effects									
		Haas (2010)	N=80	SM (once or twice per week for 8 weeks) (chiropractor)	Gentle massage	Pain and disability	Small dose effects of adjusted mean difference ≤5.6					
		Nilsson (1995)	N=54	SM (dose: 12 toggle recoil and 10 diversified technique) twice weekly for 3 weeks (medical doctor, chiropractor)	physiotherapy	(i) Pain (VAS 100 mm); (ii) analgesic use; (iii) headache intensity per episode; and (iv) number of headache hours per day	Significant between group differences in all measures					
Authors	Objective	Outcome r	neasures	·	•			SIGN critical				
Posadzi et al	The objective of this systematic review was to assess the	The primar	y outcome meas	ures were also heterogeneous ra	anging from heada	che frequency, electror	myography of frontalis	appraisal				
<u>Title</u>	effectiveness of spinal manipulations as treatment option for	muscle and	headache sever	ity, headache intensity, to analg	esic use.			grade:				
Spinal manipulations for	tension type headaches.	Effectivene	ess									
tension-type headaches:	Number of studies	Four RCTs	suggested that sp	inal manipulations are more effo	ective than drug tl	nerapy, spinal manipula	tion plus placebo, sham	AQ (+)				
a systematic review of	5	spinal man	ipulation plus am	itriptyline or sham spinal manip	ulation plus placel	oo, usual care or no inte	ervention. One RCT					
randomized controlled	Type of studies	showed no	difference in dai	ly hours of headache, pain inten	sity, and daily ana	Igesic use compared to	soft tissue therapy plus					
trials	RCTs	placebo las	ser.									
Year	Intervention/dosage	Adverse effects/safety										
2012	The frequency of SM sessions varied across RCTs, from one	*see table										
Study type	intervention lasting 10 min only to twelve, 20 min sessions	*Summary	of included stud	lies								
Systematic review	*see table	Study	Participants	Intervention	Control	Main result	Adverse events					
	Practitioner qualifications and background	Boline	N=150	'() twice weekly for 6 wk. Eac	h Drug thera	by No between	82.1% of the					
	Chiropractor x3 (1x osteo, 1x GP)	(1995)		therapy session typically lasted	20 (amitriptyli	ne) group	amitriptyline					



Study	Methodology	Results								
		(chiro)		min. The spinal manipulation group received spinal manipulation of a type described as short-lever, low-amplitude, high-velocity thrust techniques. [] In preparation for the spinal manipulation, an average of 5–10 min of moist heat and 2 min of light massage were administered to the cervicothoracic musculature'		differences at the end of the treatment period and significant improvements at 4 weeks follow up (<i>p</i> < 0.001)	therapy experienced side effects that included drowsiness, dry mouth, and weight gain and 4.3% of the SM therapy experienced neck stiffness.			
		Bove (1998) (Chiro)	N=75	'All participants received 8 treatments over 4 weeks, all performed by one chiropractor [] and each lasting approximately 15 min. [] Specific manipulation manoeuvres consisted of diversified and/or toggle-recoil techniques, depending on the level of the palpated segmental dysfunction'.	Soft tissue therapy + placebo laser	No between group differences	None			
		Vernon (2009) (Chiro)	N=19	'Chiropractic treatment consisted of brief, minimal preparatory soft tissue massage to the cervical paraspinal tissues followed by high velocity, low amplitude thrusting manipulation to any dysfunctional joints from occiput to third thoracic vertebrae. Treatment was provided at the discretion of the treating chiropractor based on the evaluation on the day of treatment. Chiropractic treatment started after four weeks of amitriptyline and was delivered on a schedule of three times per week for 6 weeks and then once per week for the last 4 weeks of this period'	(i) Sham SM + amitriptyline (ii) Sham SM + placebo (iii) SM + placebo	Statistically and clinically significant improvement of the combined treatments (<i>p</i> = .03).	4 Subjects experience AEs after SM (minor aggravations of neck pain or headaches); 5 after amitriptyline (nausea, tiredness, change in sleep, dry mouth, and constipation).			



Study	Methodology	Results				Appraisal				
Authors	Objective	Outcome measu	res			SIGN critical				
Bryans et al	The purpose of this manuscript is to provide evidence-	Included: Freque	ncy; Intensity; [Duration; Disability; Associated symptoms	; Reduction in OTC; medicine use; Functional	appraisal				
<u>Title</u>	informed practice recommendations for the chiropractic	status; Work stat	us; QoL; Health	status; Psychological dimensions; Coping	; Depression; Headache index; Sleep quality; Stress	grade:				
Evidence-Based	treatment of headache in adults.	etc.								
Guidelines for the	Number of studies	Effectiveness	Effectiveness							
Chiropractic Treatment	21 articles	• For migraine,	• For migraine, spinal manipulation and multimodal multidisciplinary interventions including massage are recommended for							
of Adults With	Type of studies	management	management of patients with episodic or chronic migraine. For tension-type headache, spinal manipulation cannot be							
Headache	Controlled clinical trials	recommended	recommended for the management of episodic tension-type headache. A recommendation cannot be made for or against							
Year	Randomised controlled trials	the use of spir	the use of spinal manipulation for patients with chronic tension-type headache. Low-load craniocervical mobilization may							
2011	Systematic reviews	be beneficial for longer term management of patients with episodic or chronic tension-type headaches. For cervicogenic								
Study type	Intervention/dosage	headache, spir	headache, spinal manipulation is recommended. Joint mobilization or deep neck flexor exercises may improve symptoms.							
Systematic review	See table*	There is no co	There is no consistently additive benefit of combining joint mobilization and deep neck flexor exercises for patients with							
	Practitioner qualifications and background	cervicogenic headache. Adverse events were not addressed in most clinical trials; and if they were, there were none or								
	Chiropractor, Physiotherapist, Medical doctor	they were min	they were minor.							
	for medication	 Evidence sugg 	ests that chirop	ractic care, including spinal manipulation,	improves migraine and cervicogenic headaches.					
		The type, freq	uency, dosage,	and duration of treatment(s) should be ba	ased on guideline recommendations, clinical					
		experience, ar	nd findings. Evid	lence for the use of spinal manipulation as	an isolated intervention for patients with tension-					
		type headache remains equivocal.								
		Adverse effects/	<u>safety</u>							
		Practitioners sele	ect treatment m	odalities in conjunction with all available	clinical information for a given patient. Of the 16					
		CCTs/RCTS includ	led in the body	of evidence for this CPG, only 6 studies ac	lequately assessed or discussed patient side effects					
		or safety parame	ter. Overall, rep	ported risks were low. Three of the trials r	eported safety information for spinal					
		manipulation.11,	<u>12, 20</u> Boline e	t al 11 reported that 4.3% of subjects expenses	rienced neck stiffness after initial spinal					
		manipulation that	it disappeared f	or all cases after the first 2 weeks of treat	ment. Soreness or increase in headaches after					
		spinal manipulat	ion (n = 2) were	reasons for treatment discontinuation ci	ted by Tuchin et al ²⁰ No side effects were					
		experienced by a	ny subjects stud	died by Bove et al ¹² using spinal manipulat	tion for the treatment of episodic tension-type					
		headache. Treatr	ment trials to ev	valuate efficacy outcomes may not enroll a	adequate numbers of subjects to assess the					
		incidence of rare	adverse events	. Other research methods are required to	develop a full understanding of the balance					
		between benefit	s and risks.							
		Chiropractor spe	cific interventio	ns for Migraines with or without aura#; te	ension type headache^; cerviogenic headache [%]					
		Study	Episodic or chronic	Experimental treatment(s)	Control treatment(s)					
		Tuchin #	Е, С	Spinal manipulation (n = 83 study	Detuned interferential therapy					
				completers) 2× per wk for 8 wk	(n = 40 study completers)					
		Nelson et al # E, C Spinal manipulation; n = 77; 14 Daily amitriptyline 25-100 mg; 3 study visits; n								
		treatments as 1-2× per wk for 8 wk = 70 HVLA manipulation; (14 treatments as 1-								
					2× per wk for 8 wk) plus daily amitriptyline 25-					
					100 mg; n = 71					
		Boline et al ^	C	Spinal manipulation, moist	Amitriptyline 10-30 mg per day; 2 visits; n = 56					
				neat, massage (2× per wk for 6 wk); n	study completers					
		= 70 study completers								



Study	Methodology			Results		Appraisal
		Bove and Nilsson^ Donkin et al ^ Nilsson [%]	E E, C E	Spinal manipulation, deep friction massage; n = 38; (2x per wk for 4 wk) Manual traction + Spinal manipulation (2-3x per wk for 4 wk); n = 15 Spinal manipulation (6 sessions for 3 wk) and deep friction massage,	Deep friction massage, low-power laser to upper cervical region; n = 37; (2× per wk for 4 wk)Spinal manipulation (2-3× per wk for 4 wk); n = 15Low-level laser, deep friction massage, trigger points (6 sessions for 3 wk); n = 25	
Authors Fernandez et al Title Spinal manipulation for the management of cervicogenic headache: A systematic review and meta-analysis Year 2020 Study type Systematic review	Objective To evaluate the effectiveness of spinal manipulative therapy (SMT) for cervicogenic headache (CGHA). Number of studies 7 (5 chiro specific) Type of studies RCT Intervention/dosage See table* Practitioner qualifications and background Not specified beyond location of intervention	Outcome measu Pain intensity: - Visual - - Nume - Nume - Nume - Visual For disability; - - Por disability; - <t< td=""><td>Analogue Scale odified Von Kor rical Rating Sca ric Pain Rating Sca ied Von Korff Sc Disability Index iche Impact tes Sy; of 30 days/mor days with head che days in the hours per day (headache hour che hours in th che nours in th che hours in th che nours in th che hours in th che nours in th che hours in the che days mall support of the second stafety ecific interventi</td><td>trigger points, low-level laser; n = 28 e (VAS) (Nilsson 1995; Nilsson et al 1997) ff Scale (Haas et al 2010) le (NRS) (Chaibi et al 2017; Haas et al 2010 Scale (NPRS) (Dunning et al 2016) alog Scale (VAS/NAS) (Borusiak et al 2010 (NDI) (Dunning et al 2016) t (HIT-6) were utilized (Haas et al 2018). nth (Chaibi et al 2017) ache in the last 4 weeks (Haas et al 2010, week (Dunning et al 2016) Chaibi et al 2017) s per day (Nilsson 1995; Nilsson et al 199 e last week (Dunning et al 2016) tal (Borusiak et al 2010) e was a significant, small effect favouring s l) and small effects for pain frequency (sta ffect for pain duration (SMD – 0.08 [95% ility (MD – 13.31 [95% CI, –18.07, –8.56]) nsity (MD – 9.77 [–24.21 to 4.68]) and a s to – 0.00]). At long-term follow-up, there ain frequency (SMD – 0.37 [–0.84 to 0.10 , superior short-term benefits for pain int ty evidence in this field is lacking. The long ons/studies</td><td> .8) .9). , 2018) 7) SMT for pain intensity (mean difference [MD] andardized mean difference [SMD] -0.35 [95% CI, CI, -0.47, 0.32]). There was a significant, small . At intermediate follow-up, there was no significant, small effect favouring SMT for pain e was no significant effects for pain intensity (MD –]). tensity, frequency and disability, but not pain g-term impact is not significant. </td><td>SIGN critical appraisal grade: HQ (++)</td></t<>	Analogue Scale odified Von Kor rical Rating Sca ric Pain Rating Sca ied Von Korff Sc Disability Index iche Impact tes Sy; of 30 days/mor days with head che days in the hours per day (headache hour che hours in th che nours in th che hours in th che nours in th che hours in th che nours in th che hours in the che days mall support of the second stafety ecific interventi	trigger points, low-level laser; n = 28 e (VAS) (Nilsson 1995; Nilsson et al 1997) ff Scale (Haas et al 2010) le (NRS) (Chaibi et al 2017; Haas et al 2010 Scale (NPRS) (Dunning et al 2016) alog Scale (VAS/NAS) (Borusiak et al 2010 (NDI) (Dunning et al 2016) t (HIT-6) were utilized (Haas et al 2018). nth (Chaibi et al 2017) ache in the last 4 weeks (Haas et al 2010, week (Dunning et al 2016) Chaibi et al 2017) s per day (Nilsson 1995; Nilsson et al 199 e last week (Dunning et al 2016) tal (Borusiak et al 2010) e was a significant, small effect favouring s l) and small effects for pain frequency (sta ffect for pain duration (SMD – 0.08 [95% ility (MD – 13.31 [95% CI, –18.07, –8.56]) nsity (MD – 9.77 [–24.21 to 4.68]) and a s to – 0.00]). At long-term follow-up, there ain frequency (SMD – 0.37 [–0.84 to 0.10 , superior short-term benefits for pain int ty evidence in this field is lacking. The long ons/studies	 .8) .9). , 2018) 7) SMT for pain intensity (mean difference [MD] andardized mean difference [SMD] -0.35 [95% CI, CI, -0.47, 0.32]). There was a significant, small . At intermediate follow-up, there was no significant, small effect favouring SMT for pain e was no significant effects for pain intensity (MD –]). tensity, frequency and disability, but not pain g-term impact is not significant. 	SIGN critical appraisal grade: HQ (++)



Study	Methodology	Results							
		Study	Location of intervention	Experimental group	Control group	Follow-up & outcome measures	Results		
		Nilsson 1995	independent chiropractic research institution	n = 20 received upper and lower cervical spinal adjustments for 3 weeks	n = 18 received soft tissue work (laser upper cervical area and deep friction massage in lower cervical area)	Changes observed from week 2 to week 6 Headache duration, intensity and medication usage	Participants in the spinal manipulation group showed improvements in all outcomes, although the differences between the treatment groups did not reach statistical significance		
		Nilsson et al 1997	independent chiropractic research institution	n = 28 received upper and lower cervical spinal adjustments for 3 weeks	n = 25 received laser in the upper cervical area and deep friction massage in the lower cervical area for 3 weeks	Changes observed from week 1 to week 5 Headache intensity and medication usage	Participants in the spinal manipulation group showed improvements in headache duration, intensity and medication usage		
		Chaibi et al 2017	chiropractic practice	n = 4 received cervical manipulative treatment	n = 4 received sham manipulation, n = 4 used as a control with no manipulation	3, 6 and 12 months Headache duration, intensity index and primary of frequency	Participants who received spinal manipulative and sham both improved for headache frequency at all-time points		
		Haas et al 2010	chiropractic college outpatient clinic	n = 63 received 18 cervical and upper thoracic manipulative therapy	n = 64 received 18 light massage sessions, n = 65 received 6 manipulative therapy and 12 massage session, n = 64 received 12 manipulative therapy and 6 massage sessions	6,12,24,39 and 52 weeks Headache duration, intensity and frequency, in addition to perceived improvement, medication use and patient satisfaction	Participants in both groups improved, however, those who received spinal manipulative therapy had more significant reductions in the number of headache days, i.e. headache days were reduced by about half		
		Haas et al 2018	university clinic and private chiropractic clinics	n = 20 received cervical and thoracic manipulative therapy for 16 sessions	n = 20 received 5 min of moist heat pack and 5 min of light massage for 16 sessions, n = 20 received 8 manipulative sessions and attention control physical examination, n = 20	4,8,16 and 20 via phone, 12 and 24 weeks via mail Headache and neck pain frequency, intensity, medication use and disability	There were clinically important and statistically significant differences which favoured spinal manipulation over light massage for pain and disability		



Study	Methodology				Results			Appraisal
					received light			
					massage for 8			
					sessions and			
					attention control			
					physical			
					examination			
Authors	<u>Objective</u>	Outcome me	asures_					SIGN critical
Parkinson et al	The aim of this study was to undertake a systematic review of	8 Domains: pa	ain, disability, clii	nical remission, oth	er/extra treatments, effec	t on normal activities,	patient	appraisal
<u>Title</u>	the literature to determine the impact of chiropractic care on	satisfaction/c	onfidence, adver	se events and cost	5.			grade:
Well-being outcomes of	the quality of life, lifestyle, health and economic impact of	Outcome mea	asures varied bet	ween studies. One	study used Deyo's Core Se	t, a standard set of m	easures for low back	
chiropractic intervention	chiropractic patients presenting with back pain.	pain research	. Three studies ir	ncluded the Roland	-Morris Disability Question	nnaire as a measure, a	nd four	AQ (+)
for lower back pain: a	Number of studies	included a vis	ual numerical pa	in scale. While no s	tudies measured quality o	f life as an outcome, fi	ive included	
systematic review	6	a measure of	patient satisfact	ion; three consider	ed effect on normal activit	, and two considered	adverse events.	
Year	Type of studies	Effectiveness						
2013	4x RCT	There was a h	igh degree of ind	consistency and lac	k of standardisation in mea	surement instrument	s and outcome measures.	
Study type	2x Observational	Three studies	reported reduce	ed use of other/ ext	ra treatments as a positive	outcome; two studie	s reported a positive effect	
Systematic review	Intervention/dosage	of chiropracti	c intervention or	pain, and two stud	dies reported a positive eff	ect on disability. The s	six studies reviewed	
	*See table	concentrated	on the impact o	f chiropractic care o	on physical health and disa	, bility. rather than the	wider holistic view which	
	Practitioner qualifications and background	was the focus	of this study. It	is difficult. therefor	e. to defend any conclusio	n about the impact of	chiropractic intervention	
	Chiropractors	on the quality	of life. lifestyle.	health and econon	nic impact on chiropractic	patients presenting wi	th back pain.	
		Adverse effec	ts/safety		·			
		Two studies c	onsidered adver	se events & reporte	ed no adverse events assoc	iated with chiropracti	с.	
		*Summary of	included studie	S:				
		Study	Setting	Sample size	Intervention	Comparison	Main Results	
		Descarreau	x Chiropractic	N = 29	Group 1: 12	Group 1 treated	Pain reduction (VAS) of	
			clinics	participants	treatments in an	only phase 1	21/100 (95 % CI 14–28)	
				(3% attrition at	intensive 1-month	(intensive); within	in groups 1 and 2	
				10 months)	period but no	group using pre-	following intense-	
					treatment in a	intervention	phase treatments but	
					subsequent 9-month	(wash in) data for	NSD in pain reduction	
					period. A 4-week	1 month.	(VAS) between groups,	
					period preceding the		but significant	
					initial phase of		difference in disability	
					treatment was used as		(maintenance	
					a control period to		treatment group had	
					examine the effect of		in disability	
					disability lovals		muisability)	
					Group 2: 12		reduced need for ico	
					treatments in an		hags compared to	
					intensive 1-month		control group	
					period and also		control Broup.	
					received maintenance			



Study	Methodology				Results			Appraisal
					spinal manipulation every 3 weeks for a 9- month follow-up period			
		Giles	Specialised unit within hospital setting	N = 1,775 participants; N = 454 satisfaction questionnaires (58 % response rate	Standard chiropractic care; 28 % Needle acupuncture; 12 % Chiropractic spinal manipulation; 8 % medicine; 1 % shoe lift; 22 % opinion only; 16 % refer to attorney; 13 % referred to other provider (orthopaedics, neurosurgery, rehabilitation medicine, anaesthetic pain clinic, physiotherapy, psychology, psychology,	No comparison group	High satisfaction with all treatments. No chiropractic adverse events.	
		Hawk	Chiropractic college	N = 106 participants (5 % attrition at 9 months)	Flexion-distraction techniques (spinal manipulative therapy); trigger point therapy	Standard chiropractic care; spinal manipulation or other spinal adjusting techniques; instruction in proper back care and strengthening and flexibility exercises	NSD in improvement between groups, both showed clinical improvement on pain disability index and Roland–Morris Back Pain Questionnaire.	
		Langworthy	Single private chiropractic clinic	 N = 101 participants (79 % response rate; 36 % attrition at 6 weeks; further 46 % attrition at 2 years) 	Sham manipulation (less force) applied with hand held device and effleurage	No comparison group	Greatest improvements at 6 weeks were in interference with normal work and LBP bothersomeness. At 2 years, 15 % (<i>n</i> = 8) moderate-extreme LBP bothersomeness; 9 %	


Study	Methodology	Results						
		UCLA Low Back Pain Study, 2002–2006*	3 ambulatory care facilities of a managed- care organisation	N = 610 participants (10 % attrition at 18 months)	 (1) Chiropractic care only. Spinal manipulation/spinal- adjusting technique; instruction in strengthening and flexibility exercises, and in proper back care. (2) Medical care with physical therapy. Medical care (see comparison group); instruction in proper back care from physical therapist, plus one or more of following at physical therapist discretion: heat therapy, cold therapy, ultrasound, electrical muscle stimulation (EMS), soft-tissue and joint mobilisation, traction, supervised therapeutic exercise and strengthening and flexibility exercises (3) Chiropractic care with physical modalities. Chiropractic care (as above), plus one or more of the following at chiropractor 	Medical care only; one or more of the following, at provider discretion: instruction in proper back care and strengthening and flexibility exercises; prescriptions for pain killers, muscle relaxants, anti-inflammatory agents, and other medications used to reduce or eliminate pain or discomfort; recommendations regarding bed rest, weight loss and physical activities	 (n = 5) experiencing interference with normal work; 16 % (n = 9) reduced normal activities last 4 weeks (mean = 1 day); 4 % (n = 2) needed time off work (mean = 0.5 days) Greater satisfaction increased odds of remission at 6 weeks, but not at 6, 12, or 18 months. 6 months: no clinical benefit DC vs. MD 18 months: no clinical benefit DC vs. MD; not cost-effective 	



Study	Methodology				Results			Appraisal
					discretion: heat or cold therapy, ultrasound and EMS			
		Wilkey	National Health Service hospital outpatient clinic (pain clinic)	N = 27 participants (10 % attrition at 8 weeks)	Standard chiropractic care (8-week Tx period); unrestricted and normal chiropractic clinical treatment: articular manipulation (side posture-diversified manipulation to the lumbar spine and pelvis, flexion distraction, and lumbar and pelvic drop techniques); trigger point Tx (stretching techniques, ischemic compression, dry needling, post- isometric relaxation stretching); soft tissue massage; home exercises, and advice regarding posture and activities of daily living; at chiropractor discretion	Standard pharmaceutical therapy (NSAIDs, analgesics and gabapentin); facet joint injection; soft tissue injection; use of transcutaneous electrical nerve stimulation machines; at discretion of pain clinic	At 8 weeks, chiropractic patients had reduced disability and mean pain intensity, compared to pain clinic group.	
<u>Authors</u> Ruddock et al Title	Objective The purpose of this systematic review was to identify and critically evaluate randomized controlled trials of spinal	Outcome meas Four types of pa was used. To as	<u>ures</u> ain outcome me sess physical fui	asure were used. ⁻ nction due to pain	To assess pain levels directl , either the Oswestry Low E	y, either a VAS or nur Back Pain Disability Qu	nerical rating scale (NRS) Jestionnaire (OLBPDQ) or	SIGN critical appraisal grade:
Spinal Manipulation Vs	manipulation (SM) vs sham manipulation in the treatment of	the Roland-Mor	ris Low Back Pa	in Questionnaire (RMLBPQ) was used.	, -	. ,	
Sham Manipulation for Nonspecific Low Back	nonspecific low back pain.	Effectiveness The effect of SN	/ for NSI BP as n	neasured by the 1	00mm VAS is presented in t	the summary of findi	ags table From 4 studies	HQ (++)
Pain: A Systematic	9 (2 identified as chiropractic)	(287 participant	ts), the SMD is –	0.36 (95% confide	ence interval, -0.59 to -0.22	12). The quality of evi	dence is graded as low	
Review and Meta-	Type of studies	because of high	dropout in 2 st	udies and broken l	olinding in 1 study, no prac	titioner could be blin	ded in any study, and only 1	
analysis	RCTs	study conducte	d ITT analysis.					
Year 2016	Intervention/dosage	The results of the	ne meta-analysis	s suggest a greater	reduction in pain scores and	mong participants rec	eiving SM in comparison to	
2010	"See table Practitioner qualifications and background	those receiving	an effective sha	im placebo. This fi	naing remained consistent	when looking at pain	recorded at immediately	
Systematic review	2 identified as chiropractors 7 unspecified	the SM had less	anu ionow-up. main (a mean o	f 0 36 standard de	viations lower) than those	in the control group	n terms of clinical	
Systematic review	2 la chanca as chiropractors, 7 dispecifica.				viacions lowery than those	an the control group.		



Study	Methodology				Results							
		relevance, th because mos <u>Adverse effe</u> Only 3 trials discomfort a * Chiropract	is is only a sm t studies had <u>cts/safety</u> reported on a nd tiredness, in studies	all to moderate effect, and some degree of RoB by fai dverse events. Senna et al which had resolved within	I the CIs are wide. Caution ing to report on random (2011) reported that the 24 hours. The other 2 and	on is needed before d nization procedure or e most common adver rticles just stated that	rawing conclusions on allocation concealment. se events were local none were reported.					
			Sample	Study Setting/Participants	SM	Sham Control	No. of treatments					
		Waagen et al (1986	N= 29	1st time patients at a chiropractic college clinic with pain of >3wk duration. Patients naive to chiropractic care	High-velocity thrust to all levels of spine	Lumbar drop piece of chiropractic table se to mimic thrust, followed by soft tissue manipulation	n 2-3 treatments/wk for 2 wk with discrepancies between groups					
		Hoiiris et al (2004)	N=192	Participants had subacute NSLBP between 2 and 6 wk duration	Variable adjustments, prone or side-lying for all spine + placebo medicine	Prone or side-lying positioning with practitioner contact and motion with no thrust + placebo medicine	7 treatments for each group, over 2 wk					
Authors	<u>Objective</u>	Outcome me	Outcome measures									
Walker et al Title	To determine the effects of combined chiropractic interventions (that is, a combination of therapies, other than	The outcome effects	es of interest v	vere pain, disability, back-i	elated function, overall	improvement, patien	satisfaction, and adverse	appraisal grade:				
Combined chiropractic	spinal manipulation alone) on pain, disability, back-related	Effectivenes	5					grader				
interventions for low-	function, overall improvement, and patient satisfaction in	Included stud	dies evaluated	a range of chiropractic pro	ocedures in a variety of	sub-populations of pe	ople with LBP. No trials					
back pain. Cochrane	adults with LBP, aged 18 and older.	were located	l of combined	chiropractic interventions	compared to no treatm	ent. For acute and su	bacute LBP, chiropractic	HQ (+=)				
Vear	12	-0.18)) comp	ared to other	treatments but there was	n (SMD -0.25 (95% CI -0 no significant differenc	.46 to -0.04) and MD - e in long-term pain (N	0.89 (95%CI -1.60 to 1D -0 46 (95% CI -1 18 to					
2010	Type of studies	0.26)). Short-	-term improve	ement in disability was grea	ater in the chiropractic g	group compared to oth	er therapies (SMD -0.36					
Study type	RCT	(95% CI -0.70	to -0.02)). Ho	owever, the effect was sma	Ill and all studies contrib	outing to these results	had high risk of bias.					
Systematic review	Intervention/dosage	There was no	o difference in	medium- and long-term d	isability. No difference v	was demonstrated for	combined chiropractic					
	*see table	intervention	s for chronic L	BP and for studies that had	a mixed population of	LBP.						
	Practitioner qualifications and background Registered chiropractor	Adverse effe	cts/safety	rted in only two of the incl	uded studies (Hawk 200	15. Heigh 2002) From	these two studies 16 out					
		of a total of 2	LO6 participan	ts who received the chiror	ractic interventions rep	orted minor, transient	, exacerbations of					
		symptoms. N	lone of the ind	cluded studies reported an	y serious adverse effect	s in participants that r	eceived the chiropractic					
		interventions. However, relatively small and short-term RCTs included in this review are not the best study design for										
		detecting ad	verse events,	and longer term large obse	ervational studies are ne	eded to provide a vali	d evaluation of adverse					
		effects, parti	cularly those	that are uncommon or rare			0					
		Beverman	N=252	S Chiropractic: A moist	ntervention	15 Outcome	measures at baseline					
		2006		minutes at each visit. and spinal manipulation	Flexion/distraction tech	nique and then after: Visi	follow-up measurement t 5. 10. 15 and 20 (no					



Study	Methodology			Results		Appraisal
				Comparison: A moist hot pack was applied for 15 minutes at each visit. Country of training: Not described Years in practice: Not described	actual times given). Using: 1. Lumbar Ranges Motion with J- Tech Dual Digital Inclinometer. 2. Oswestry low-back Pain Questionnaire 3. Visual analogue pain scale (0-100 mm)	
		Brønfort 1989	N=19	Chiropractic: Low amplitude, high velocity manipulative procedure aimed at dysfunctional articulations involving all areas of the spine and pelvis. No specific chiropractic technique was adhered to. Patient education on how to minimize LBP episodes given. Average of 7 visits. Comparison: received analgesics, local analgesics/injections, bed rest and/or physiotherapy (ultrasound, diathermy and ergonomic advice). Also given patient education on how to minimize LBP episodes. Average of 7 visits. Country of training: Unknown. Years in practice: 'many years'	Outcome measures at baseline* and then follow-up measurement after 1, 3, and 6 months (not imme-diately after intervention):1. Patient reported improvement2. Number of days with symptoms3. Number of days with bed rest4. Inability to work5. Use of medication	
		Brønfort 1996	N=174	Group 1: Spinal manipulation therapy (SMT): high velocity, low amplitude manual spinal thrusting technique with contact over the vertebral osseous process, muscle or ligament and thrust over vertebral or sacroiliac joints PLUS Strengthening exercises. Group 2: NSAID: patients in this group were given 500 mg Naproxen sodium each morning and evening for 5 weeks; PLUS trunk and leg extensions and abdominal strengthening Group 3. SMT PLUS Stretching exercises. People in groups 1 and 2 received 20 supervised sessions: 10 sessions lasting 10 to15 minutes for 5 weeks, then 10 sessions of exercise alone (1 hour duration) and for 6 weeks. Country of training: Not reported Years in practice: Chiropractors had 5 to 25 years of experience.	Outcome measures at baseline:1. Pain radiation to leg %2. Analgesic use in past week %3. Depression score (CES-D, 0-60 scale)4. LBP score (0-10)	
		Cherkin 1998	N=323	Chiropractic: Short-lever high velocity thrust. All participants underwent manipulation to lumbar or lumbosacral regions or both. 54% received sacral or sacroiliac manipulation, 27% thoracic manipula-tion, 12% cervical manipulation, 6% hip, pelvis or ischium manipulation, 64% received manipulation of more than one region of spine. 20% received ice packs, 49% received localized massage, 41% per-formed exercises in the office and 58% performed exercises at home. The number of sessions was 9. Comparison 1: Physical Therapy: The McKenzie approach was used to teach patients exercises that would allow them to	Outcome measures at baseline:1. 'Bothersomeness' of back pain, leg pain and numbness/tingling during preceding 24 hours: 11- pointscale (validity similar to similar scale).2. Disability: Roland Disablity Scale (validated).3. Subject characteristics (validation not mentioned).4. Two subscales of the SF36: General health perceptions score and the Mental health score. Not validat-ed.5.	



Study	Methodology			Results		Appraisal
				'centralize' pain. This group was also given an educational book entitled Treat Your Own Back. Patients in this group reported using lumbar rolls (71%), and recommended sitting pos-ture (83%). The number of sessions was 9. Comparison 2: Booklet group: patients received an educational booklet that has been shown in a pre-vious study to have little effect on improved outcomes. Country of training: Not reported Years in practice: Chiropractors had 6 to 14 years experience. Physical therapists had 14 years experience.	Narcotic use. Not validated.Outcomes measured at 1, 4, and 12 weeks follow up:1. 'Bothersomeness' of pain: 11- point scale (validity similar to similar scale).2. Disability: Roland Disability Scale (validated).	
		Cramer 1993	N=36	Chiropractic: Clinicians assigned to the treatment group gave whatever treatment they saw fit to the patients as long as it included a side-lying manipulation to the affected area of the lumbar spine. Most frequently patients received electrical muscle stimulation, cold pack in addition to the manipulation. 3to 5 sessions delivered over 10 days Comparison: Ultrasound to low-back followed by cold pack for 10 to 15 minutes and 15 to 30 seconds of very gentle soN tissue massage. Country of training: Not reported Years in practice: Not reported	Outcome measures at baseline and then immediately after the 10 day intervention:1. Pain: VAS (validation not mentioned)2. Function: Oswestry (validation not mentioned)3. Electrodiagnostics procedures: isometric strength of lumbar extensions and flexions (validation not mentioned), maximum voluntary strength tests (validation not mentioned), maximum flexion and ex-tension measurements (validation not mentioned), bilateral nerve conduction velocity and F wave latencies (validation not mentioned), evaluation of H reflex (validation not mentioned).	
		Gudavalli 2006	N=235	Chiropractic: Series of flexion-distraction procedures performed on a specially constructed table with a moveable headpiece, a stationary thoraco-lumbar piece, and a moveable lower extremity piece. With the subject lying prone, the clinician places one hand over the lumbar region at the level of interest and uses the other hand to flex, laterally flex, and/or rotate the lower extremity section of the table. Technique repeated three times at each week, all clinically affected levels. Also ultrasound and ice. Comparison: Active trunk exercise protocol (ATEP) was administered by licensed physical therapists and consisted of flexion or extension exercises, weight training, flexibility exercises, and cardiovascular exercises depending on patient symptoms.	Outcome measures at baseline, immediately after the 4-week treatment period, and at 1-year fol-low-up:1. 100 mm VAS for perceived pain2. Roland-Morris Questionnaire to measure function3. SF-36 to measure health status Outcome measures only at end of 4 weeks treatment:1. Levels of satisfaction (would they recommended to others?) (validity not reported) Outcome measures only at 1-year follow-up:1. Health care utilisation (weekly phone interview with	



Study	Methodology	Results				Appraisal
				Biomechanically the ATEP did not concentrate on a specific joint level but sought to impact the lumbar spine as a whole. Also ultrasound and ice. Study participants in both groups were seen 2 to 4 times a week, at the discretion of the treatment provider, for 4 weeks. Country of training: Not reported (but study occurred in USA) Years in practice: Not reported	access to services; validity not reported)2. low-back biomechanics (method not reported)	
		Hawk 2005	N= 111	Chiropractic: In the active group patients received FDT and trigger point therapy. In FDT, the clinician moves the patient's spine in small increments while manually directing inferior-to-superior force against the vertebrae, assisted by movable table sections and manual posterior-to-anterior stabilising pressure. Trigger point therapy involved manual ischaemic compression to muscles with localised regions of painful contracted tissue. Eight treatments were delivered over 3 weeks. Comparison: Patients received sham manipulation and effleurage. Sham manipulation was performed with a hand-held instrument. Country of training: Likely USA as study conducted in USA Years in practice: Not reported	Outcome measures at baseline and immediately after 3 weeks treatment:1. Pain Disability Index, as a mean change, a patient self- report instrument with demonstrated reliability and validity2. Roland Morris Back Pain Questionnaire3. VAS for Pain4. Beck Depression Inventory5. Medical Outcomes Study 36-item Short-Form Health Survey6. Patient expectation of improvement was indicated on a 100 mm VAS scale at baseline and prior to treatment at visit 4	
		1992	N=65	Chiropractic roter vention: SW1; Not pack for 10 mins; 3 times per week for 3 wks Comparison 1: Massage. 3 massage therapists 'interns'. 3 times per week for 3 wks. Hot pack for 10 mins, then gentle stroking massage to whole back area w/out any deep so N tissue manipulation Comparison 2: Freeman lumbosacral corset. Initial fitting then weekly follow- up for 3 weeks Patients told to wear for 8 hrs per day. Chiropractor gave instruction Comparison 3: Transcutaneous muscular stimulation. Myocare PLUS (3M) unit. Initial instruction then weekly follow-up for 3 wks. Patients told to wear for 8 hrs per day. Chiropractor gave instruction Country of training: Not reported Years in practice: Between 1 and 17 yrs	(only Oswestry and Roland Morris results reported at Visit 1 and Visit 3.	
		Hsieh 2002	N=200	Chiropractic: The patients received both SMT and myofascial therapy treatments. SMT included joint manipulation (the 'Diversified' technique) and drop table techniques. Myofascial therapy treatments included intermittent Fluori-Methane sprays and stretches, Ischaemic compressions using a massage finger, stripping massage and hot packs for 10 minutes at the completion of therapy. Treatment frequency	Outcome measures at baseline and then follow-up measurement after 3 weeks and 6 months:1. VAS2. Roland-Morris3. MOS4. Short form of the Minnesota Multiphasic Personality Inventory:5. Confidence score6. Satisfaction score7. Palpation for	



Study	Methodology			Results		Appraisal
				was three times a week for three weeks. Comparison 1: Back School Program once per week for a total of three weeks. Participants watched three videos about spine anatomy, common causes of LBP, and body mechanics for daily activities. Subsequently, the participants received individual instructions and supervised practice of their home program by experienced licensed physical therapists at UCIMC and trained experienced licensed chiropractors at LACC. Comparison 2: SMT (see description above) Comparison 3: Myofascial therapy (see description above) Country of training: Not reported Years in practice. Swear minimum of clinical experienced	active trigger points8. Palpation for tenderness	
		Hurwitz 2002	N=681	Chiropractic 1: Patients assigned to chiropractic care only received spinal manipulation or another spinal- adjusting technique, instruction in strengthening and flexibility exercises, instruction in proper back care. At 6 months average back pain-related visits were 5.3 in the chiropractic only group. Chiropractors spent an average of 15 minutes with patients at each visit. Chiropractic 2: Patients assigned to the chiropractic care with physical modalities received care as de- scribed in 'chiropractic care only', as well as one or more of the following at the discretion of the chiro- practor: heat or cold therapy, ultrasound and EMS. At 6 months average back pain-related visits were5.7 in the chiropractic plus physical modalities group. Chiropractors spent an average of 15 minutes with patients at each visit Comparison 1: Patients assigned to the medical care only group received one or more of the following at the discretion of the primary care provider: instruction in proper back care and strengthening and flexibility exercise, prescriptions for pain killers, muscle relaxants, anti-inflammatory agents, oth-er medications to reduce or eliminate pain or discomfort, and recommendations regarding bed rest, weight loss and physical activities. At 6 months average back pain-related visits were 2.9 in the medical care only group. Medical providers spent an average of 15 minutes with patients at each visit. Comparison 2: Patients assigned to the medical care with physical therapy received medical care as de- scribed in 'medical care only', plus one or more of the following at the discretion of the physical thera-pist:	Outcome measures at baseline and then follow-up measurement after 2 weeks*, 6 weeks, 6 months, and 18 months: 1. Disability resulting from low- back pain using the 24-item Roland-Morris adaptation of the Sickness Impact Profile (validated) 2. Numerical ratings of pain intensity (validated) 3. Pain History 4. Psychological distress and well- being assessed by the Medical Outcomes Study 36-Item Short- Form Health Survey (validated) 5. Sociodemographic data	



Study	Methodology		Results						
		Meade	N=741	heat therapy, cold therapy, ultrasound, electrical muscle stimulation, soN tissue and joint mobilisation, traction, supervised therapeutic exercise, strengthening and flexibility exercises. At 6 months average back pain-related visits were 5.4 in the medical care plus physical modalities group. Physical therapy providers averaged 31 minutes per patient visit.85% patients in the chiropractic groups received high velocity spinal manipulation. The physical modalities most often given to patients were heat therapy alone (28%), heat and EMS (25%), heat, EMSand ultrasound (23 %), and heat therapy and ultrasound (15%). 4% patients in the modalities group were not treated with any modalities and 13 % patients in the chiropractic-only group received modali-ties. The most common intervention in the physical therapy group were heat or cold therapy (71%), supervised physical exercise (59.5%), ultrasound (45%), EMS(33.6%), and mobilisation (20%). Prescrip-tion pain medications (58.5%), muscle relaxants (48.5%) and non prescription pain medications (30%)were the most frequent interventions in the medical groups. Country of training: Not reported Years in practice: Not reported Chiropractic: Treatment at the discretion of treating	Outcome measures at baseline and				
		Wilkey 2008	N=741	Chosen from this list: Diversified MT, flexion/distraction, drop techniques; trigger point therapy, stretching, dry needling, massage, home exercises, postural advice, ADL advice. Frequency at the dis-cretion of the chiropractor. Control: Pain clinic group saw 2 anaesthetists. On average 1.9 times and they received medication average 1.9 times and they received medication	 Outcome measures at baseline and then follow-up measurement after 6 weeks, 6 months, and 1, 2, and3 years: 1. Oswestry - results presented as mean score physio minus mean score for chiropractic group. Validated. 2. Satisfaction 3. Partial or complete relief 4. Using drugs (analgesics or NSAIDs) 5. Pain free NRS 11 points, X2. 1 for current pain and 1 for average pain over past 2, 4, 6, 8 weeks Roland Morris Disability Q, Validated: 2, 4, 6, 8 weeks 11 point satisfaction Q (validation not stated) at 8 weeks Medication diary for PC group (validation not 				



Study	Methodology				Results		Appraisal		
Authors	Objective	Outcome me	easures						
Yeganeh et al	To determine the effectiveness of acupuncture, acupressure	Primary outo	come: Pain (using vis	sual analog scale) &	back pain specific functional stat	us			
<u>Title</u>	and chiropractic (non-pharmacological) interventions on the	Effectivenes	<u>s</u>						
The effectiveness of	treatment of chronic nonspecific low back pain in Iran.	The three RC	Ts that compared c	hiropractic to physic	cal therapy modalities all had pos	itive outcomes but all were low quality.			
acupuncture,	Number of studies	See table*							
acupressure and	7 (3 Chiropractic)	Adverse effe	Adverse effects/safety						
chiropractic	Type of studies	Not specified	Not specified						
interventions on	RCT			:	*Chiro specific studies				
treatment of chronic	Intervention/dosage		Intervention	Comparison	Primary Outcome	Main results			
nonspecific low back	*See table	Raigani	2 to 6 session	3 to 20 session	Pain (VAS) and Roland-	VAS pain:			
pain in Iran: A	Practitioner qualifications and background	et al	Spinal	physical	Morris Low Back Pain and	Spinal manipulation > physical			
systematic review and	Chiropractor (n=3)	2002	manipulation	therapy (Hot	Disability Questionnaire	therapy > educational booklet (P <			
meta-analysis			(Maigne)	pack and TENS)	(RDQ)	0.001)			
Year		(n=96)	Follow up at 1	or educational	Lumbar spine range of	Roland-Morris Low Back Pain and			
2017			and 6 week	DOOKIET	motion	Disability Questionnaire:			
Study type						therapy > educational booklet			
Systematic review						(P < 0.001)			
						Lumbar spine range of motion: not			
		seen significant differences							
		Mohseni-	Manual therapy	ultrasound	difference between baseline	VAS pain:			
		Bandpei	for ? session	(SEMG)	pain intensity and functional	1 week: Manual therapy >			
		et al	over ?		disability with one week and	Ultrasound (SEMG)			
		2006	Follow up at 1		six mounts	6 mounts: Manual therapy >			
		(n=112)	week and 6			Ultrasound (SEMG)			
			mounts			Disability:			
						1 week: Manual therapy >			
						6 mounts: Manual therapy >			
						Ultrasound (SEMG)			
		Panahi et	Manual therapy	Electrotherapy	The primary outcome was	NSR Pain:			
		al	for 10 session	modalities for	the pain and disability and	Massage > Electotharapy modalities			
		2011	over 10 days	10 session over	flexion range of motion and	Disability:			
		(n=30)		10 days	assessed the difference	Massage > Electotharapy modalities			
					between baselines with 10	Modified schober test:			
					days after intervention and	No significant differences between			
					concluded that the pain	two groups			
					disability and functional				
					significantly but flexion				
					range of motion did not				
					show significant				
					improvement				



Study	Methodology			Results	Appraisal			
Authors	Objective	Outcome measu	res		SIGN critical			
Andronis et al	To identify, document and appraise studies reporting on the	See table*			appraisal			
<u>Title</u>	cost effectiveness of non-invasive and non-pharmacological	Effectiveness			grade:			
Cost-Effectiveness of	treatment options for LBP.	Haas et al (USA,	perspective not explicitly stated)	calculated the total healthcare costs in relation to Medicare expenditure				
Non-Invasive and Non-	Number of studies	for chiropractic of	are and found that this option w	as associated with only moderately higher total costs than usual care,	AQ (+)			
Pharmacological	33 (1x chiropractic care)	mainly owing to	fewer onward/external referrals	. The cost per reduction in pain and disability score for chiropractic care was				
Interventions for Low	Type of studies	lower for chronic	wer for chronic than for acute patients. The intervention becomes more cost effective for chronic patients at 12 months					
Back Pain: A Systematic	RCTs (<i>n</i> = 29)	than at 3 months	, though the opposite results are	e observed for acute patients.				
Literature Review.	Randomised and a non-randomised trial (n=1)	Adverse effects/	<u>safety</u>					
<u>Year</u>	Prospective cohort (n=2)	Not specified						
2017	Intervention/dosage	*Chiropractic sp	ecific studies					
Study type	Study interventions were categorised as: (1) combined	Study	Intervention(s) and	Resource use, costs and outcomes				
Systematic review	physical exercise and psychological therapy, (2) physical	-	comparator(s)					
	exercise therapy only, (3) information and education, and (4)	Haas et al	Intervention:	Main resource use items:				
	manual therapy.	(2005)	Chiropractic care (spinal	Secondary and specialist care services (Medicare)				
	Practitioner qualifications and background		manipulation), exercise	Measure of benefit used in economic evaluation (instrument used):				
	1x Chiropractic care		plan and self-care	Pain, functional disability, patient satisfaction, physical health, mental				
			education	health via a visual analogue scale, the Revised Oswestry Disability				
			Comparator:	Questionnaire and the Short Form-12 questionnaire				
			Usual medical care	Main outcome of economic evaluation:				
			(including exercise plan and	Additional cost per improvement in clinical outcomes: chronic cohort:				
			self-care education)	US\$0.1 Incremental total cost per unit of improvement in the pain				
				ineasure at 12 months. Acute conort: US\$12 incremental total cost per				
Authors	<u>Objective</u>	Outcome measu	res		SIGN critical			
Blanchette et al	To estimate the clinical effectiveness and to systematically	Primary outcome	25:		appraisal			
<u>Title</u>	review the literature of full economic evaluation of	• Pain (e.g., visua	al analogue scale, numerical ratir	ng scale, McGill pain score)	grade:			
Effectiveness and	chiropractic care compared to other commonly used care	 Functional stat 	us (e.g. Roland-Morris questionn	aire, Oswestry Disability Index)				
Economic Evaluation of	approaches among adult patients with non-specific LBP.	Global improve	ment (e.g., the proportion of pa	tients recovered)	HQ (++)			
Chiropractic Care for the	Number of studies	Secondary outco	mes:					
Treatment of Low Back	Qualitative synthesis (n= 6)	Health related	quality of life (e.g., SF-36, EuroQ	ol)				
Pain: A Systematic	Meta-analysis (n=5)	Return to work	(e.g. number of days to return t	o work or proportion of patients at work)				
Review of Pragmatic	Type of studies	Adverse events						
Studies	RCTs	Effectiveness						
Year	Intervention/dosage	• Five RCTs with	low risk of bias compared chirop	practic care to exercise therapy (n = 1), physical therapy (n = 3) and medical				
2016	*see table	care (n = 1).						
Study type	Practitioner qualifications and background	Overall, individ	ual studies showed similar effec	ts of chiropractic care compared to exercise therapy, physical therapy or				
Systematic review	Chiropractic standard care was defined as patient-centred,	medical care for	or the treatment of low back pair	n regardless of type of outcome. Similarly, the pooled results revealed no				
	multimodal care (e.g. combinations of SMT, soft tissue	significant diffe	erence in effectiveness between	providers groups.				
	techniques, prescription of exercise, advice and reassurance)	Three low to h	gh quality full economic evaluat	ions studies (one cost-effectiveness, one cost-minimization and one cost-				
	planned and delivered by a licensed chiropractor.	benefit) compa	red chiropractic to medical care	. Given the divergent conclusions (favours chiropractic, favours medical				



Study	Methodology			Appraisal	
		care, equiv care. • Moderate evidence s no firm con <u>Adverse effe</u> No serious a	valent options), mixed-evidence was found for economi evidence suggests that chiropractic care for LBP appear uggests the same conclusion when chiropractic care is nclusion can be reached at this time. <u>ects/safety</u> dverse events were reported for any type of care.	ic evaluations of chiropractic care compared to medical rs to be equally effective as physical therapy. Limited compared to exercise therapy and medical care although	
		Study	Intervention	Comparative Treatments	
		Bronfort 2011	Chiropractic care once to twice per week for 15 to 30 minutes including: SMT and few minutes of soft-tissue massage, ice, or heat (n = 100).	Supervised exercise therapy provided by exercise therapists (n = 100).	
		Cherkin 1998	Chiropractic care: according to usual clinician's procedures including recommendations about exercise and activity restrictions (n = 122).	Physical therapy care: provided by therapists trained by the McKenzie Institute faculty. Subjects received McKenzie's Treat Your Own Back book and a lumbar- support cushion. Therapists were instructed to avoid therapies such as heat, ice, transcutaneous electrical nerve stimulation, ultrasonography, and back classes (n = 133).	
		Herzog 1991	Chiropractic care: SMT and the optimal treatment modality to the discretion of the chiropractor** for 10 sessions over 4 week (n = 16).	Physical therapy care: back school therapy for 10 sessions over 4 week (n = 13).	
		Hurwitz 2002	Chiropractic Care: SMT, instruction in strengthening and flexibility exercises, and instruction in proper back care (n = 169).	Medical care: One or more of the following: instruction in proper back care and strengthening and flexibility exercises; prescriptions for pain killers, muscle relaxants, anti-inflammatory agents, and other medications used to reduce or eliminate pain or discomfort; and recommendations regarding bed rest, weight loss, and physical activities (n = 170).	
		Meade 1990	Chiropractic care: at the discretion of the chiropractor for a maximum of 10 treatments over one year. The treatments were intended to be concentrated within the first 3 months (n = 384).	Physiotherapy care: within hospital outpatient clinics (n = 357).	
		Petersen 2011	Chiropractic care: all type of manual technique including SMT and myofascial trigger-point massage at the discretion of the chiropractor for a maximum of 15 treatments in a 12 weeks period. Mobilizing exercises, alternating lumbar flexion/ extension movements, and stretching, were allowed (n = 175).	Physical therapy care: according to the McKenzie treatment protocols. An educational booklet about self care or a 'lumbar roll' for the seated posture were sometimes provided to the patient (n = 175).	



Study	Methodology			Results		Appraisal					
Authors	<u>Objective</u>	Outcome measures									
Rubinstein et al	To assess the benefits and harms of spinal manipulative	Pain, Function									
<u>Title</u>	therapy (SMT) for the treatment	Effectiveness (see table bel	ow)								
Spinal manipulative	of chronic low-back pain	SMT produces similar effect	ts as recommended ther	rapies for chronic low-back pain,	while SMT appears to be better than						
therapy for the	Number of studies	non-recommended interver	on-recommended interventions for short-term improvement in function. SMT appears to be an effective option for the								
treatment of chronic	47	treatment of chronic LBP ar	eatment of chronic LBP and should be considered for inclusion in clinical guidelines.								
low-back pain:	Type of studies	Adverse effects/safety									
systematic review and	RCTs	Given limitations in the avai	Given limitations in the available studies, the incidence of adverse events following SMT for this population cannot be								
meta-analysis of	Intervention/dosage	accurately determined	accurately determined								
randomized controlled	*see table		1			_					
trials		Study Chronicity of Treatment dosage Compared to other									
<u>Year</u>	Practitioner qualifications and background		NSLBP		treatments						
2019	Non-specific	Bronfort 2011	Chronic	12 wks	Function (1,3,6,12 mth) NSD	1					
Study type	Chiropractor (n=16), Physical therapist (n=14), osteopath				Pain (1,3,6,12 mth) NSD						
Systematic	(n=5), Doctor (n=6), bone-setter (n=2), naprapth (n=2)	Bronfort 1996	Chronic	10 Rx over 5 wks	Function (1,3 mth) NSD	1					
review/Meta-analysis					Pain (1.3 mth) NSD						
		Dougherty 2014	Chronic	8 Rx over 4 wks	Function (1.3.6 mth) NSD	-					
					Pain (1.3.6 mth) NSD						
		Gudavalli 2006	Chronic	16 Bx over 4 wks	$\frac{1}{1} = \frac{1}{1} = \frac{1}{2} = \frac{1}$	-					
					Pain (1.6 mth) SD						
					Pain $(3, 12 \text{ mth})$ NSD						
		Haas 2014	Chronic	6 - 18 By over 6 wks	$\frac{1}{1} \frac{1}{1} \frac{1}$	-1					
			Childhie		Function (3 mth) SD						
					Pain (1.3 mth) SD						
					$P_{ain} (6, 12 \text{ mth}) \text{ NSD}$						
		Hondras 2009	S/A - chronic	12 By over 6 wks	Function (1, 3, 12 mth) SD	-					
		101010133 2005	S/A - Chi Ohic	12 IX OVELOWKS	Function (6 mth) NSD						
		Heigh 2002	S/A chronic	0 By over 2 wks	Function (1 6mth) NSD	-					
		Tisien 2002	5/A - Chi Ohic	3 RX OVEL 3 WKS	Pain (1, 6mth) NSD						
			A 11	Not reported	Function (1, 6, 12mth) NCD	-					
			All	Not reported	Function (1, 6, 12mth) NSD						
		Mullar 2005	Character	Not you out oil	Pain (1, 6, 12mth) NSD	-					
		Muller 2005	Chronic	Not reported	Function : Not reported						
					Pain Not reported	_					
		Petersen 2011	Chronic	15 Rx over 12 wks	Function (3mth) NSD						
					Function (6,12mth) SD**						
					Pain (3, 6, 12mth) NSD	4					
		Pope 1994	S/A - chronic	3 Rx over 3 wks	Pain (1mth) NSD	4					
		Postacchini 1988	Chronic	12 Rx over 6 wks	Not reported	_					
		UK BEAM trial 2004	S/A - chronic	8 Rx over 12 wks	Function (1,3,12 mth) NSD						



Study	Methodology					Results			Appraisal
							Pair	n (1,3,12 mth) NSD	
		Waagen 19	86	S/A - chro	onic	6 Rx over 2 wks	Not	reported	
		Walker 201	3	Acute - ch	nronic	2 Rx over 2 wks	Fun	ction (2wks) SD**	
							Pair	n (2wks) SD**	
		Wilkey 200	8	Chronic		16 Rx over 8 wks	Fun	iction (1 mth) SD	
		,					Pair	n (1 mth) SD	
		Xia 2016		S/A - chro	onic	4 Rx over 2 wks	Fun	iction (1 mth) NSD	
							Pair	n (1 mth) NSD	
Authors	Objective	Outcome meas	ures .						SIGN critical
Goertz et al	The primary objective of this paper was to describe the	Visual analogue	scale, n	umerical pain rati	ing scale, Rol	and-Morris Disability C	Questionnaire,	and the Oswestry Low Back Pain	appraisal
<u>Title</u>	current literature on patient- centered outcomes in	Disability Index							grade:
Patient- centered	randomized controlled trials of HVLA SM in patients with low	Effectiveness							10(1)
outcomes of nign-	back pain.	we found that i	HVLA SIV	for LBP appears	to convey a s	small but consistent tre	eatment effect	at least as large as that seen in	AQ (+)
velocity, low-amplitude	Number of studies	other	othoda a	f caro. This findin	a ic cimilar t	a that in other systema	tic rovious of	SM of LPD. The beterogeneity and	
low back pain: a	So Tuno of studios	inconsistancy in	roporti	n care. This findin	g is similar u	d makos it difficult to di	raw dofinitivo	sonclusions or adoquately	
systematic roviow		summarizo	reporti	ing within the stut					
Voar	Intervention/docage	nationt-contore	d outco	mes for clinical tri	als of HVI A 9	SM for LBP			
2012	*see table	*no further sne	cific chir	opractic conclusio	ais 01 11 v LA . ans	DIVITOR EDF.			
Study type	Practitioner qualifications and background	Adverse effects	/safety		5115				
Systematic review	Doctor of Chiropractic (DC) in addition to physical therapist.	Not specified	Jourcey						
o you change of the first of th	osteopath, Primary Medical Care	*Chiropractic sp	pecific in	terventions					
		Study	N=	SM	Exp.	Comparison	Outcome	Result	
				frequency	Group &		measure		
					provider				
		Bishop et al	88	2-3 trts/4 wks	SM +	Primary Medical	RMDQ	RM: SMT > MD in short and	
		2010	474	10 10 10 10 10	Exercise	Care	SF-36	long term	
		Bronfort et	174	10 trts/5 wks	SIVI +	1) SM + Stretching	RMDQ	NRS : SMT > MD in short	
		ai 1996			overcise	2) Primary Medical	INKS	No Sig Dif in long term	
					DC	Care		RM : SMT > MD in short term	
					20	ou.c		No Sig Dif in long term	
		Bronfort et	301	1-2 trts/wk	SM only	1) Supervised	NRS	NRS : SMT > sup exercise in	
		al 2011		for 12 wks	DC .	Exercise	Modified	short term	
						2) Home Exercise	RDMQ	SMT < unsupervised exercise	
						and Advice	SF-36	in short term	
								No Sig Dif in long term	
								RM : SMT > sup exercise in	
								short and term	



Study	Methodology	Results						Appraisal	
								SMT < unsupervised exercise in short term No Sig Dif in long term	
		Cherkin et al 1998	321	up to 9 trts/4 wks	SM only DC	1) PT 2) Educational booklet	RMDQ	RM: SM> PT and Booklet in short and long term	
		Cramer et al 1993	21	3-5 trt/10 days	SM only DC	1) Ultrasound, cold pack and gentle massage	OSW VAS	VAS : SMT > Ultrasound in ST No Sig Dif in long term OSW: SMT > Ultrasound in ST No Sig Dif in long term	
		Giles et al 2003	115	2 trts/wk for 9 wks	SM only DC	 Primary Medical Care Needle Acupuncture 	OSW VAS	<u>VAS :</u> SMT > MD and Acupuncture in short term No Sig Dif in long term	
		Giles et al 1999	77	6 trts in a 3-4 wks	SM only DC	1) Primary Medical Care 2) Acupuncture w/ low volt	OSW VAS	VAS : SMT > MD and Acupuncture in short term No Sig Dif in long term <u>OSW</u> : SMT > MD and Acupuncture in short term No Sig Dif in long term	
		Hoiriis et al 2004	192	3 trts/2 wks	SM + MD (placebo) DC	1) Muscle Relaxants and Sham Treatments 2) Medical Placebo and Sham Rxs	VAS OSW	VAS : SMT > MD+ sham SMT in short term and long term <u>OSW</u> : SMT > MD+ sham SMT in short term and long term	
		Hondras et al	240	Max 12 trts/6 wks	SM only DC	1) Flexion- Distraction 2) Minimal Conservative Medical Care	RMDQ Secondary: VAS SF-36	VAS: SMT > mobilization in short term SMT < MD om short term No Sig Dif in long term <u>RM:</u> SMT = mobilization and MD in short and long term	
		Hsieh et al 2002	200	3 trts/3 wks	SM + PT DC	1) Combined SM + Myofascial Therapy 2) ''Back to School 3) Myofascial Therapy	VAS RMDQ	VAS : SMT < myofascial in short term SMT < back school in short term SMT < myofascial in long term RM: SM = backschool and myofascial in short and long term	
		Hsieh et al 1992	63	3 trts/3 wks	SM + PT DC	 Massage Corset Transcutaneous 	OSW RMDQ	<u>RM</u> : SM > corset, massage and TMS in short term No Sig Dif in long term	



Study	Methodology					Results			Appraisal
						Stimulation (TMS)		OSW: SM > corset, massage and TMS in short term No Sig Dif in long term	
		McMorland et al 2010	40	2-3 trts - 1st 4 wk; 1-2 trts/wk next 3-4 wks; at 8 wks with trt PRN	SM + PT DC	Surgical Microdisketomies	SF-36 RMDQ	<u>RM</u> : SM > surgery in short and long term	
		Meade et al 1990	741	Max of 10 trts within 3 mos to 1 yr	SM only DC	Primary Medical Care	OSW	OSW: SMT= MD in short and long term	
		Skargren et al 1997	323	Not specified	SM + MT + Other DC	PT (mobilization + other)	OSW	OSW: SMT =MD in short and long term	
		Wilkey et al 2008		Max of 16 over 8 wks	SM + MT DC	Primary Medical Care	NRS RMDQ	NRS: SMT > Pain clinic in short term No Sig Dif in long term RM: SMT > Pain clinic in short term No Sig Dif in long term	
		Key: mos – mon Spinal Manipula	iths; ME ition; tri) – Primary Medic ts – treatments; y	al Care; MT - r – year.	– Manual Therapy; NS	– Not Specifiec	l; PT – Physical Therapy; SM –	
Authors Oakley et al <u>Title</u> Restoring lumbar	Objective To systematically review controlled trial evidence for the use of lumbar extension traction by Chiropractic BioPhysics [®] methods for the purpose of increasing lumbar lordosis in	Outcome mease Pain intensity & Effectiveness Trials demonstr	<u>ures</u> disabili ated inc	ty (Oswestry disa reases in radiogra	bility index). aphic measu	red lordosis of 7–11°, c	ver 10–12 wee	eks, after 30–36 treatment	SIGN critical appraisal grade:
lordosis: a systematic review of controlled trials utilizing Chiropractic Bio Physics	those with hypolordosis and low back disorders. <u>Number of studies</u> 4 citations (3 trials) 120 intervention patients	sessions. Randomized trials demonstrated traction treated groups mostly maintained lordosis correction, pain relief, and disability after 6 months follow-up. The non-randomized trial showed lordosis and pain intensity were maintained with periodic maintenance care for 1.5 years. Importantly, control/comparison groups had no increase in lumbar lordosis. Randomized							AQ (+)
(CBP) non-surgical approach to increasing lumbar lordosis in the treatment of low back	102 controls <u>Type of studies</u> RCT and non-RCT <u>Intervention/dosage</u>	trials showed comparison groups receiving physiotherapy-less the traction, had temporary pain reduction during treatment that regressed towards baseline levels as early as 3 months after treatment Both RCTs demonstrated that rehabilitation programs that include lordosis restoration by LET show better long-term (6- month) outcomes versus patients receiving 'cookie-cutter' physiotherapy treatments that included hot packs (15 minutes)							
alsorders Year <u>2020</u> Study type Systematic review	10–12 weeks, after 30–36 treatment sessions Incorporating supine LET. Lumbar extension traction (LET) is classically a type of 3-point bending load application (Fig. 2). As described by Harrison21).	and interferenti and hamstring r <u>Adverse effects</u> Not specified	al thera nuscles] /safety	py (20 minutes)) :).	as well as inf	rared radiation (15 mir	nutes) and exe	rcises for the quadratus lumborum	
<u>oyeconidio</u> retteur	to achieve the 3-point bending, a padded strap is placed								



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Study	Methodology	Results	Appraisal
	under the subject's low back at the level most deviated from		
	normal/ideal alignment (sitting and standing positions are		
	also possible). This 'pulling strap' is placed under tension (to		
	patient's tolerance) and is a transverse force. When supine,		
	the weight of the body provides the second (upper) point in		
	the		
	3-point bending, overwise a strap is placed across the chest		
	pulling posteriorly (for seated and standing positions). The		
	third point of the 3-point bending is a strap placed at the level		
	of the femur heads, which allows the pelvis to rotate over the		
	femur heads. Typically, this traction is maintained for 10–20		
	minutes.		
	Practitioner qualifications and background		
	Not specified		

Part 2 : Lower Limb Conditions

Study	Methodology	Results	Appraisal
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Espí-López GV, Arnal-	To conduct a review of randomized controlled trials (RCTs) to	Pain: VAS	appraisal
Gómez A, Balasch-	determine the treatment effectiveness of the combination of	Function: AKPS	grade:
Bernat M, Inglés M	manual therapy (MT) with other physical therapy techniques.	Patient satisfaction: PSS	
<u>Title</u>	Number of studies	Effectiveness	AQ (+)
Effectiveness of Manual	N=5	Both interventions improved knee function in both the short-term (immediately after treatment) and mid-term (2 months)	
Therapy Combined With	Type of studies	follow-ups. In the local treatment group, pain decreased (1.0 cm, P = .41) in the short term (post-treatment), whereas in	
Physical Therapy in	RCTs with an acceptable methodological quality (Jadad \geq 3)	the full kinetic chain group, pain decreased (about 1.5 cm, P = .21) at the mid-term follow-up (2 months after treatment)	
Treatment of	were selected.	Adverse effects/safety	
Patellofemoral Pain	Intervention/dosage	Few reported mild adverse reactions (ie, 1 in group A, 3 in group B) such as stiffness, soreness, and weakness after	
Syndrome: Systematic	Clinical trials were considered if they included adult patients	treatment. There were no reports of serious adverse reactions.	
Review	(≥18 years old) diagnosed with PFPS by an experienced		
Year	practitioner based on clinical examination (pain and orthopedic		
2017	tests) with any level of physical activity, and if they included MT		
Study type	techniques and physical therapy approaches.		
Systematic Review	Brantingham et al (2009) assessed short-term and mid-term		
	outcomes of 2 different chiropractic interventions. The study		
	included a local treatment group and a full kinetic chain group.		
	Intervention was applied 1 to 3 times per week for 2 to 6		
	weeks; participants received a total of 6 sessions each.		
	Practitioner qualifications and background		
	Brantingham et al (2009) was the only study where MT was		
	delivered by chiropractors		



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Part 3 : Upper Limb Conditions

Study	Methodology	Results					
Authors	Objective	Outcome measur	<u>es</u>			SIGN critical	
Brantingham JW,	To complete a systematic review of manual and manipulative	Any				appraisal	
Cassa TK, Boddefin	therapy (MMT) for common upper extremity pain and	Effectiveness				grade:	
D,Pribicevic M, Robb A	disorders including the temporomandibular joint (TMJ)	Chiropractic speci	fic results below				
Pollard H, Tong V	Number of studies	Chudu	Church i trimo	Condition	Decult	AQ (++)	
Korporaal C.	35 RCTs, 4 controlled trials, 32 case series, reports and/or	Study	Study type	condition	Result		
<u>Title</u>	single-group pre-test post-test prospective case series of which	Krenner 2005	Case study (n=2)	impingement	improving function in 6 treatments		
ivianipulative and	4 RCIS, 1 retrospective case series and 7 Case studies were			syndrome			
upper extremity and	Type of studios	Murphy 2012	retrospective case	shoulder adhesive	CMT improved pain and function		
temporomandibular	All study designs		series (n=50)	capsulitis	civit improved pair and function		
disorders: a systematic	Intervention/dosage	Charles 2011	Case studies (n=1)	nourogonio chouldor	CMT improved pain and function in 12.19		
review	Any manual and manipulative therapy	Charles 2011,	Case studies (n=1)	neurogenic shoulder	Civil Improved pain and function in 12-18		
Year		Daub 2007		pain	treatments		
2013		Langen-	RCT	Lateral epicondylitis	CMT effective in reducing pain and improving		
Study type		Peters 2003			function but not as effective as ultrasound.		
Systematic Review		Blanchette	RCT	Lateral epicondylitis	 ART effective in reducing pain and improving 		
		2011			function but no more effective than usual care		
		Radpasand	case study (n=1)	Lateral epicondylitis	CMT improved pain and function after 7 trootmonts		
		2005	DOT	Consultantial			
		Burke 2007	KC1	Carpai tunnei	Graston Instrument-assisted mobilization offective but no better than manual STM for		
				Synuronne	noin and function		
		Davis 1998	PCT	Carnal tunnol	CMT of the soft tissues and henvioints of the		
		Davis 1998	NC1	Syndrome	• Civit of the soft tissues and bony joints of the		
				Synaronic	week for 2 wk, 2 treatments/ week for 3 wk and		
					one treatment/week for 4 wk), ultrasound over		
					the carpal tunnel and nocturnal wrist supports		
					no better than usual care		
		De Leon et al	Case studies	Carpal tunnel	 CMT and ART improved pain and function in 8 – 		
		2002,		Syndrome	15 treatments		
		Cradt et al					
		2011,					
		George et al					
		2006					
		Adverse effects/s not reported	afety				



Study	Methodology	Results	Appraisal
Authors Minkalis AL, Vining RD, Long CR, Hawk C, de Luca K Title A systematic review of thrust manipulation for non-surgical shoulder conditions Year 2017 Study type SR	Objective To investigate one manual therapy approach, thrust manipulation, as a treatment option for shoulder conditions Number of studies 6 Type of studies 4 RCT and 2 CT Intervention/dosage Study: Thrust manipulation directed to the shoulder and/or regions of the cervical or thoracic spine to a participant with a shoulder condition with a defined primary diagnosis Munday et al (2007): Group A (n = 15): detuned ultrasound, Group B (n = 15): thrust manipulation (AC joint or GH joint; if necessary, scapula or ribs) 8 treatments in 3 weeks Practitioner qualifications and background The qualifications of the practitioners were not reported. The articles were screened with 5 of the interventions being provided by physical therapist and 1 by chiropractor. Only Munday et al (2007) is analysed in the results section. Munday received a 4/10 Pedro score. Kardouni et al 2015 – physical therapist Kardouni et al 2015 # 1 – physical therapist Haik at al (2014) – physical therapist Munday et al (2007) – chiropractors Boyles et al (2009) - physical therapist	Outcome measures • VAS (100 mm) • SFMPQ Effectiveness • VAS • Pre-post mean change within groups: group A, -29.17 (p ≤ .05); group B, -27.24 (p ≤ .05) • Mean differences between groups: -9.1 (p = .019) • SFMPQ • Pre-post mean change within groups: group A, -10.77 (p ≤ .05); group B, -24.01 (p ≤ .05) • Mean differences between groups: -8.4 (p = .005) Adverse effects/safety Munday et al (2007) reported 5 incidents of minor and temporary soreness post-treatment.	SIGN critical appraisal grade: HQ (++)
Authors	Objective	Outcome measures	SIGN critical
Pribicevic M, Pollard H, Bonello R, de Luca K. <u>Title</u> A systematic review of manipulative therapy for the treatment of shoulder pain <u>Year</u> 2010 <u>Study type</u> SR	To discuss the evidence for manipulative methods of management of shoulder pain and chiropractic management techniques used within the literature. <u>Number of studies</u> 30 <u>Type of studies</u> 4 RCT, 4 case series, 22 case reports <u>Intervention/dosage</u> Treatment performed by a registered practitioner of chiropractic, physiotherapy or medicine Treatment was typical of the profession and included manipulative thrust technique <u>Practitioner qualifications and background</u> Part A Inclusion criteria included:	 Predetermined outcome measures were a specified inclusion criterion. <u>Effectiveness</u> The evidence for chiropractic management of shoulder pain is limited to low level evidence in the form of case reports and case series and 1 small controlled trial (Munday 2007). See above. There is a need for more well-designed, trials investigating multi-modal chiropractic management for shoulder pain. <u>Adverse effects/safety</u> NR 	appraisal grade: LQ (-)



Authors	 the studies provided a detailed description of the treatment intervention with the treatments performed by a registered practicing chiropractor the treatments rendered were performed by a registered chiropractor only Part B Studies where the treatment was provided by a physiotherapist or medical professional were included Only studies that described a high velocity or manipulative thrust technique of the shoulder were included. 		
de Almeida AC Racilio	To review the scientific literature the effects of chiropractic in	Visual digital pair scale	annraisal
ER do Silvo PMV	nations with frozenshoulder	 Visual digital path scale, Eurotional choulder limitation assessment questionnaire (DASH and Murley constant) and 	appraisai grado:
Title	Number of studies	Strength evaluation (System 3, Biodex Medical Systems, New York)	graue.
Effects of chiropractic in	3	Effectiveness	10 (-)
patients with shoulder	Type of studies	• FDM is an effective modality with rapid onset of action and acceptable secondary effects, superior to conventional	
adhesive capsulitis	3 RCT – Only 1 RCT was performed by Chiropractors	manual therapy	
(frozen shoulder):	Intervention/dosage	Adverse effects/safety	
review article	FDM X Conventional manual procedures	NR	
Year	2 weeks, 2 times a week, during 20 minutes over 6 weeks		
2016	Practitioner qualifications and background		
Study type	Not reported		
SR Authors	Objective	Outcome measures	SIGN critical
Huisstede BM Hoogyliet	<u>Objective</u>	Hand function	annraisal
P. Randsdorp MS.	effectiveness of nonsurgical interventions for treating carpal	Effectiveness	grade:
Glerum S, van	tunnel syndrome (CTS).	No significant differences on hand function between chiropractic treatment and medical treatment at 13 weeks of	Branci
Middelkoop M, Koes BW	Number of studies	follow-up.	HQ (++)
<u>Title</u>	20		
Carpal Tunnel	Type of studies	Adverse effects/safety	
Syndrome. Part I:	Only 1 RCT was performed by Chiropractors	NR	
Effectiveness of	Intervention/dosage		
Treatments-A	manual thrusts, myofascial massage and loading, ultrasound,		
Systematic Review	and nocturnal wrist splint) vs medical treatment (ie, ibuprofen		
Year	and wrist splint)		
2010	Practitioner qualifications and background		
Study type			
SR			



Part 4 : General musculoskeletal conditions, Temporomandibular joint

Study	Methodology	Results	Appraisal
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Ernst E, Posadzki P	To assess the effectiveness of chiropractic interventions for the	Display efficacy through the use of a clinical outcome	appraisal
<u>Title</u>	treatment and/or prevention of sports injuries.	Effectiveness	grade:
Chiropractic for the	Number of studies/Type of studies	 One RCT and two CCTs suggested that chiropractic was an effective treatment for sports injuries 	
prevention and/or	4RCTs and 2CCTs	- Two RCTs indicated that there was no difference between chiropractic and control groups in the treatment of	
treatment of sports	The methodological quality of the included RCTs was poor, with	sports injuries	AQ (+)
injuries: A systematic	Jadad scores ranging between zero and three	 One RCT suggested that chiropractic was not effective for the prevention of sports injuries 	
review of controlled	Intervention/dosage	 Few rigorous trials have tested the effectiveness of chiropractic manipulation for the treatment and/or 	
clinical trials.	Receive chiropractic care from a registered chiropractor with	prevention of sports injuries	
Year	comparison to a control group.	Adverse effects/safety	
2012	Practitioner qualifications and background	NR	
Study type	Limited to chiropractic care		
SR			
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Hawk C, Schneider MJ,	To update evidence-based recommendations on the	 We did not specify outcomes in great detail because we intended only to summarize relevant findings 	appraisal
Haas M, Katz P,	best practices for chiropractic care of older adults	 Actual outcomes included changes in pain, function, and/or quality of life. 	grade:
Dougherty P, Gleberzon	Number of studies/ Type of studies	Effectiveness	
B, Killinger LZ, Week J	6 articles about effectiveness or efficacy	- A high-quality RCT found that, although spinal manipulation did not result in greater reduction in pain than sham,	AQ (+)
<u>Title</u>	- 3 RCT	disability was slightly more improved at 12 weeks	
Best Practices for	- 2 cohort	- One low-quality and 1 medium-quality RCT found improvements in pain among older adults receiving manipulation	
Chiropractic Care for	- 1 SR	 Two high-quality cohort studies found that, although Medicare users of chiropractic care had a slightly increased risk 	
Older Adults: A	6 on safety	for declines in lower body function and self-rated health, chiropractic use was protective against 1-year decline in all	
Systematic Review and	- 2 RCT	outcomes, and users were satisfied with their care	
Consensus Update	- 2 cohort	 A fair-quality systematic review found insufficient evidence for the effect of manipulation on balance and falls 	
	- 1 case series	Adverse effects/safety	
Year	- 1 NR	 A 2015 systematic review stated: 'We found no evidence for a causal link between chiropractic care and CAD 	
2017	Intervention/dosage	[cervical artery dissection]'	
SR	Chiropractic care vs a comparison group Practitioner qualifications and background	 A 2015 case-control study found no significant association between the risk of vertebrobasilar artery (VBA) stroke and use of chiropractic 	
-	Chiropractic care	- A 2014 review found no epidemiologic studies demonstrating an association between cervical manipulation and	
		internal carotid artery (ICA) dissection	
		- A 2015 study indicated that 'maximal ICA strains imparted by cervical spinal manipulative treatments were well within	
		the normal ROM' and did not cause strains in excess of those experienced with normal everyday neck movements	
		- A 2014 study suggested that vertebral artery (VA) strains during global head and neck movements, including spinal	
		manipulation, were considerably smaller than published VA failure strains	
		- A 2014 biomechanical study found no significant changes in blood flow in the vertebral arteries of healthy young	
		adult males after cervical spine manipulations	
		 A 2014 statement from the American Heart Association suggested that patients should be informed of the risk of 	
		cervical arterial dissection prior to undergoing manipulation of the cervical spine	



Study	Methodology	Results	Appraisal
		 A systematic review on the incidence of serious adverse events following lumbopelvic spinal manipulative therapy found only anecdotal cases (including cauda equina and disc herniation), so causation cannot be inferred. Similar risks of adverse events occur with exercise compared with manual therapy; risk is lower comparing manual therapy with drugs 	
Authors	Objective	Outcome measures	SIGN critical
Huggins T, Boras AL, Gleberzon BJ, Popescu M, Bahr LA	To conduct a systematic review of the literature investigating clinical outcomes involving the use of the Activator Adjusting Instrument (AAI) or Activator Methods Chiropractic Technique	Use some type of outcome measure for determining the effect of chiropractic care [i.e. Visual Analogue Scale (VAS), Numerical Pain Rating Scale (NPRS), Neck Disability Index (NDI), Oswestry Disability Index (ODI), McGill Pain Questionnaire, range of motion, algometer/goniometer devices]	appraisal grade:
Title	(AMCT)	Effectiveness	AQ (+)
Clinical effectiveness of	Number of studies	- 8 clinical trials involving the use of the AAI found reported benefits to patients with spinal pain and trigger points,	
the activator adjusting	N=8	although these results were not statistically significantly different when compared to the use of HVLA manual	
instrument in the	Type of studies	manipulation or trigger point therapy.	
management of	5 – RCT	- Clinically meaningful improvements were documented in patients with acute and chronic low back or SIJ pain, acute and	
musculoskeletal	1 - CT	subacute neck pain, TMJ disorders and trigger points in the trapezius muscle	
disorders: a systematic	2 - CS	Adverse effects/safety	
review of the literature	Intervention/dosage	To date, no experimental or clinical evidence exists that the use of instrumented adjusting demonstrates a better safety	
Year	Had an Activator Adjusting Instrument (AAI) experimental	profile compared to manual manipulation with respect to serious adverse events (i.e stroke) in patients with identified or	
2012	group and an AMCT control group	unidentified vascular risk factors, since manual manipulation has not been conclusively linked to the incidence of stroke at	
Study type	Practitioner qualifications and background	all	
SR	Treatments must have been administered by a qualified		
Authous	chiropractor		
Autnors Karmali A. Malizada A	<u>Objective</u>	<u>Outcome measures</u>	SIGN Critical
Stubor K	offects of IASTM on poin intensity in the treatment of	Scale (VIS) Numeric Data Seventy as an outcome measure using instruments including but not inmited to the Visual Analog	appraisai
Title	musculoskolotal conditions	Scale (VAS), Numeric Pain Nating Scale (NPKS), Verbai Nating Scale (VKS).	graue.
The efficacy of	Number of studies /Type of studies	- All 5 of studies compared IASTM to a pop-IASTM group demonstrated a statistically and clinically significant (pr/0.05)	AO (+)
instrument-assisted soft	A total of 5 randomized controlled trials and 1 controlled clinical	 All 5 of studies of particulation of a non-restriction group demonstrated a statistically and chincary significant (p-0.05) reduction in pain within the IASTM groups 	λα(')
tissue mobilization for	trial were included	- Four of the 6 studies demonstrated a statistically significant (n<0.05) difference between groups	
musculoskeletal pain: a	Intervention/dosage	- In Brantingham et al (28) the average decreases in VASworst scores for both groups A and B were statistically	
systematic review	The Graston technique was reported as being the specific	significant, 19.5mm and 19.1mm, respectively	
Year	technique utilized in all studies in the experimental group.	- At the sixth treatment Group A showed statistically significant improvement in VAS-usual scores, but Group B did not	
2019	Five of the 6 studies compared IASTM to a non-IASTM group	- At the 2-month follow-up, the decrease in VAS-usual was statistically significant for group B (mean of 14.8mm), but	
Study type	Practitioner qualifications and background	not for group A (mean of 7.6mm)	
SR	Study by Brantingham et al reported the intervention being	- VAS-worst average changes were statistically significant and clinically meaningful for both groups at the 2-month	
	performed by a chiropractor. They others did not state the	follow-up, reporting a mean decrease of 20.4mm and 27.3mm in groups A and B, respectively	
	qualifications of the therapist	- No significant difference was detected between groups from baseline to the 2-month follow up.	
		Adverse effects/safety	
		NR	
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Axen I, Hestbaek LH, and	to investigate its clinical usefulness and cost-effectiveness	• Pain	appraisal
Leboeuf-Yde C	of chiropractic maintenance care	• Disability	grade:
<u>Title</u>		Effectiveness	
	Number of studies	Low levels of evidence considered in review	AQ (+)



Study	Methodology	Results	Appraisal
Chiropractic	14	No studies were found on the cost-effectiveness of maintenance care	
maintenance care -	Type of studies	Maintenance care can be considered an evidence-based method to perform secondary or tertiary prevention in	
what's new? A	4 – RCT	patients with previous episodes of low back pain, who report a good outcome from the initial treatments. However,	
systematic review of the	4 – Survey	these results should not be interpreted as an indication for maintenance care on all patients, who receive	
literature	3 – observational	chiropractic treatment	
Year	1 – observation in clinic	• Four studies investigating the effect of chiropractic maintenance care were identified, with disparate results on pain	
2019	1 – workshop	and disability of neck and back pain.	
Study type	1 – interview	Adverse effects/safety	
SR	Intervention/dosage	NR	
	Chiropractic care for preventive or maintenance purposes		
	Practitioner qualifications and background		
	Chiropractor		

Safety and Risk

Study	Methodology	Results	Appraisal
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Carnes D, Mars TS,	To explore the incidence and risk of adverse events with manual	Adverse events reported	appraisal
Mullinger B, Froud R,	therapies.	Effectiveness	grade:
Underwood M	Number of studies/Type of studies	- The incidence estimate of proportions for minor or moderate transient adverse events after manual therapy was	
<u>Title</u>	Eight prospective cohort studies and 31 manual therapy RCTs	~41% (Cl 95% 17–68%) in the cohort studies and 22% (Cl 95% 11.1–36.2%) in the RCTs	AQ (+)
Adverse events and	were accepted	- for major adverse events ~0.13%.	
manual therapy: A	Intervention/dosage	- The pooled relative risk (RR) for experiencing adverse events with exercise, or with sham/ passive/control	
systematic review	Manual therapies only; administered by regulated therapists; a	interventions compared to manual therapy was similar, but for drug therapies greater (RR 0.05, CI 95% 0.01–0.20)	
Year	clearly described intervention; We performed a meta-analysis	and less with usual care (RR 1.91, Cl 95% 1.39–2.64).	
2010	using incident estimates of proportions and random effects	Adverse effects/safety	
Study type	models.	Classification:	
SR	Practitioner qualifications and background	Major: medium to long term; moderate or severe intensity	
	Registered health professional, not limited to chiropractors	Moderate: medium to long term; moderate intensity	
		Minor: short term and mild intensity	
		- Nearly half of patients after manual therapy experience adverse events that are short-lived and minor; most will occur	
		within 24 h and resolve within 72 h.	
		- The risk of major adverse events is very low, lower than that from taking medication.	
		- We suggest that risk is inherent in all health interventions and should be weighed against patient-perceived benefit	
		and alternative available treatments.	
Authors	Objective	Outcome measures	SIGN critical
Ernst E	To summarise all cases in which chiropractic spinal	Death	appraisal
<u>Title</u>	manipulation was followed by death	Effectiveness	grade:
Deaths after	Number of studies	- Twenty six fatalities were published in the medical literature and many more might have remained unpublished	
chiropractic: a review of	N=23	- The time between treatment and death ranged from 1 h to 58 days; in 10 cases, it was 1 day or less.	LQ (-)
published cases	Type of studies	- The alleged pathology usually was a vascular accident involving the dissection of a vertebral artery	
<u>Year</u>	Case reports and series	- Chiropractors are more frequently associated with serious manipulation related adverse effects than osteopaths,	
2010	Intervention/dosage	physiotherapists, doctors or other professionals.	
Study type	Chiropractic spinal manipulation	- The risks of chiropractic neck manipulations by far outweigh their benefits. Healthcare professionals should advise the	
SR	Practitioner qualifications and background	public accordingly	
	Limited to evidence for chiropractic manipulation only	Adverse effects/safety	
		- Death	
		- Many incidences have gone unreported	
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Gorrell LM, Engel RM,	to describe the extent of adverse events reporting in published	Adverse event	appraisal
Brown B, Lystad RP	RCTs involving SMT, and to determine whether the quality of	Effectiveness / Adverse effects/safety	grade:
<u>Title</u>	reporting has improved since publication of the 2010	- The proportion of trials reporting on adverse events was greater for post-CONSORT articles (50.0%) than for pre-	
The reporting of adverse	Consolidated Standards Of Reporting Trials (CONSORT)	CONSORT articles (32.3%)	AQ (+)
events following spinal	statement.	 This difference in proportions was statistically significant (17.7% [95%CI: 6.5%, 29.0%]; p=.002) 	
manipulation in	Number of studies	- Of the 140 trials reporting on adverse events, only 35 articles (9.5%) reported on all classifications of adverse events.	
randomized clinical	368 were eligible	- The most frequently reported adverse event classifications were 'no adverse events experienced during the trial'	
	140 reported an adverse event	(n=67)	



Study	Methodology	Results	Appraisal
trials—a systematic	Type of studies	- "mild adverse events" (n=61)	
review	RCTs	 "major adverse events" were reported in two articles only 	
<u>Year</u>	Intervention/dosage	- Qualitatively, the most commonly reported adverse events were described as mild and transient muscle soreness and	
2016	Patient undergone SMT	stiffness, aggravation of symptoms or increase in pain, dizziness or weakness, irritability or crying (pediatric	
Study type	Practitioner qualifications and background	population), paresthesia, and fatigue.	
SR	55% of SMT was provided from chiropractors	- Onset and duration of adverse event were reported in 41 (29.3%) and 36 (25.7%) articles, respectively.	
		- The frequency of the practitioner providing SMT was as follows: chiropractor 77 (55.0%), physiotherapist 42 (30.0%),	
		osteopath 11 (7.9%), naprapath 6 (4.3%), medical practitioner 4 (2.9%), manual therapist 3 (2.1%), physiatrist 1	
		(0.7%), and unknown in 15 (10.7%) articles	
		- there is still a substantial proportion of RCTs that do not uphold the CONSORT recommendations for the reporting of	
		adverse events	
<u>Authors</u>	<u>Objective</u>	Outcome measures	SIGN critical
Kranenburg et al	To identify characteristics of 1) patients, 2) practitioners, 3)	Patient characteristics	appraisal
<u>Title</u>	treatment process and 4) adverse events (AE) occurring after	Practitioner characteristics	grade:
Adverse events	CSM or cervical mobilization.	Treatment characteristics	
associated with the use	Number of studies	Adverse event characteristics	AQ (+)
of cervical spine	144 studies	Effectiveness	
manipulation or	227 cases	144 studies were included, containing 227 cases. 117 cases described male patients with a mean age of 45 (SD 12) and a	
mobilization and patient	Type of studies	mean age of 39 (SD 11) for females. Most patients were treated by chiropractors (66%). Manipulation was reported in 95%	
characteristics: a	Of the included cases:	of the cases, and neck pain was the most frequent indication. Cervical arterial dissection (CAD) was reported in 57% (P ¼	
systematic review	 66.1% were published in case reports 	0.21) of the cases and 45.8% had immediate onset symptoms. The overall distribution of gender for CAD is 55% (n ¼ 71) for	
<u>Year</u>	 28.2% in retrospective case series 	female and therefore opposite of the total AE.	
2017	- 5.7% in surveys	Adverse effects/safety	
Study type	Intervention/dosage	Type of AE	
Systematic review	Manipulation was the most frequently reported technique	- The most commonly reported type of AE was cervical arterial dissection (CAD) (57% of the cases), and this was a	
	(95.2%). In 62.6% of the cases, patients received a non-specified	combination of all reported vascular dissections. The overall distribution of gender for dissections was 55% (n ½ 71)	
	manipulation (i.e. impulse and/or direction was not specified),	for female and 45% (n ½ 58) for male. The most frequently reported specific type of AE was the Vertebral Artery	
	26.9% a rotation manipulation, 2.6% a traction manipulation	dissection. Of all vertebral artery dissections in our sample (53 cases). 65.9% were female and 30 male cases (36.15%)	
	and 3.1% another type of manipulation. In 1.7%, patients were	were counted.	
	treated with mobilizations. For 3.1% of the patients the	Type of signs and symptoms associated with AE (number of cases)	
	technique was not described.	- The most frequently described symptom was a disturbance of control of voluntary movements (104), followed by	
	Practitioner qualifications and background	altered sensation (97), pain (82), paresis (71), visual disturbance (54), nausea, headache (47), vomiting (44), and	
	The majority of patients with reported major AE were treated	vertigo (43)	
	by chiropractors (65.6%). 5.3% by non-clinicians. 4.8% by	Onset of signs and symptoms	
	osteopaths, 3.1% by physical therapists, 2.6% by other medical	- Immediate onset of the signs and symptoms was reported in 45.8% of the cases and of these 53% were male and	
	professions (e.g. general practitioner), 2.2% (½ 5 cases) by self-	47% were female. The majority of symptoms had an onset within 1 week with 84.5% (83.7% Male and 87.2% Female)	
	treatment 0.4% by manual therapists. For 15.9% of the cases	Overall in 2.6% symptoms started within 1a2 weeks and in 1.8% in took more than	
	the profession was not described		
Authors	Objective	Outcome measures	SIGN critical
Carlesso et al	The goal of this systematic review is to synthesize the	The primary outcome was any adverse events (or lack of events) following treatment with MT	annraical
Titlo	יווב הסמו טו נווס סיסובוומנוב ובעופש וס נט סיוונובסובב נווב	The primery outcome was any adverse events (or lack or events) following treatment with init.	appi aisai arado:
		transignt neurological sumptoms increased neck pain/stiffness headache, radiating pain fatigue as other. Deported	graue.
Carlesso et al <u>Title</u>	The goal of this systematic review is to synthesize the	The primary outcome was any adverse events (or lack of events) following treatment with MT. The adverse events were initially grouped into major - death, stroke or permanent neurological deficits and minor- transient neurological symptoms, increased neck pain/stiffness, headache, radiating pain, fatigue or other. Reported	appraisal grade:



Study	Methodology				Results			Appraisal
Adverse events	literature that has reported adverse events related to both	adverse events we	adverse events were abstracted from eligible studies into categories previously recorded as 'common' side effects to spinal					
associated with the use	cervical manipulation and mobilization techniques across	manipulation (Cag	nie et al 2004). 'S	Stroke' and 'other' o	ategories were add	ed to allow for any event t	to be recorded.	
of cervical manipulation	professions at the highest possible level of evidence.	Effectiveness / Ac	verse events					
and mobilization for the	Number of studies	Seventeen of 76 io	lentified citation	s resulted in no maj	or AE. Two pooled e	estimates for minor AE fou	nd transient	
treatment of neck pain	N=17	neurological symp	toms [RR 1.96 (9	5% CI: 1.09 -3.54) p	< 0.05]; and increas	ed neck pain [RR 1.23 (95	% Cl: 0.85-1.77) p	
in adults: A systematic	Type of studies	> .05]. Forty-four	tudies (58%) we	re excluded for not	reporting AE. No de	finitive conclusions can be	made due to a small	
review.	RCT = 14 (6 chiro specific)	number of studies	, weak associatio	on, moderate study	quality, and notable	ascertainment bias.		
Year	Case Series = 3 (2 chiro specific)	*Chiropractor spe	cific intervention	s/studies				
2010	Intervention/dosage					A	Treatment	
Study type	Type of intervention	Study	Participants	Intervention	Comparison	Any adverse	phase	
Systematic review	1) Cervical manipulation was defined as a high velocity, low					outcomes	length	
	amplitude force applied to the cervical vertebrae and	Bronfort et al	Chronic (>12	SMT, light	a. SMT and low-	RR 0.83 95% CI	11 weeks	
	2) Cervical mobilization was defined as lower velocity manual	2001	weeks)	massage	tech exercise	(0.39 - 1.76);		
	forces applied with varying amplitude to the cervical vertebrae	(RCT)	mechanical	for 15 min with	b. High tech	p >0.05		
	or any neuromuscular-based soft tissue techniques (such as		neck pain	45 min of sham	exercise			
	muscle energy or proprioceptive neuromuscular facilitation).		N. 1. 1	microcurrent			10	
	These studies could have MT used alone or in combination with	Evans et al	Neck pain<	SMT, light	a. medical care	Frequencies ranging	12 weeks,	
	other treatments.	2003 (DCT)	12 weeks	massage,	(medication	from 10-90% of neuro	frequency	
	Type of comparison: Placebo, wait list/no treatment control			auvice	h Self-care	symptoms, (neck	by CH	
	group, active treatment control (e.g. manipulation and exercise				education (2-45	other	by ch	
	vs. exercise) or inactive				min sessions	other		
	treatment (e.g. sham ultrasound) were included.				with PT			
	See table for chiro specific*	Haas et al	Neck pain of	SMT specific to	SMT to 'sham'	RR: 1.13 95% CI	1 visit	
	Practitioner qualifications and background	2003	varying	identified level	generated level	(0.47 - 2.69);		
	Chiropractor, Physiotherapist and/or Osteopath	(RCT)	length	of	0	p >0.05		
				restriction				
		Haas et al	Chronic,	SMT once a	a. SMT 3	None occurred	3 weeks	
		2004	cervicogenic	week,	times/week,			
		(RCT)	headache,	+/- 2 modalities	+/- 2 modalities			
					b. SMT 4			
					times/week,			
		11	Nectors	CN 4T to so al	+/- 2 modalities	DD 4 34 05% CL	2	
		HURWITZ	Neck pain of	SIVIT to neck	a. SIVIT, neat	KK- 1.31 95% CI	2 weeks	
			longth	upper thoracic	D. SIVIT, EIVIS,	(1.12 - 1.52); n < 0.05		
					FMS	h 20.02		
					d. Mobs to neck			
					and/or			
					upper thoracic			
					e. Mobs, heat			
					f. Mobs, EMS			



Study	Methodology				Results				Appraisal
					g. Mobs hea	at,			
					EMS			_	
		Rubinstein	Neck pain of	SMT, mobs,	None	Frequencies ranging	3 visits		
		et al 2007	varying	exercise,		from 2.6 to 25.9% of			
		(Case series)	length	modalities,		neuro symptoms,			
				tochniquos		fatigue and other			
		Strunk and	Mechanical	SMT	SMT to tho	RR-150	2 weeks: 1		
		Hondras 2008	neck	51011	muscle ene	rov 95% CL (0.18-12.5)	visits		
		(RCT)	pain >4		musele ene	p >0.05	VISIUS		
		(weeks			p · cicc			
		Thiel et al	Not specified	SMT, uncertain	None	Frequencies ranging	2 visits		
		2007		if		from 0.7 to 1.7% of	within a 6		
		(case series)		other treatment		neuro & radiating	week time		
				occurred		symptoms, \ neck	frame		
						pain, headache and			
						other.			
Authors	Objective	Outcome measure	<u>es</u>						SIGN critical
Church et al	Performing a systematic review and meta-analysis of published	Not specified							appraisal
<u>Title</u>	data on chiropractic manipulation and CAD.	Effectiveness / Ad	verse effects						grade:
Systematic Review and	Number of studies	The meta-analysis	revealed a small	association betwee	n chiropractic	care and dissection (OR 1.74, 9	5% CI 1.26-2.41)). The	
Meta-analysis of	5 in quantitative synthesis	quality of the body	of evidence acc	ording to GRADE cri	teria was "ver	ry low."			LQ (-)
Chiropractic Care and	6 in qualitative synthesis	Sir Austin Bradford	Hill famously ad	dressed the probler	m of assigning	causation to an association with	h the applicatior	n of	
Cervical Artery	Type of studies	nine tests [<u>22</u>]. The	ese criteria incluc	le strength, consiste	ency, specificit	ty, temporality, biological gradie	nt, plausibility,		
Dissection: No Evidence	Case control (2x class II, 4x class III)	coherence, experir	mental evidence,	and analogy. The sp	pecific tests ar	nd our assessment for the associ	ation between o	cervical	
for Causation	Intervention/dosage	manipulation and	CAD In our appra	isal, this association	clearly passe	s only one test, it fails four, and	the remaining for	our are	
Year	Manipulation vs no manipulation	equivocal due to a	bsence of releva	nt data.					
2016	Further details not specified	The quality of the	published literatu	ure on the relations	hip between c	hiropractic manipulation and CA	AD is very low. C	Dur	
Study type	Practitioner qualifications and background	analysis shows a sr	mall association b	petween chiropracti	c neck manipu	ulation and cervical artery dissed	tion. This relation	onship	
Systematic review	Chiropractor	may be explained	by the high risk o	f bias and confound	ling in the ava	ilable studies, and in particular b	by the known		
		association of necl	c pain with CAD a	ind with chiropraction	c manipulatio	n. There is no convincing eviden	ce to support a	causal	
		link between chiro	practic manipula	tion and CAD. Belie	f in a causal lir	nk may have significant negative	consequences s	such as	
		numerous episode	s of litigation						
		Table 1							
		Class II studies		Design	Patients	Number of dissections/VBA str	okes		
		Smith et al 2003		Case control	151	51			
		Dittrich et al 200	7	Case control	94	47			
		Class III studies							
		Rothwell et al 20	01*	Case control	2910	582			
		Cassidy et al 200	8	Case control	3982	818			
		Thomas et al 201	11	Case control	90	47			
		Engelter et al 20	13	Case control	1897	966			



Study	Methodology	Results	Appraisal
		*Cases overlap with Cassidy et al 2008. VBA = Vertebrobasilar accidents	
Authors	Objective	Outcome measures	SIGN critical
Fernando et al	To perform a systematic review of literature on spontaneous	Varied: clinical presentation, opening pressure (L), CT, MRI, CSF leak detection procedure.	appraisal
Title	intracranial hypotension (SIH) secondary to chiropractic	Effectiveness/ Adverse effects/safety	grade:
Acute Subdural	manipulation (CM).	The mean age was 41.6 + 7.8 years [range, 29 – 54] and ten patients (83.3%) were female. All patients presented with	
Hemorrhage as the	Number of studies	orthostatic headache while 5 patients had vomiting (41.7%). Axial tension (n = 6, 50%)4-6,9-11 and rotation (n = 8, 66.7%)	LQ (-)
Initial Presentation of	N=12	were the most common mechanisms of CM.	
Intracranial Hypotension	13 patients	The median time from CM to symptom onset was 24 hours [range, 0 – 168 hours]. However, not all studies specified the	
Following Cervical	Type of studies	onset of symptoms after CM. Only 8 patients had cranial MRI.	
Chiropractic	Case reports and retrospective study	The most common cranial imaging findings were diffuse pachymeningeal enhancement (n¼ 6, 75%), subdural hygroma (n=	
Manipulation: A Case	Intervention/dosage	2, 25%), tonsillar herniation (n = 1, 12.5%) and venous sinus engorgement (n = 1, 12.5%). A spine MRI was done in 7	
Report and Systematic	Most common mechanisms were axial tension and rotation.	patients (58.3%) which revealed extra-axial fluid collections at the epidural space, ventral to the thecal sac. The number of	
Review	Other spinal manipulation therapy techniques included:	affected levels were 2 $[1 - 2]$. Only 7 patients (58.3%) had CSF leak localization procedures such as myelography (n ³ /4) or	
<u>Year</u>	- Rapid rotatory neck manipulation, Rotation and	cisternography (n=2). Five of these 7 patients had CSF leak detected at the thoracic (n = 3), cervical (n = 2) and lumbar (n =	
2021	hyperextension, Rotation and hyperextension, Tension on the	1) levels. Seven patients (58.3%) were initially treated conservatively, with 2 patients eventually receiving an epidural	
Study type	occipital area, posterior nuchal area, and bilateral	blood patch.5,6 Four patients were immediately treated with an epidural blood patch (EBP). Five patients (41.7%)	
Systematic review	Shoulders.	recovered after supportive management. The median time to complete recovery was achieved in 13 days [range, 12 – 14].	
	Practitioner qualifications and background	One patient was given an EBP after 18 days of failed supportive therapy. Two patients who had non-directed EBPs had	
	Chiropractor	complete recovery after the first blood ptch. All cases had complete recovery after one to 3 EBPs.	
		It is essential to note that a history of CM must be actively sought in patients presenting with SIH. A high level of clinical	
		suspicion is necessary as misdiagnoses can cause significant delay and pain to these patients where supportive	
		management is intuitive and successful. Our case highlights that a careful and thorough history is warranted in patients	
		with new onset headache and acute SDH on imaging. The limited evidence from the case report shows that patients with	
		SIH and SDH but with normal neurologic examination and minor spinal pathology may be managed conservatively for less	
		than 2 weeks. This review has shown that conservative treatment in a closely monitored environment may be an	
		appropriate first line treatment.	
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Haynes et al	Our systematic review updates Rubinstein et al (2005) analysis	Not specified	appraisal
<u>Title</u>	for cervical spinal manipulative therapy (cSMT), and aims to	Effectiveness / Adverse effects/safety	grade:
Assessing the risk of	assess the quality of the newer studies in comparison with the	Four case– control studies and one case–control study, which included a case- crossover design, met the selection criteria,	
stroke from neck	earlier ones, as well as to determine whether there is conclusive	but all of them had at least three items in the quality assessment that failed to be completely positive. I wo studies were	AQ (+)
manipulation: a	evidence of a strong association between cSMT and CAD stroke.	assessed to be the most robustly designed, one indicating a strong association between stroke and various intensities of	
systematic review	Number of studies	neck movement, including manipulation, and the	
Year	5 (2 chiropractor)	other suggesting a much-reduced relative association when using primary care practitioners' visits as controls. However,	
2012	Type of studies	potential biases and confounders render the results inconclusive.	
Study type	Case-control studies	Message for the clinic	
Systematic review	Intervention/dosage	Conclusive evidence seems to be lacking for a strong association between neck manipulation and stroke, and	
	Not specified	also appears to be absent for no association.	
	Practitioner qualifications and background	Informed consent should be obtained from patients before neck manipulation is administered, advising them	
	2x Chiropractor	that neck movements, including manipulation, may increase the risk of a rare form of stroke.	
	3x not specified		



Study	Methodology		Results					
		• Pr	Premanipulative screening of vertebral arteries is still warranted, and Doppler ultrasound velocimetry shows					
		рс	potential for this.					
		Chiropractor	studies:	T				
			Practitioner	Overview	Outcomes			
		Rothwell	Chiropractor	Cases were patients with	For those aged < 45 years, a strong measured			
		et al		vertebrobasilar occlusive stroke, of	association was found within 1 week of the stroke,			
		(2001)		whom an unknown proportion	with four cases (3.6%) compared with four controls			
				included VAD cases. Their	(0.9%) [UR crude = 3.94 (95% CI = 0.99– 15.78), (non-parametric bootstrap 95% CI = 0.64–46.28)]			
				spine related visits to	(101-parametric b) = 5.04-40.28			
				chiropractors as a proxy, was				
				compared with age and sex-				
				matched non-stroke controls.				
		Cassidy	Chiropractor	Cassidy et al (25) is an extension	Positive associations, especially with cervical and			
		et al		of the Rothwell et al (21) study	headache related visits, were only observed for			
		(2008)		using similar data, and is a	chiropractic patients aged < 45 years, with 25			
				population- based case-control	cases (24.5%) and 27 controls (6.6%) within 7 days			
				and case-crossover study. They	for general visits. For headache or cervical visits			
				aimed to control contounding due	within 7 days, results in the case–control study			
				VAD by comparing exposures of	were OR crude = 3.11 (95% CI = $1.16-8.35$) and			
				cervical related visits between	1.07-9.60 and for visits within 3 days the case-			
				those for chiropractors and	crossover study gave OB crude = $17.7 (95\% \text{ Cl} =$			
				primary care practitioners (PCPs)	2.04–153.3), bootstrap unavailable. However, for			
				and (2) differences in health status	the PCP visits similar associations were observed			
				of chiropractic and PCP patients	for patients aged < 45 years and ‡ 45 years. For			
				using a case-crossover design. To	headache or cervical visits within 7 days for			
				factor in the unknown proportion	patients aged < 45 years, the case–control study			
				of vertebra-basilar occlusive	resulted in OR crude = 37.60 (95% CI = 4.80– 294),			
				strokes caused by VAD, they	and for within 3 days the case-crossover study			
				performed a sensitivity analysis	yielded OR crude = $28.00 (95\% \text{ Cl} = 3.44 - 227.58)$,			
				With positive predictive values for	and in both cases the bootstrap was unavailable.			
				VAD ranging from 0.2 to 0.8,	estimates towards the null with lower positive			
					predictive values, but the associations remained			
					positive and \significant (data not presented).			
Authors	Objective	Outcome me	asures	•		SIGN critical		
Hebert et al	The purpose of this study was to systematically search the	A serious adv	<i>erse event</i> was d	lefined as an untoward occurrence that	t results in death or is life threatening, requires	appraisal		
<u>Title</u>	literature for studies reporting serious adverse events following	hospital adm	ission, or results	in significant or permanent disability.	Ne included studies published in English, German,	grade:		
Serious Adverse Events	lumbopelvic spinal manipulative therapy (SMT) and to describe	Dutch, and Sv	wedish.					
and Spinal Manipulative	the case details.	Effectiveness	<u>5</u>			AQ (+)		
Therapy of the Low Back	Number of studies	n/a						
	41 studies	Adverse effe	cts/safety					



Study	Methodology			Results			Appraisal
Region: A Systematic	77 cases	The most com	nonly reported adve	rse events were signs and sy	mptoms consist	ent with cauda equina syndrome (29	
Review of Cases	Type of studies	cases, 38% of t	otal) and <u>lumbar disc</u>	cherniation (23 cases, 30% o	of total). Additio	nal adverse events consisted of fracture	
Year	Case studies	(7 cases, 9%), ł	nematoma or hemori	hagic cyst (6 cases, 8%), or	other serious ad	verse events (12 cases, 16%) including	
2015	Intervention/dosage	neurologic or v	ascular compromise	, <u>soft tissue trauma</u> , muscle	abscess formation	on, disrupted <u>fracture healing</u> , and	
Study type	SMT applied to the <u>lumbar spine</u> or pelvis by any type of	esophageal rup	oture.				
Systematic review	provider (eg, chiropractic, medical, physical therapy,	 Most cases we 	re reported from Eur	ope (35, 46%) and North An	nerica (32, 42%),	, with few cases from Australia (7, 9%)	
	osteopathic, layperson).	and Asia (3, 4%	5). Of the reported pa	itient demographic data, the	e mean (SD) pati	ent age was 50.1 (15.9) years, and 41%	
	Practitioner qualifications and background	were female. C)f the 61 cases with a	vailable data on the patient	's pre-SMT prese	entation, 58 (95%) appeared to have	
	Of the 50 cases reporting clinician type, 40 (80%) identified the	signs or sympto	oms originating from	the lumbopelvic region (eg,	low <u>back pain</u> , s	sciatica), whereas the indication for	
	SMT provider as a doctor of chiropractic/chiropractor; 3 (6%),	lumbopelvic SM	/IT in the remainder	of cases was for pain in othe	er regions (eg, ne	eck pain, mid back pain) or other	
	an osteopath; 2 (4%), a medical doctor or physician; and 5	complaints (eg	, dyspnea).				
	(10%), another type of health care provider or nonprofessional	 Approximately 	half (49%) of the cas	es reported information reg	arding the time	to onset of the adverse event following	
		SMT; 29 (76%)	of these cases occur	red within 24 hours of SMT.	Sixty-three case	s (82% of total) reported information	
		describing trea	tment for the advers	e event, of which 53 (84%)	nvolved some ty	pe of surgical intervention. Fifty-three	
		cases (69% of t	otal) reported some	information related to the p	oatient's clinical	outcome, and of those, 34 (64%)	
		reported favou	rable clinical outcom	nes (ie, no major functional i	mpairment) foll	owing treatment. No information was	
		available on ye	ars of experience of	the health care practitioner			
Authors		Outcome measur	<u>es</u>				SIGN critical
Paige et al	To systematically review studies of the effectiveness and harms	Pain (measured b	y either the 100-mm	visual analog scale, 11-poin	t numeric rating	scale, or other numeric pain scale),	appraisal
<u>litle</u>	of SMT for acute (<6 weeks) low back pain.	function (measure	ed by the 24-point Ro	bland Morris Disability Ques	tionnaire or Osw	estry Disability Index [range, 0-100]), or	grade:
Association of spinal	Number of studies	any narms measu	red within 6 weeks.				
manipulative therapy	26 (effectiveness analysis)	Effectiveness	a identified 15 DCTs	(1000 metiente) manuialed an		wider as that CNAT has a statistically	HQ (++)
with clinical benefit and	8 (adverse event analysis) (5 chiro specific)*	Of 26 eligible RCT	s identified, 15 RCIS	(1699 patients) provided mo	oderate-quality e	a 100 mm viewel engling nois a statistically	
narm for acute low back	<u>Type of studies</u>	significant associa	ition with improveme	ents in pain (pooled mean in	nprovement in ti	ne 100-mm visual analog pain scale,	
pain systematic review	Effectiveness analysis = RCTs	-9.95 [95%CI, -15	0.6 t0 Ta (4204 and in the)		idea and that CN 47		
and meta-Analysis.	Adverse events = Prospective conort studies & RCTS	-4.3]). Twelve RC	to in function (no clo	duced moderate-quality ev	idence that Sivil	nas a statistically significant association	
<u>Year</u>	Intervention/dosage	with improvement	ts in function (poole	a mean effect size, -0.39 [9:	5%CI, -0.71 to -0	J.07]). Heterogeneity was not explained	
2017 Study type	aither thrust type SMT or penthrust type SMT	by type of clinicia	h periorning sivir, ty	pe of manipulation, study q	uality, or wheth	er sivit was given alone of as part of a	
Suctomatic roview	Practitioner qualifications and background		afotu				
Systematic review	SMT was provided by physical therapists in 12 studies	No PCT reported	arely any sorious advorso (wont Minor transiont advor	so ovonts such a	as increased pain, muscle stiffness, and	
	chiroproctors in 7 studios modical doctors in 5 studios, and	hoadacha woro ro	any serious adverse a	f the time in large case sorie	se events such a	atod with SMT	
	osteonathic physicians in 3 studies			The time in alge case selle	s of patients the		
		*chiro specific stu	udies for adverse eve	ents			
		Studies	Sample Size	Method for assessing	Intervention	Findings	
				adverse event			
		Barrett et al	68 Patients; 11	Questionnaires given to	All received	53% reported an adverse event,	
		2000	chiropractors	12	SMT	mostly increased or radiating pain	



Study	Methodology			Results	;		Appraisal
				consecutive new			
			C25 Datiants 66	patients	All received	Treatment reactions were common	
		et al 1997	chiropractors	10	SMT	hut benign and short lasting	
			ennopractors	consecutive patients	51111		
		Senstad et al	1050 Patients;	Chiropractor asked 12	All received	At least 1 reaction was reported by	
		1997	102	consecutive patients a	SMT	580 patients (55%), 53% reported	
			chiropractors	set of standardized		reactions were local discomfort	
		Pubinstoin of	520 Pationts with	questions	All received	All patients were treated for pack	
		al 2008	neck nain: 79	completed at	SMT	nain: 56% of natients reported at	
			chiropractors	regularly scheduled	0	least 1 adverse event; more than	
				visits		70% of reported adverse events	
						were	
			100 Dationals 12	Quality	the set	musculoskeletal or pain	
		2013	198 Patients; 12	Questionnaires	Usual	42% of usual care patients and 33%	
		2015	ennopractors	of treatment	care (96%	adverse event: the most common	
					received	adverse events were increased pain,	
					SMT) or a	muscle stiffness, headache, and	
					sham	radiating discomfort	
Authors	<u>Objective</u>	Outcome measu	res				SIGN critical
Puentedura EJ, O'Grady	To retrospectively analyze all available documented case	Adverse events a	ifter a patient undergo	Ding a TJM. The most freque	ent AE reported v	was injury (mechanical or vascular) to	appraisal
	experienced severe adverse events (AE) after receiving TIM to	Effectiveness	(10), with pheumoth	orax and hematothorax (2/.	IU) and CSF leak	secondary to dural sleeve injury (1/10).	grade:
Safety of thrust joint	their thoracic spine	N/A					
manipulation in the	Number of studies	Adverse effects/	safetv				AQ (+)
thoracic spine: a	Case reports were included if they: (1) were peer-reviewed; (2)		<u></u>				
systematic review	were published between 1950 and 2015; (3) provided case						
Year	reports or case series; and (4) had TJM as an intervention.						
2015	Articles were excluded if: (1) the AE occurred without TJM (e.g.						
Study type	spontaneous); (2) the article e was a systematic or literature						
Systematic review	review; or (3) it was written in a language other than English or						
	Spanish.						
	<u>Type of studies</u>						
	involved females (8) more than males (2) with mean age being						
	43.5 years (SD=18.73, Range = $17 - 71$). The most frequent AF						
	reported was injury (mechanical or vascular) to the spinal cord						
	(7/10), with pneumothorax and hematothorax (2/10) and CSF						
	leak secondary to dural sleeve injury (1/10).						
	Intervention/dosage						



Study	Methodology						Results		Appraisal
	TJM to the thoracic spine	Tal	ole 3 The 10 cases	of serious	adverse ever	nts (AEs) repor	ted in seven pub	lished articles	
	Practitioner qualifications and background Of the 10 adverse events 7 were chiropractors, 1 osteopath, 1 physical therapist and 1 law percen	No	Authors and year	Age (years), sex	Interval to symptom onset	Practitioner	Thoracic level manipulated	AE	
		1	Ruelle <i>et al.</i> (1999) ³⁵	64, F	2 hours	Chiropractor	Lumbar and thoracic spine	Acute epidural haematoma T9-11	
		2	Oppenheim <i>et al.</i> (2005) ³⁹	60, F	Not known	Chiropractor	Upper thoracic spine	T4-5 collapse; cord compression	
		3		56, F	Not known	Chiropractor	Upper thoracic spine	T4 pathology; epidural tumour	
		4		71, F	Not known	Chiropractor	Upper thoracic spine	T4 fracture; lung CA	
		5		32, M	Not known	Chiropractor	Middle thoracic spine	Thoracic syrinx, swollen cord	
		6	Lopez-Gonzalez and Peris-Celda (2011) ³³	45, F	2 hours	Chiropractor	Middle thoracic spine	Traumatic T8–T9 disc herniation; complete T6 level paraplegia secondary to spinal cord ischaemia	
		7	Lee et al. (2011) ³⁴	38, F	4 hours	Chiropractor	Cervical and upper thoracic	Acute epidural haematoma T1-7	
		8	Struewer et al. (2013) ³⁸	17, M	2 days	Osteopath	Middle thoracic spine	Large left hematothorax	
		9	Masneri <i>et al.</i> (2007) ³⁷	20, F	24 hours	Lay person	Middle thorax	Right pneumothorax	
		10	Donovan <i>et al.</i> (2007) ³⁶	32, F	2 weeks	Physical Therapist	Cervical and upper thoracic spine	CSF leak and spontaneous intracranial hypotension from dural sleeve tear C8–T5	
Authors	Objective	Out	come measures						SIGN critical
Heneghan NR, Pup C,	To report thoracic AE following SMT and secondly to report	Adv	erse events and	their sub	sequent rep	orted outco	mes.		appraisal
Koulidis K, Rushton A	patient characteristics to inform further research for safe	Effe	<u>ectiveness</u>						grade:
Title	practice.	N//	N						
Thoracic adverse events	Number of studies	Adv	verse effects/safe	ety					AQ (+)
following spinal	19	21 (unique thoracic A	E involvi	ng the spina	al cord tissue	s [nonvascular	(n = 7), vascular (n = 6)], pneumothorax or hemothorax	
manipulative therapy: a	Type of studies	(n =	3), fracture (n =	3), esop	hageal ruptu	ure (n = 1), ru	pture of thora	cic aorta (n = 1), partial pancreatic transection (n = 1).	
systematic review and	15 single case studies and 4 case series	Rep	orted outcomes	included	fully recove	ery (n = 8), pe	ermanent neui	ological deficit (n = 5), and death (n = 4)	
narrative synthesis	Intervention/dosage	Alth	ough causality ca	annot be	confirmed,	serious thor	acic AE to inclu	ude permanent neurological deficit and death have	
Year	Spinal Manipulative Therapy on the thoracic spine	bee	n reported follov	ving SM1	-				
2020	Practitioner gualifications and background								
Study type	15 Chiropractors, 2 physical therapists, 1 osteopath and 1 lay								
Systematic review +	person.								
Narrative synthesis									



Appendix 7: Data Extraction Tables RCTs

Part 1 : Spinal Conditions

Study	Methodology	Results	Appraisal
Authors	Objective	Outcome measures	SIGN critical
Walker BF, Hebert JJ, Stomski NJ, Losco B, French SD	Establish the short-term effectiveness of chiropractic therapy for spinal pain compared with a sham intervention and explore the predictors of chiropractic treatment satisfaction	 Primary outcomes at 2 weeks were pain intensity (0–10 scale) and function (0–40 Functional Rating Index). Secondary outcomes were global change, minimum acceptable outcome, and treatment satisfaction Effectiveness	appraisal grade:
Title Short-Term Usual Chiropractic Care for Spinal Pain: A randomized controlled trial Year 2013 Study type RCT	Number of subjects 183 adults with spinal pain (chiropractic, n = 92; sham, n = 91) Intervention/dosage 2 treatments of chiropractic or sham therapy Chiro - 2 treatments were provided with approximately 1-week between treatments. Sham - Four chiropractors in this group delivered the following procedures at each visit (1) detuned ultrasound 14; (2) an Activator instrument (Activator Methods International, Ltd., Phoenix, AZ), 15 a hand held device that delivers a low impulse thrust, but was delivered at its lowest output and randomly administered on or around the spine through a tongue depressor to disperse any remaining force; and (3) a randomly placed hand on the spine while the detuned ultrasound head was placed on the participant's back/neck to give a 'hands on' experience. Practitioner qualifications and background Chiropractors	 Participants receiving chiropractic therapy reported greater improvements in pain (mean difference, 95% confidence interval [Cl] = 0.5 [0.1–0.9]), physical function (mean difference [95% Cl] = 2.1 [0.3–4.0]), and were more likely to experience global improvement (48% vs. 24%, P = 0.01) and treatment satisfaction (78% vs. 56%, P < 0.01). There was no between-group difference in achieving a minimally acceptable outcome (34% sham vs. 29% chiropractic, P = 0.42) Awareness of treatment assignment and achieving minimally important improvement in pain intensity were associated with chiropractic treatment satisfaction Short-term chiropractic treatment was superior to sham; however, treatment effects were not clinically important. Awareness of treatment assignment and clinically important reductions in pain were associated with chiropractic not. Adverse effects/safety There were no serious adverse events. Common adverse events were increased pain (sham group, 29%; usual care group, 36%), muscle stiffness (sham group, 29%; usual care group, 9%). 	AQ (+)
Authors	Objective	Outcome measures	SIGN critical
Aki S, Özden AV, Alptekin HK, Alptekin JO	The aim of the current study was to compare the effectiveness of chiropractic application (diversified technique) and dry needling therapy in patients with	 Pain VAS, during relaxation (static positions such as fixed head and neck position), activity (dynamic positions of the head such as tilting back and forth and rotation), and at night 	appraisal grade:
Short-term effects of	Number of subjects	Modified version of the Neck and Disability Index	AQ (+)
chiropractic application	40	 Oswestry Low Back Disability Questionnaire 	
and dry needling	Intervention/dosage	 Copenhagen Neck Functional Disability Scale 	
treatment on chronic	The first group (20 patients) received chiropractic (diversified technique)	Effectiveness	
Mechanical neck pain	control aroun	Both treatments were effective in reducing neck pain and neck disability levels and for increasing the joint range	
2020	The second group (20 natients) received dry needling treatment at two	of motion (group 1: p< 0.01; group 2: p< 0.001). Dry needling was significantly more successful in reducing night	
Study type	applications/week (eight applications in total).	pain (p< 0.05) and allowing patients to more comfortably turn their heads to the left (p< 0.05); chiropractic	
Bandomised controlled	Practitioner qualifications and background	application was significantly more successful for allowing patients to the their near backwards ($p < 0.05$).	
trial	Not reported	the joint range of motion, and decreasing the degree of neck disability in natients with chronic mechanical pain	
		And your range of motion, and accreasing the acgree of neak associaty in patients with choice meetianical pain Adverse effects/safety	



Study	Methodology	Results	Appraisal
Authors Gorrell et al Title Manual and Instrument Applied Cervical Manipulation for Mechanical Neck Pain: A Randomized Controlled Trial Year 2016 Study type RCT	Objective The purpose of this study was to compare the effects of 2 different cervical manipulation techniques for mechanical neck pain (MNP) Number of subjects n = 65 Intervention/dosage • Group 1 (control) received a standardized active muscle stretching routine (S) • Group 2 (MAM) received the same active muscle stretching routine (S) plus a single (manually applied manipulation [MAM]; and group 3 (IAM) received the same active muscle stretching routine (S) plus a single (instrument-applied manipulation [IAM] Practitioner qualifications and background All MAMs were administered by a single practitioner with 30 years clinical experience in manual manipulation, whereas all IAMs were administered by a different practitioner with 29 years of clinical experience in instrument manipulation.	 Outcome measures All outcome measurements were taken immediately preintervention and postintervention. Subjective pain levels (NPRS) were also measured 7 days postintervention by telephone text message. Pain was the primary outcome and was measured using visual analogue scale and pressure pain thresholds. Secondary outcomes included cervical range of motion, hand grip-strength, and wrist blood pressure. Effectiveness Subjective pain scores decreased at 7-day follow-up in the MAM group compared with control (P = .015). Cervical rotation bilaterally (ipsilateral: P = .002; contralateral: P = .015) and lateral flexion on the Contralateral side to manipulation (P = .001) increased following MAM. Hand grip-strength on the contralateral side to manipulation (P = .013) increased following IAM. Adverse effects No moderate or severe adverse events were reported. Mild adverse events were reported on 6 occasions (control, 4; MAM, 1; IAM, 1). 	SIGN critical appraisal grade: AQ (+)
Authors Martel et al <u>Title</u> A randomised controlled trial of preventive spinal manipulation with and without a home exercise program for patients with chronic neck pain <u>Year</u> 2011 <u>Study type</u> RCT	ObjectiveTo investigate the efficacy of preventive spinal manipulative therapy (SMT) compared to a no treatment group in NCNP patients.Another objective is to assess the efficacy of SMT with and without a home exercise program.Number of subjectsN=98During the symptomatic phase of the trial, all eligible participants received a short course of SMT designed to relieve symptoms. The interventions were standardised beforehand and lasted 10 to 15 minutes. Between 10 and 15 treatments were provided over a 5- to 6-week period. Each treatment consisted of a maximum of 4 spinal manipulations to the cervical and upper thoracic areas (down to T4). Myofascial soft tissue therapy (brief trigger point therapy) was permitted but was to be kept to a minimum Intervention/dosage Spinal manipulation group This group received a maximum of 4 spinal manipulations to the cervical and upper thoracic areas. They were given 1 treatment per month that lasted 10 to 15 minutes.Spinal manipulation combined with a home exercise program group This group received a maximum of 4 spinal manipulations to the cervical and upper thoracic areas (down to T4). They were dispensed with 1 treatment per month, and each of them lasted 10 to 15 minutes Control groupAttention-control group This group received no treatment (no SMT or exercise program) but each participant attended the clinic once every 2 months. To give all trial participants	Outcome measures • The primary outcome measure throughout the trial was pain level. Pain was scored with a 10-cm VAS • Cervical spine function was assessed with the cervical range of motion instrument (cROM@ • Disability was measured with the Neck Pain Disability Index (NDI) and the Bournemouth Questionnaire (BQ). • Exploratory outcome measures included health-related quality of life (HRQOL), fear and avoidance phenomena, exercise adherence and co-intervention. HRQOL and fear avoidance phenomena were scored with the SF-12 Questionnaire and the Fear-avoidance Behaviour Questionnaire (FABQ), • Exercise adherence and co-intervention were measured through a diary Effectiveness Our results show that, in the preventive phase of the trial, all 3 groups showed primary and secondary outcomes scores similar to those obtain following the non-randomised, symptomatic phase. No group difference was observed for the primary, secondary and exploratory variables. Significant improvements in FABQ scores were noted in all groups during the preventive phase of the trial. However, no significant change in health related quality of life (HRQL) was associated with the preventive phase Our results also indicate that there is no additional benefit for patients with NCNP to receive monthly preventive SMT or monthly preventive SMT with a home exercise program compared to meeting a chiropractor once every 2 months to discuss neck problems. Adverse effects NR	SIGN critical appraisal grade: HQ (++)



Study	Methodology	Results	Appraisal
Authors Miranda et al Title Influence of the cervical spine manipulation in the neck disability index in patients with chronic neck pain: A preliminary study Year 2015 Study type RCT	the same attention, each visit lasted twice as long as the other two groups treatment time, specifically 20 to 30 minutes. The same procedures as for the other 2 groups were performed at these meetings (standardised short health history, VAS, standardised passive palpation and the distribution of diaries) but with much slower flow. As with the 2 other groups, no advice or educative strategy was allowed. Practitioner qualifications and background A team of 3 chiropractors using high velocity low amplitude spinal manipulation and with at least 3 years of experience was responsible for treating the study participants. Objective To evaluate the influence of Cervical Spine Manipulation (CSM) in the Neck Disability Index (NDI) of patients with chronic neck pain compared to a manipulative sham group Number of subjects 15 patients with chronic neck pain, were randomly assigned into one of two groups. Experimental Group (EG), with 8 patients (2 male and 6 female), mean age of 30.6(13.7) years and Sham Group (SG), with 7 patients (1 male and 6 female), mean age of 38.9(17.0) years Intervention/dosage Experimental Group (EG) A CSM with high-velocity, low-amplitude thrust to the spine held in lateral flexion, with slight rotation and slight extension, with the patient in a seated position. This type of CSM is a standard procedure commonly used by chiropractors, named as Gonstead Technique's Cervical Chair manipulative procedure Control group <u>Sham Group (SG)</u> it was used a validated SMPCS simulating the sensory experience of a high- velocity, low-amplitude manipulation procedure with the 4 components of the procedure: touch the region with dysfunction, head positioning, movement and sound with the help of the headpiece table-drop Practitioner qualifications and background Not Reported Debindite	Outcome measures The NDI questionnaire was used to assess the neck function Effectiveness Statistically significant differences (p=0.000) were found for NDI between the pre and post-treatment evaluations of both the EG (26.3(5.0) % pre; 10.9(7.1) % post) and the SG (30.1(3.7) % pre; 18.4(5.3) % post). There were no significant differences for NDI in the pre-treatment between groups (p=0.122), however statistically significant differences were found in the post-treatment between the EG and the SG (p=0.039) Adverse effects Not Reported	SIGN critical appraisal grade: LQ (-)
<u>Authors</u> Saayman et al	<u>Objective</u> To determine the short-term effect of chiropractic joint manipulation therapy	<u>Outcome measures</u> The Numerical Pain Rating Scale (NRS) for subjective pain intensity and Neck Disability Index	SIGN critical appraisal
<u>Title</u>	(CMT) and low-level laser therapy (LLLT) on pain and range of motion in the	(NDI) for pain disability (the participant's ability to manage in everyday life The secondary outcome measure was	grade:
Chiropractic	management of cervical facet dysfunction	cervical ROM	
manipulative therapy	Number of subjects	Effectiveness	HQ (++)
and low-level laser	Sixty ambulatory women between the ages of 18 and 40 years with cervical facet	NO differences existed between the 3 groups at baseline. A significant difference was seen between groups 1 (CMT) and 2 (CMT) that for consider flowing and	
management of cervical	juint pain of more uldit 30-udy duration	(UVI) and 2 (LLL) for cervical nexton, between groups 1 (UVI) and 3 (UVI) + LLL) for cervical nexton and	
facet dysfunction: a		rotation. All 3 groups showed improvement in the primary and secondary outcomes Δ combination of CMT and	
acce dystatiction. a		totation. An 9 proup showed improvement in the primary and secondary outcomes. A combination of CWH and	



Study	Methodology	Results	Appraisal
randomized controlled	The 3 groups were all active treatment groups so that an efficacy comparison	treatments for cervical facet dysfunction. Further studies are needed to explore optimal treatment procedures for	
study	could be made between CMT (group 1), LLLT (group 2), and a combination of the	CMT and LLLT and the possible mechanism of interaction between therapies	
Year	2 treatment protocols (group 3). Each treatment acted as a control for the others.	Adverse effects	
2011	The CMT treatment protocol was identical in groups 1 and 3. The location and	NR	
Study type	direction of joint restrictions were identified during the facet joint assessment		
RCT	before the treatment. Specific shortlever, high-velocity, low-amplitude diversified		
	techniques of cervical manipulation were then used to restore joint motion. A		
	maximum of 3 joints was treated per session		
	Control group		
	A Uni-Laser 201 830-nm gallium alluminium arsenide (ASAH-MEDICO A/S,		
	Hvidovre, Denmark) semiconductor laser diode with a hand-held probe was used		
	to administer the laser treatment.		
	Practitioner qualifications and background		
	Not reported		
Authors	Objective	Outcome measures	SIGN critical
Wei et al	To observe the therapeutic effect of Governor Vessel-unblocking and yang-	• In the process of this study, no case dropped off. The criteria of the therapeutic effects in this study were	appraisal
<u>Title</u>	regulating acupuncture plus chiropractic treatment on upper cervical spondylosis	stipulated in reference to the relevant literature.	grade:
Clinical observation on	Number of subjects	• Cure: The symptoms and signs disappeared, with normal X-ray film of the atlantoaxial joint.	
acupuncture plus	A total of 64 eligible cases were randomly allocated into an observation group	Remarkable effect: The symptoms and signs disappeared basically, with tendency of normal X-ray film of the	AQ (+)
chiropractic treatment	(n=32) and a control group (n=32)	atlantoaxial joint.	
for cervical spondylosis	Intervention/dosage	• Improvement: The symptoms and signs were relieved, or with presence of change in X-ray film of the dislocated	
Year	Cases in the observation group were treated with Governor Vessel-unblocking	atlantoaxial joint.	
2015	and Yang-regulating needling method, fine adjustment of the upper cervical spine	Failure: No change in the symptoms and signs and X-ray film.	
Study type	and lumbosacral Ban-pulling manipulation;	Effectiveness	
RCT	Control group	The total effective rate was 78.1% in the observation group and 67.5% in the control group. The difference in the	
	Cases in the control group were treated with routine acupuncture and same	total effective rate between the two groups was statistically significant (P<0.05). Governor Vessel-unblocking	
	spinal adjustment as the observation group.	and yang-regulating acupuncture and regulate yang plus chiropractic therapy is better than routine acupuncture	
	Practitioner qualifications and background	plus chiropractic therapy in the therapeutic effect in the treatment of upper cervical spondylosis	
	Not reported	Adverse effects	
		NR	
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Fan et al	To observe the curative effect of cervical chiropractic for cervical spondylosis of	The hemodynamic parameters of left and right vertebral and basilar arteries of all participants were examined	appraisal
<u>Title</u>	vertebral artery type (CSA) and to explore its possible mechanism	with color Doppler sonography : peak systolic velocity (Vs), end diastolic flow velocity (Vd), mean velocity (Vm),	grade:
Clinical observation on	Number of subjects	pulsatility index (PI) and resistance index (RI). The patients were examined before treatment and 1 week	
cervical chiropractic for	N=60	after the treatment	LQ (-)
cervical spondylosis of	Intervention	• Cured: The original main symptoms disappeared; muscle strength, neck and limb function returned to normal.	
vertebral artery type	Patients in the treatment group were treated with chiropractic. C1-C7 vertebral	 Improved: The original main symptoms, and function of neck and limb improved. 	
Year	displacement	Failure: No improvement in symptoms.	
2018 Study to rea	<u>Dosage</u>	Effectiveness	
Study type	in accordance with the requirements of the cervical chiropractic, the	The total effective rate was 96.7% in the treatment group and 83.3% in the control group. The curative rate was	
net .	day, for 7 times.	oo.7% in the treatment group and 20% in the control group. The differences between the two groups in the total	

Study	Methodology	Results	Appraisal
Authors	Control group Patients in the control group received oral flunarizine hydrochloride 10 mg each night for 14 d. Practitioner qualifications and background Not reported Objective	effective rate and the curative rate were statistically significant (both P<0.05). The scores of cervical vertigo symptom and functional assessment after treatment in both groups were significantly higher than those before treatment (both P<0.01); the difference between the two groups was statistically significant (P<0.05). After treatment, the maximum systolic velocity (Vs), the maximum diastolic velocity (Vd), the mean velocity (Vm), the pulsatility index (PI) and the vascular resistance index (RI) in both groups were significantly improved compared with those before the treatment (all P<0.01); there were significant differences between the two groups (all $p<0.05$). Adverse effects Not reported Outcome measures	SIGN critical
Vernon et al	To determine if the addition of a self-acupressure pillow (SAP) to typical	 The primary outcome instrument for the study was the Headache Diary. 	appraisal
Title	chiropractic treatment results in significantly greater improvement in tension-	• The primary outcome measure for the study was 'headache frequency'.	grade:
A Randomized	type and cervicogenic headache sufferers	Headache intensity was also obtained from the diary.	-
Pragmatic Clinical Trial	Number of subjects	 The primary end point of the study was taken at either week 4 or 5 of the intervention phase. 	HQ (++)
of Chiropractic Care for	n=34	 Three additional secondary outcomes were included. 	
Headaches with and	Group A (n = 15) received typical chiropractic care only (manual therapy and exercises) and group $R (n = 10)$ received typical chiropractic care with daily home	• The first was the percentage of subjects in each group achieving a reduction in headache days of greater than	
Acupressure Pillow	use of the SAP	40%. The second sector defined dischills have second to second if a discrimination of the Next Dischills had a	
Year	Intervention	 The second was 'headache-related disability' as assessed by a modified version of the Neck Disability Index known as the Headache Activities of Daily Living Index, for headache assessment. 	
2015	Group B. This group received 5 weeks of usual chiropractic treatment plus a	 A third outcome was used: a 'satisfaction' questionnaire at follow-up (providing a score out of 15 based on 	
Study type	pillow. The first week constituted the baseline phase during which the Dr Zaxx	three questions: (a) use of SAP per week. (b) how often the device was helpful, and (c) overall level of	
RCT	device was not used. After the first week, subjects were given the device with	satisfaction).	
	instructions. They used it for the next 4 weeks.	Effectiveness	
	<u>Dosage</u>	Owing to failure of randomization to produce group equivalence on weekly headache frequency, analysis of	
	for analysis	covariance was performed showing a trend (P = .07) favouring the chiropractic-only group; however, this was	
	Control group	<u>not statistically significant.</u>	
	Group A. This group received 5 weeks of usual chiropractic treatment. Usual	Group A obtained a 46% reduction of weekly headaches greater than 40% was 71% , while for group P, this was	
	chiropractic treatment consisted of spinal manipulation to the cervical and upper	28%. The mean benefit score (0-3) in group B of the use of the SAP was 1.2 (.86). The mean satisfaction rating of	
	thoracic spines. Spinal manipulations involved high-velocity, low-amplitude	users of the SAP was 10.4 (2.7) out of 15 (63%).	
	thrusting procedures to specific motion segments of the spine. Non-thrusting	Adverse effects	
	mobilizations were also included in this area, as well as soft tissue therapy, chiefly	No major adverse events such as stroke, neck injury, or sudden headache were reported.	
	nostural exercises was also nermitted		
	Practitioner gualifications and background		
	Not reported		
Authors	Objective	Outcome measures	SIGN critical
Bishop et al	To determine if full CPGs-based study care (SC) results in greater improvement in	• Improvement (ie, change) in back pain-specific function at 16 weeks compared with the start of treatment, as	appraisal
Title	functional outcomes than family physician–directed usual care (UC) in the	measured on the modified Roland-Morris Disability Questionnaire (RDQ)	grade:
The Chiropractic	treatment of AM-LBP.	• The secondary outcomes of interest included the change in RDQ scores at other time points (8 and 24 weeks)	
Interventions Research	N=81	and in normalized Short Form-36 (SF-36) bodily pain (BP) and physical functioning (PF) domain scores at 8, 16,	ΠQ (++)
Outcomes	Intervention/dosage	AILU 24 WEEKS	
	CPGs-based study care (SC)		


Study	Methodology	Results	Appraisal
(CHIRO) Study: a randomized controlled trial on the effectiveness of clinical practice guidelines in the medical and chiropractic management of patients with acute mechanical low back pain <u>Year</u> 2010 <u>Study type</u> RCT	Patients received reassurance regarding the natural history of AM-LBP; advice to avoid passive treatment approaches (eg, bed rest, heat, or the use of back supports/corsets/braces); advice to carry out a progressive walking program (two walks a day, each with an initial duration of between 5 and 15 minutes depending on the patient's tolerance increasing by 2 minutes each walk per week); acetaminophen, 650mg every 6 to 8 hours as required for 2 to 4 weeks, unless medically contraindicated (eg, because of allergy, compromised liver function, or acute porphyria); and a maximum 4 weeks of lumbar spinal manipulative therapy using conventional side posture, high-velocity, low-amplitude techniques. Spinal manipulative therapy was specifically limited to the lumbar spine (ie, no treatment was directed to the cervical or thoracic regions) and was administered by a registered chiropractor. Study care patients were also advised to avoid guideline-discordant treatments, including muscle relaxant and opioid-class medications, passive physiotherapy modalities, bed rest, and "special" back exercise programs (eg, "core stability" or extension exercises Dosage Chiropractic treatment was conducted in the CNOSP outpatient clinic at a frequency of two to three times per week, for a maximum period of 4 weeks at the discretion of the attending chiropractor Control group <u>Family physician-directed "usual care (UC)"</u> Patients in the UC treatment arm were advised of their diagnosis (ie, mechanical low backpain) and referred back to their referring family physician with a letter explaining the protocol of the present study. Practitioner qualifications and background Not reported	The primary outcome, the unadjusted mean improvement in RDQ scores, was significantly greater in the SC group than in the UCgroup (p<.003). Regarding unadjusted mean changes in secondary outcomes, improvements in RDQ scores were also greater in the SC group at other time points, particularly at 24 weeks (p<.004). Similarly, improvements in SF-36 PF scores favoured the SC group at all time points; however, these differences were not statistically significant. Improvements in SF-36 BP scores were similar between groups. In repeated-measures analyses, global adjusted mean improvement was significantly greater in the SC group in terms of RDQ (p<.002), nearly significantly greater in terms of SF-36 PF (p<0.08), but similar between groups in terms of SF-36 BP (p<0.27). CONCLUSIONS: This is the first reported randomized controlled trial comparing full CPG-based treatment, including spinal manipulative therapy administered by chiropractors, to family physician–directed UC in the treatment of patients with AM-LBP. Compared to family physician– directed UC, full CPG-based treatment including CSMT is associated with significantly greater improvement in condition-specific functioning. <u>Adverse effects</u> N/R	
Authors	Objective	Outcome measures	SIGN critical
Goertz et al	no assess changes in pain levels and physical functioning in response to standard medical care (SMC) versus SMC plus chiropractic manipulative therapy (CMT) for	Pain was measured using the numerical rating scale (NRS) and physical functioning was measured using the Roland-Morris Disability Questionnaire (RMQ) and the Back Pain Functional Scale	appraisai grade:
Adding Chiropractic	the treatment of low back pain (LBP) among 18 to 35-year-old active-duty military	Secondary outcomes included patient satisfaction and global improvement.	8.000
Manipulative Therapy	personnel.	Outcome assessments occurred at baseline, 2 weeks and 4 weeks.	AQ (+)
to Standard Medical	Number of subjects	Effectiveness	
Care for Patients With	The study did not restrict access to SMC or prescribe a SMC delivery protocol.	Mean Roland-Morris Disability Questionnaire scores decreased in both groups during the course of the study, but	
Acute Low Back Pain	I nus, both groups had normal access to the SML typically provided to patients with LRP at M/RAMC	adjusted mean scores were significantly better in the SMC plus CMI group than in the SMC group at both week 2 (P < 0.001 and week 4 ($P = 0.004$). Mean numerical rating scale pair scores were also significantly better in the	
2013		group that received CMT. Adjusted mean back pain functional scale scores were significantly better in the	
Study type	Treatments consisted of HVIA manipulation as the primary approach in all cases.	the SMC plus CMT group than in the SMC group at both week 2 ($P < 0.001$) and week 4 ($P = 0.004$).	
RCT	with ancillary treatments at the doctor's discretion, including brief massage, the	Adverse effects	
	use of ice or heat in the lumbar area, stretching exercises, McKenzie exercises,	There were no serious adverse events (AEs). Two AEs graded as mild, expected events were reported by	
	advice on activities of daily living, postural/ergonomic advice; and mobilization.	participants from the SMC plus CMT treatment arm. One AE was reported as	
	HVLA manipulation involves a single load or impulse 'thrust' to body tissues.	sharp pain in the right buttocks that resolved within 24 hours; this AE was graded unrelated to trial interventions.	
	Patients were placed in a lateral recumbent or side-lying position with the	The other AE was graded possibly related to the CMT when the participant	
	superior or free hip and knee flexed and adducted across the midline. The chiropractor stabilized the patient's free leg with his own leg while holding the	reported sharp pain in the lower back that prompted a visit to the physician assistant for pain medication; this AE resolved within 48 hours.	

Study	Methodology	Results	Appraisal
	patient's superior shoulder. The manipulative load was applied by using a pisiform		
	contact on the patient's lumbar spine or sacroiliac joint while preventing motion		
	of the patient through stabilizing holds on the shoulder and hip. The single		
	impulse load, or thrust, was delivered by a quick, short controlled movement of		
	the shoulder, arm, and hand combined with a slight body drop		
	Dosage		
	Participants in the group receiving CMT in addition to SMC were scheduled for up		
	to 2 visits weekly with a doctor of chiropractic (DC) for a period of 4 weeks.		
	Control group		
	Standard care included any or all of the following: a focused history and physical		
	examination, diagnostic imaging as indicated, education about self-management		
	including maintaining activity levels as tolerated, pharmacological management		
	modulities such as heat/ice and referral to a pain clinic		
	Practitioner qualifications and background		
	Not reported		
Authors	Objective	Outcome measures	SIGN critical
Goertz et al	To determine whether the addition of chiropractic care to usual medical care	Coprimary outcomes were low back pain intensity (Numerical Rating Scale; scores ranging from 0 [no low back	appraisal
Title	results in better pain relief and pain-related function when compared with usual	pain] to 10 [worst possible low back pain]) and disability (Roland Morris Disability Questionnaire; scores ranging	grade:
Effect of Usual Medical	medical care alone	from 0-24, with higher scores indicating greater disability) at 6 weeks. Secondary outcomes included perceived	-
Care Plus Chiropractic	Number of subjects	improvement, satisfaction (Numerical Rating Scale: scores ranging from 0 [not at all satisfied] to 10 [extremely	AQ (+)
Care vs Usual Medical	UMC with chiropractic care (375 participants) or UMC alone (375 participants)	satisfied]), and medication use. The coprimary outcomes were modeled with linear mixed-effects regression over	
Care Alone on Pain and	Intervention/	baseline and weeks 2, 4, 6, and 12.	
Disability Among US	The primary chiropractic procedure was spinal manipulative therapy in the low	Effectiveness	
Service Members	back and adjacent regions. Treatment decisions regarding manipulation type.	Adjusted mean differences in scores at week 6 were statistically significant in favor of usual medical care plus	
With Low Back Pain	location, and direction were based on patient diagnoses. Other factors included	chiropractic care compared with usual medical care alone overall for low back pain intensity (mean difference	
A Comparative	natient preference prior response to care paraspinal muscle hypertonicity spinal	$-1.1 \cdot 95\%(1 - 1.4 \text{ to } -0.7)$ disability (mean difference $-2.2 \cdot 95\%(1 - 3.1 \text{ to } -1.2)$ and satisfaction (mean	
Effectiveness Clinical	ioint hynomobility, and imaging findings. Additional theraneutic procedures may	difference 2.5: 95%CL 2.1 to 2.8 as well as at each site. Adjusted odd ratios at week 6 were also statistically	
Trial	have included rehabilitative exercise interferential current therapy ultrasound	significant in favor of usual medical care plus chirogratic care overall for perceived improvement (odds ratio =	
Vear	therapy cryotherapy superficial heat and other manual therapies	0.18: 95 (1.0.13-0.25) and self-reported pain medication use (odds ratio = 0.73: 95%(1.0.54.0.97)	
2018	Docage		
Study type	Participants allocated to LIMC with chiropractic care had LIMC in addition to as	Advarsa affects	
RCT	many as 12 chiropractic visits during the active care had own in addition to as	There were 62 adverse effects reported throughout the 6-week active care phase. Of	
NCT .	Control group	the 10 adverse offects reported by participants receiving UMC along 2 were due to prescribed	
	Ln this programatic trial LIMC in both groups included any care recommended or	nedications A wear related to availural injections, and 12 consisted of muscle or inject stiffners	
	no uns pragmatic trial, Owic in both groups included any care recommended of	attributed to physical therapy or cell care recommendations	
	solf management advice, pharmagelagic pair management, physical thereas, an	of the 42 educroe effects reported humarticipants receiving LIMC with chiransectic care 20 were described as	
	sen-management advice, pharmacologic pain management, physical therapy, or	or the 45 auverse effects reported byparticipants receiving UNIC with chiropractic care, 38 were described as	
	pant cinic referral.	inuscie or joint sumess attributed to chiropractic care (37 events) or physical therapy (1 event), 1 was reported as	
	Practitioner qualifications and background	indistinct symptoms following an epidural injection, 3 were described as pain, tingling, or sensitivity in an	
	Not reported	extremity without reference to a specific treatment, and 1 was a lower-extremity burning sensation for 20	
		minutes following spinal manipulative therapy	

Study	Methodology	Results	Appraisal
Authors	Objective	Outcome measures	SIGN critical
Schulz et al	To assess the relative short- and long-term effectiveness of adding spinal	Participants rated their typical level of back pain over the last week,	appraisal
<u>Title</u>	manipulative therapy (SMT) or a supervised exercise program (SEP), to a home	Low back disability was measured with the 23-item Modified Roland Scale. General health status was measured by	grade:
Spinal manipulative	exercise program (HEP), compared to HEP alone, for adults 65 years of age and	the Medical Outcomes Study Short Form 36-item Health Survey (SF-36 D)	
therapy and exercise	older with low back pain	Overall satisfaction with care, were rated on a 7-point scale,	HQ (++)
for older adults with	Number of subjects	Weekly frequency of non-prescription and prescription medication use for LBP was measured on a 5-point scale.	
chronic low back pain:	N=241	Adherence with home exercise was measured at weeks 26 and 52.	
a randomized clinical	All participants received 12 weeks of care in one of three treatment groups: 1)	Health care utilization (within and outside of the studies) was measured using standardized clinician treatment	
trial	Home Exercise Program (HEP); 2) Supervised Exercise (SEP) + HEP; or 3) Spinal	forms (each visit, weeks 1 to 12), monthly phone call interviews (weeks 16 to 52) and patient self-report	
Year	Manipulative Therapy (SMT) + HEP.	questionnaires (baseline and weeks 4, 12, 26 and 52). Productivity loss was measured through patient self-report	
2019	Intervention/dosage	(weeks 4, 12, 26, and 52) using three questions from the National Health Interview Survey (NHIS)	
Study type	SMT : Manual treatment based on physical condition and tolerance. Up to 4 min	Effectiveness	
RCT	of adjunct therapies to facilitate SMT (light soft tissue massage, active and passive	The primary analysis showed group differences in pain over the one-year were small and not statistically	
	stretching, ischemic compression of tender points, ice and heat).	significant. Pain severity was reduced by 30 to 40% after treatment in all 3 groups with the largest difference	
	High velocity, low amplitude SMT when possible. Other manual therapies if	(eight percentage points) favoring SMT and home exercise over home exercise alone. Group differences at other	
	needed (low velocity, low amplitude SMT or mobilization, flexion-distraction	time points ranged from 0 to 6 percentage points with no consistent pattern favoring one treatment. One-year	
	manipulation, drop-table assisted SMT.	post-treatment pain reductions diminished in all three groups. Secondary self-report outcomes followed a similar	
	HEP: Information and instructions for selfcare for pain (postural adjustments	pattern with no important group differences, except satisfaction with care, where the two combination groups	
	during activities of daily living; use of ice, heat, medications; importance of	were consistently superior to home exercise alone.	
	movement and staying active). Instructions in low load exercises with graded	Conclusions: Adding spinal manipulation or supervised rehabilitative exercise to home exercise alone does not	
	progressions, to be done at home to improve balance and coordination, trunk	appear to improve pain or disability in the short- or long-term for older adults with chronic low back pain, but did	
	strength and endurance. Stretching exercises (seated or standing lumbar flexion,	enhance satisfaction with care.	
	full spine flexion/extension motion cycles, quadriceps stretch, hamstring stretch,	Adverse effects	
	hip stretch, head retraction, and chest expansion). Muscle strength and	None	
	endurance exercises: chair squats, abdominal curls, seated back extension, seated		
	upright rows (using resistance tubing), and push-ups. Balance exercises: standing		
	knee lifts, standing straight-leg hip flexion and extension.		
	SEP: Information and instructions for selfcare for pain (postural adjustments		
	during activities of daily living; use of ice, heat, medications; importance of		
	movement and staying active). Light aerobic warm up on stationary equipment.		
	Instructions, monitoring and encouragement in low load exercise with graded		
	progressions, with an emphasis on high repetitions (up to 20) to increase		
	endurance, strength and balance. Stretching, strength and balance exercises as		
	described for HEP, with the addition of neck flexion, quadruped, lunges, side		
	bridging, and trunk extension exercises on an adjustable angle roman chair.		
	Dosage		
	Up to 20 sessions (based on discretion of provider and patient preferences)		
	• 10 to 20 min per session		
	Maximum frequency: 2 times/week		
	Practitioner qualifications and background		
	licensed chiropractors with a minimum of 5 years practice experience.		

Study	Methodology	Results	Appraisal
Authors Vavrek et al Title Cost analysis related to dose response of spinal manipulative therapy for chronic low back pain: outcomes from a randomized controlled trial Year 2014 Study type RCT	Objective To report the incremental costs and benefits of different doses of spinal manipulative therapy (SMT) in patients with chronic low back pain (LBP). Number of subjects 400 participants (Haas et al) Intervention/ Randomized to receive a dose of 0, 6, 12, or 18 SMT sessions from a chiropractor. Spinal manipulative therapy was performed at the assigned number of visits, and a brief light massage control was performed at non-SMT visits to control provider attention and touching the participants Dosage All participants were assigned 18 treatment visits, 3 per week for 6 weeks Control group light massage Practitioner qualifications and background Not reported	Outcome measuresSocietal costs in the year after study enrollment were estimated using patient reports of health care use and lost productivity. The main health outcomes were the number of pain-free days and disability-free days.EffectivenessLost productivity accounts for most societal costs of chronic LBP. Cost of treatment and lost productivity ranged from \$3398 for 12 SMT sessions to \$3815 for 0 SMT sessions with no statistically significant differences between groups. Baseline patient characteristics related to increase in costs were greater age (P = .03), greater disability (P = .01), lower quality-adjusted life year scores (P = .01), and higher costs in the period preceding enrollment (P b .01). Pain-free and disability-free days were greater for all SMT doses compared with control, but only SMT 12 yielded a statistically significant benefit of 22.9 pain-free days (P = .03) and19.8 disability-free days (P = .04). No statistically significant group differences in quality-adjusted life years were noted. Conclusions: A dose of 12 SMT sessions yielded a modest benefit in pain-free and disability-free days. Care of chronic LBP with SMT did not increase the costs of treatment plus lost productivity.Adverse effects Not reported	SIGN critical appraisal grade: AQ (+)
Authors Kongsted et al Title Effects of weekly pain monitoring on back pain outcomes: a non-randomised controlled study Year 2021 Study type Non-BCT	Objective Number of subjects N=2892 Adults seeking care for LBP were enrolled at the first visit to a chiropractor and followed with surveys after 2 weeks, 3 months and 12 months Intervention/dosage Those enrolled first, n = 1,623, furthermore received weekly SMS-questions about pain frequency and pain intensity. Control group Those enrolled next was the control group, n = 1,269 followed only by surveys. Practitioner qualifications and background Not reported	Outcome measures Pain intensity, activity limitation and pain control Effectiveness LBP intensity (0-10) was slightly lower at 12-months follow-up in the SMS group than the control group (adjusted beta – 0.40 (95% CI: – 0.62; – 0.19)). No relevant between-group differences were observed for activity limitation (0–100) (1.51 (95% CI: – 0.83; 3.85)) or ability to control pain (0–10) (– 0.08 (95% CI – 0.31; 0.15)). Frequent pain monitoring did not demonstrate any negative effects of weekly pain monitoring. Adverse effects Not reported	SIGN critical appraisal grade: LQ (-)
Authors Dougherty et al Title Evaluation of a modified clinical prediction rule for use with spinal manipulative therapy in patients with chronic low back pain: a randomized clinical trial Year 2014 Study type RCT	Objective To explore the use of a modified clinical prediction rule for spinal manipulative therapy in patients with chronic low back pain Number of subjects N=165 Based on the response to the Fear Avoidance Belief Questionnaire (FABQ), subjective symptoms and the physical exam findings, patients were categorized in terms of whether they were positive or negative on the modified clinical prediction rule Intervention/dosage Spinal Manipulative Therapy, included high velocity low amplitude spinal manipulation and/or flexion distraction therapy or mobilization, and advise on heat/ice Control group	Outcome measures VAS and the SF-36 pain subscale and disability using the ODI Effectiveness As hypothesized, we found main effects of time where the SMT and AET groups showed significant improvements in pain and disability from baseline. There were no differences in treatment outcomes between groups in response to the treatment, given the lack of significant treatment x time interactions. The mCPR x treatment x time interactions were not significant. The differences in outcomes between treatment groups were the same for positive and negative on the mCPR groups, thus our second hypothesis was not supported. We found no evidence that a modification of the original CPR can be used to discriminate CLBP patients that would benefit more from SMT. Adverse effects Not reported	SIGN critical appraisal grade: HQ (++)



Study	Methodology	Results	Appraisal
	Active Exercise Therapy included directional preference exercises, lumbar		
	stabilization, general flexibility, and specific training exercises		
	Not reported		
Authors	Objective	Outcome measures	SIGN critical
Eklund et al	The aim of this trial was to investigate the effectiveness of MC on pain trajectories	The number of days with bothersome LBP experienced during the study period (52 weeks), collected by means of	appraisal
<u>Title</u>	for patients with recurrent or persistent LBP.	weekly text messages using an automated system called ^a SMS-track ^o	grade:
The Nordic	Number of subjects	Effectiveness	
Maintenance Care	N=328	MC resulted in a reduction in the total number of days per week with bothersome LBP compared with symptom-	HQ (++)
program:	Intervention/dosage	guided treatment. During the 12 month study period, the MC group (n = 163, 3 dropouts) reported 12.8 (95% CI =	
Effectiveness of	MC (preventive treatment, i.e. clinician-controlled) - the aim was to schedule	10.1, 15.5; p = <0.001) fewer days in total with bothersome LBP compared to the control group (n = 158, 4	
chiropractic	patients before substantial pain reoccurred (i.e. controlled by the clinician)	dropouts) and received 1.7 (95% CI = 1.8, 2.1; p = <0.001) more treatments.	
maintenance	Control group	Adverse effects	
care versus symptom-	Patient controlled - symptom-guided treatment, i.e. patients were instructed to	No serious adverse events were recorded.	
guided treatment for	call in if and when the pain recurred (patient controlled).		
recurrent and persistent	Practitioner qualifications and background		
low back painĐA	Not reported		
pragmatic randomized			
controlled trial			
<u>Year</u>			
2018			
Study type			
RCT			
Autnors Haas at al	<u>Objective</u> To identify the doce response relationship between visits to a chiroproctor for	<u>Outcome measures</u>	SIGN critical
	spinal manipulation and chronic low back pain (cl RP) outcomes and to determine	evaluated at the 12- and 24-week primary end points. Secondary outcomes included days with pain and functional	appraisai grade:
Dose-response and	the efficacy of manipulation by comparison with a light massage control	disability, pain unpleasantness, global perceived improvement, medication use, and general health status.	gruue.
efficacy of spinal	Number of subjects	Effectiveness	AQ (+)
manipulation for care of	400 participants	For the primary outcomes, mean pain and disability improvement in the manipulation groups were 20 points by	
chronic low back pain: a	Intervention/	12 weeks and sustainable to 52 weeks. Linear dose-response effects were small, reaching about two points per six	
randomized controlled	Randomized to receive a dose of 0, 6, 12, or 18 SMT sessions from a chiropractor	manipulation sessions at 12 and 52 weeks for both variables (p=0.025). At 12 weeks, the greatest differences from	
trial	Spinal manipulative therapy was performed at the assigned number of visits, and	the no-manipulation control were found for 12 sessions (8.6 pain and 7.6 disability points, pl.025); at 24 weeks,	
Year	a brief light massage control was performed at non-SMT visits to control	differences were negligible; and at 52 weeks, the greatest group differences were seen for 18 visits (5.9 pain and	
2014 Study type	provider attention and touching the participants	8.8 disability points, p<.025). The number of coincid manipulation vicits had modest affects on sLPD outcomes above these of 18 hands on visits	
BCT	All participants were assigned 18 treatment visits 3 per week for 6 weeks	to a chiropractor. Overall, 12 visits vielded the most favorable results but was not well distinguished from other	
	Control group	dose levels.	
	light massage	Adverse effects	
	Practitioner qualifications and background	There were no notable adverse events. Three persons reported seeking care for symptomatic relief of LBP	
	Not reported	exacerbation related to the study. One ineligible person subsequently	
		reported increase of pain after the screening examination. One participant in the 12-SMT group lost several days	
		of work followed by complete resolution or the episode during the treatment phase. One participant in the 12-	
		SMT group dropped out after an exacerbation associated with lifting a child.	



Study	Methodology	Results	Appraisal
Authors	Objective	Outcome measures	SIGN critical
Bronfort et al	To evaluate the relative clinical effectiveness of 12 weeks of monodisciplinary	The primary outcome measure was typical level of back pain over the previous week, using a numerical rating	appraisal
<u>Title</u>	chiropractic care (CC), versus multidisciplinary integrative care (IC), for adults with	scale (0 = no pain, 10 = the worst pain possible	grade:
Multidisciplinary	sub-acute and chronic LBP	Secondary outcomes included:	
integrative care versus	Number of subjects	 Back disability measured with the 23-item Roland Morris Disability Questionnaire 	AQ (+)
chiropractic care for low	N=201	 Global improvement (1 = no symptoms, 100% improvement; 9 = as bad as it could be, 100% worse) 	
back pain: a randomized	Intervention	Days with medication use for back pain in the past week	
clinical trial	 CC was delivered by a team of chiropractors allowed to utilize any non- 	Quality of life measured with the EuroQol EQ5D-3L	
Year	proprietary treatment under their scope of practice not shown to be	• Satisfaction with care (1 = completely satisfied,couldn't be better; 7 = completely dissatisfied, couldn't be worse)	
2022	ineffective or harmful including manual spinal manipulation (i.e., high velocity,	 Frequency of low back or leg symptoms (0 = none of the time; 5 = all of the time) 	
Study type	low amplitude thrust techniques, with or without the assistance of a drop	 Number of days in the past month with missed work or reduced activities due to back pain 	
RCT	table) and mobilization (i.e., low velocity, low amplitude thrust techniques,	Work (0 to 42) and physical activity (0 to 24) subscales of the fear avoidance beliefs questionnaire	
	with or without the assistance of a flexion-distraction table). Chiropractors	Pain self-efficacy (0 to 60)	
	also used hot and cold packs, soft tissue massage, teach and supervise	Pain coping strategies measured with the Vanderbilt Pain Management Inventory short form (active strategies	
	exercise, and administer exercise and self-care education materials at their	subscale 5 to 25; passive strategies subscale 6 to 30)	
	discretion.	 Kinesiophobia measured with the Tampa Scale for Kinesiophobia (17 to 68) 	
	 IC was delivered by a team of six different provider types: acupuncturists, 	<u>Effectiveness</u>	
	chiropractors, psychologists, exercise therapists, massage therapists, and	There was also a significant advantage over the long term for IC in some secondary measures (disability,	
	primary care physicians, with case managers coordinating care delivery.	improvement, satisfaction and low back symptom frequency), but not for others (medication use, quality of life,	
	Interventions included acupuncture and Oriental medicine (AOM), spinal	leg symptom frequency, fear avoidance beliefs, self efficacy, active pain coping, and kinesiophobia).	
	manipulation or mobilization (SMT), cognitive behavioral therapy (CBT),	Adverse effects	
	exercise therapy (ET), massage therapy (MT), medication (Med), and self-care	no serious adverse events resulted from either of the interventions.	
	education (SCE), provided either alone or in combination and delivered by their		
	respective profession.		
	Dosage		
	12 weeks of treatment		
	Practitioner qualifications and background		
Authors	Not reported		
Autnors	<u>Ubjective</u>	<u>Outcome measures</u>	SIGN critical
vining et al	To investigate whether chiropractic care influences strength, balance, and/or	Patient-reported outcomes included average pain over the past 24h reported on a 0-10 numerical rating scale (0 =	appraisai
<u>Ffforts of Chiroprostic</u>	(I go)	no pain, 10 = Worst Imaginable), the koland worris Disability Questionnaire, PROMIS, Fear-Avoidance Bellets	grade:
Care on Strongth	(LDF). Number of cubiests		
Cale off Strength, Balanco, and Enduranco		Enecuveness Differences in mean change between groups were statistically significant in favor of chiropractic for LPB related	AQ (+)
in Active-Duty U.S.	Intervention	Directices in mean charge between groups were statistically significant in ravor or chiropractic for LBF related	
Military Personnel	Chiropractic care included clinical evaluation SM education and self-	Advarse affarts	
with Low Back Pain: A	management advice about daily activities that benefit and/or negatively impact	Auverse clusters	
Randomized Controlled	symptoms	racoluing	
Trial	Dosage	resolving synthesis and muscle screpess. Four mild events were related to the eligibility evan and	
Vear	Four weeks treatment	symptom approximation, summas, and muscle solenticity, but muscle strain) events were related to the englishing exam and treatment (2) Six wild and one moderate, severity (obligue muscle strain) events were attributed to the strength	
2020	Control group	tect	
Study type	Wait list control	Four mild events were attributed to the endurance test, one to the balance test, and six to a combination of	
RCT	Practitioner qualifications and background	strength endurance and/or balance tests	
	Two different chiropractors, each with more than 20 years of experience		
	Two unterent chiropractors, each with more than 20 years of experience.		

Study	Methodology				Resu	ılts		Appraisal
		Table I. Trea	tment Sche	edules				
			Placebo	F-D group 1	F-D group 2	F-D group 3		
		Week 1	2	2	3	4		
		Week 2	2	2	3	4		
		Week 3	1	1	2	3		
		Week 4	1	1	2	3		
		Week 5	1	1	1	2		
		Week 6	1	1	1	2		
		Total no. of	8	8	12	18		
		treatments						
A								
Authors Combined at al	<u>Objective</u>	Outcome measu	<u>res</u> fuence de la					SIGN critical
	into a clinical trial that used different docages of flexion-distraction manipulation	functional health	status (2) t	he visual analo	a scale (VAS) for	in this study: (1)	eg pain and (3) the Oswestry Low Back	appraisai grade:
A pilot randomized	Number of subjects	Pain Disability Inc	dex (ODI) fo	functional sta	tus related to l	ow back pain.	eg pain, and (5) the Oswestry Low back	grade.
controlled trial of	N=60	Effectiveness		runotional ota				AQ (+)
flexion distraction	Intervention	No Sig difference	e.					
dosage for chiropractic	The F-D care included mobilization and traction, depending on the subject's	The 2 higher dosa	age groups (12 and 18 visit	s) tended to pro	oduce more cha	nge than the lower dosage group;	
treatment of lumbar	symptoms. Mobilization is passive movement within the physiologic joint space to	however, there w	vas little diff	erence betwee	en the 12- and 1	L8-visit dosages		
spinal stenosis	restore full painless joint function by rhythmic, repetitive passive movements to	Adverse effects						
Year	the patient's tolerance, in voluntary and/or accessory range and graded according	None Reported						
2014	to examination findings. These movements are applied from a specified beginning							
Study type	point, move to a specified end point, and immediately return to the beginning							
NCT .	mechanically applied in the longitudinal axis of a body part	Table Trea	tment Sche	dulos				
	Dosage	Table 1. 17ea	imeni sene	uuies				
	There were 3 different treatment schedules, implemented over 6 weeks. Patients		Placebo	F-D group 1	F-D group 2	F-D group 3		
	in group 1 had a total of 8 treatment visits, those in group 2 had a total of 12	Week 1	2	2	3	4		
	visits, and those in group 3 had a total of 18 visits. The fourth group (placebo	Week 2	2	2	3	4		
	group) received a total of 8 visits. These treatment frequencies were chosen	Week 3	1	1	2	3		
	graduated frequency was chosen because most clinicians decrease the number of	Week 4	1	1	2	3		
	visits during successive weeks. Table 1 provides the details of the specific	Week 5	1	1	1	2		
	treatment schedules for subjects in each of the 4 treatment groups. The patients	Total no. of	8	8	12	18		
	in the placebo group all received a treatment schedule of 8 visits over 6 weeks.	treatments	0	0	12	10		
	Control group	ucamento						
	The placebo treatment included a combination of a low level laser device and a							
	handheld mechanical manipulation instrument. After the laser pad was removed,							
	a placebo 'manipulation' was simulated by clicking the handheld instrument at							
	several locations in the lumbar, pelvis, and lower extremities.							
	Practitioner qualifications and background							
	Not reported							



Study	Methodology	Results	Appraisal
Authors Branco KC, Moodley M Title Chiropractic manipulative therapy of the thoracic spine in combination with stretch and strengthening exercises, in improving postural kyphosis in woman Year 2016 Study type RCT	Objective to determine effectiveness of either chiropractic spinal manipulative therapy to the thoracic spine or stretch and strengthening exercises versus the combined treatment of chiropractic spinal manipulative therapy to the thoracic spine in conjunction with stretch and strengthening exercises. Number of subjects 30 Intervention/dosage Group 1 (n =10) received chiropractic spinal manipulative therapy to the thoracic spine. Group 2 (n= 10) received chiropractic spinal manipulative therapy to the thoracic spine as well as stretch and strengthening exercises. Group 3 (n=10) received stretch and strengthening exercises. Practitioner qualifications and background Specified chiropractic manipulation	Outcome measures Objective data were obtained by using the Flexicurve® Ruler measurements for the angle of kyphosis. Visual analysis was done by taking lateral (sagittal) view photographs at the beginning of the initial and final consultations. Effectiveness The study showed that all three treatment protocols for Groups 1, 2, and 3 were effective. However, Group 1 had not shown a great improvement in their postural kyphosis, Group 3 had shown a relatively good improvement in their posture, while Group 2 had shown the best results with regards to improvement of the participants' posture. Therefore, in conclusion, Groups 2 and 3 treatment protocols can be used effectively to treat postural kyphosis but Group 2's treatment protocol, consisting of chiropractic spinal manipulative therapy to the thoracic spine in combination with stretch and strengthening exercises, will yield the best results. Adverse effects/safety NR	SIGN critical appraisal grade: AQ (+)
Authors Crothers AL, French SD, Hebert JJ and Walker BF <u>Title</u> Spinal manipulative therapy, Graston tech® and placebo for non- specific thoracic spine pain: a randomised controlled trial <u>Year</u> 2016 Study type - RCT	Objective The objective of this trial was to determine the efficacy of SMT and GT compared to sham therapy for the treatment of non-specific thoracic spine pain. Number of subjects N=143 Intervention/dosage People with non-specific thoracic pain were randomly allocated to one of three groups: SMT, GT, or a placebo (de-tuned ultrasound). Each participant received up to 10 supervised treatment sessions at Murdoch University chiropractic student clinic over a 4 week period. Practitioner qualifications and background A registered chiropractor or a final year chiropractic student under the direct supervision of a registered chiropractor	Outcome measures Primary outcome measures included a modified Oswestry Disability Index, and the Visual Analogue Scale (VAS) Effectiveness Results of the intention to treat analyses revealed no time by group interactions, indicating no statistically significant between-group differences in pain or disability at 1 week, 1 month, 3 months, 6 months, or 12 months. There were significant main effects of time (p < 0.01) indicating improvements in pain and disability from baseline among all participants regardless of intervention.	SIGN critical appraisal grade: HQ (++)
Authors Stochkendahl MJ, Christensen HW, Vach W, Høilund-Carlsen PF, Haghfelt T, Hartvigsen J <u>Title</u> A randomized clinical trial of chiropractic treatment and self- management in patients with acute musculoskeletal chest pain: 1-year follow-up <u>Year</u> 2012	Objective We have previously reported short-term follow-up from a pragmatic randomized clinical trial comparing 2 treatments for acute musculoskeletal chest pain: (1) chiropractic treatment and (2) self-management. Results indicated a positive effect in favor of the chiropractic treatment after 4 and 12 weeks. The current article investigates the hypothesis that the advantage observed at 4 and 12 weeks would be sustained after 1 year. In addition, we describe self-reported consequences of acute musculoskeletal chest pain at 1-year follow-up Number of subjects N=115 Intervention/dosage 4 weeks of either chiropractic treatment or self-management, with posttreatment questionnaire follow-up 52 weeks later Practitioner qualifications and background 8 experienced chiropractors	Outcome measures The primary outcome measures were change in pain intensity (11-point box numerical rating scale) and self-perceived change in pain (7-point ordinal scale). Effectiveness Both groups experienced decreases in pain, positive global, self-perceived treatment effect, and increases in the 36-Item Short Form Health Survey scores. No statistically significant differences were observed between groups at the 1-year follow-up, and we could not deduce a common trend in favor of either intervention. Adverse effects/safety Participants were asked about adverse events after the initial 'active' treatment phase at 4 weeks. At the 12 and 52 weeks follow up, no additional registration was done.	SIGN critical appraisal grade: AQ (+)



Study	Methodology	Results	Appraisal
Study type			
RCT			
Authors Stochkendahl MJ, Christensen HW, Vach W, Høilund-Carlsen PF, Haghfelt T, Hartvigsen J Title Chiropractic Treatment vs Self-Management in Patients With Acute Chest Pain: A Randomized Controlled Trial of Patients Without Acute Coronary Syndrome Year 2012 Study type	Objective The purpose of the present study is to evaluate the relative effectiveness of 2 treatment approaches for acute musculoskeletal chest pain: (1) chiropractic treatment that included spinal manipulation and (2) self-management as an example of minimal intervention. Number of subjects 115 consecutive patients with acute chest pain and no clear medical diagnosis at initial presentation were included Intervention/dosage 4 weeks of chiropractic treatment or self-management, with posttreatment questionnaire follow-up 4 and 12 weeks later. Practitioner qualifications and background 8 experienced chiropractors	Outcome measuresPrimary outcome measures were numeric change in pain intensity (11-point box numerical rating scale) and self- perceived change in pain (7-point ordinal scale).EffectivenessBoth groups experienced decreases in pain, self-perceived positive changes, and increases in Medical Outcomes Study Short Form 36-Item Health Survey scores. Observed between-group significant differences were in favor of chiropractic treatment at 4 weeks regarding the primary outcome of self-perceived change in chest pain and at 12 weeks with respect to the primary outcome of numeric change in pain intensityAdverse effects/safety Adverse effects, affecting 44 patients, were transient and benign in nature, most commonly in the form of locally increased tenderness, headache, or fatigue. No serious adverse effects lasting longer than 24 hours were reported.	SIGN critical appraisal grade: AQ (+)
RCT Authors Stochkendahl MJ, Sørensen J, Vach W, Christensen HW, Høilund-Carlsen PF, Hartvigsen J Title Cost-effectiveness of chiropractic care versus self-management in patients with musculoskeletal chest pain Year 2016 Study type RCT	Objective To assess whether primary sector healthcare in the form of chiropractic care is cost-effective compared with self-management in patients with musculoskeletal chest pain, that is, a subgroup of patients with nonspecific chest pain Number of subjects 115 adults aged 18–75 years with acute, non-specific chest pain of musculoskeletal origin were recruited from a cardiology department in Denmark Intervention/dosage Patients with musculoskeletal chest pain were randomised to 4 weeks of community based chiropractic care (n=59) or to a single information session aimed at encouraging self management as complementary to usual care (n=56) Practitioner qualifications and background 8 experienced chiropractors	Outcome measures Patient cost and health-related quality adjusted life years (QALYs; based on EuroQol fivedimension questionnaire (EQ-5D) and Short Form 36- item Health Survey (SF-36)) were compared in cost-effectiveness analyses over 12 months from baseline Effectiveness Mean costs were €2183 lower for the group with chiropractic care, but not statistically significant (95% CI -4410.5 to 43.0). The incremental cost-effectiveness ratio suggested that chiropractic care was cost-effective with a probability of 97%, given a threshold value of €30 000 per QALY gained. In both groups, there was an increase in the health-related quality of life, and the mean increases were similar over the 12-month evaluation period. The mean differences in QALYs between the groups were negligible. Adverse effects/safety Owing to the limited follow-up of 1 year, we were not able to observe potentially long-term adverse effects of reduced hospital admission in the chiropractic care group; however, we have previously shown that the risk of future cardiac events is low in patients with NSCP and will likely occur within the first year after hospitalisation, if at all	SIGN critical appraisal grade: AQ (+)

International Centre for Allied Health Evidence

Part 2 : Lower Limb Conditions

Study	Methodology	Results	Appraisal
Authors Kazemi M, Leguard SH, Lilja S, Mahaise S, <u>Title</u> A clinical crossover trial of the effect of manipulative therapy on pain and passive and active range of motion of the painful hip <u>Year</u> 2021 Study type BCT (cross over)	Objective This study aims to determine whether manipulative therapy of the hip joint can increase range of motion (ROM) and/or decrease pain in individuals experiencing symptomatic hip pain. Number of subjects 20 students enrolled at the Canadian Memorial Chiropractic College, experiencing self-reported symptomatic pain or limited ROM at the hip joint. Intervention/dosage Subjects received a drop-piece hip manipulation (DPHM) or an alternative treatment, Practitioner qualifications and background Not reported	Outcome measures Outcome measures included passive/active hip ROM and pain perception. ROM of the hip joint was measured in extension, flexion, abduction, adduction, ER, and IR. External and IR were performed with the knee flexed to 90 degrees. Pain perception was measured by a numeric pain scale (NPS) (1-10) and was measured both before and after the intervention. Effectiveness Statistically significant improvements in numeric pain scale (NRS) and passive abduction were observed for the manipulation group when compared to the alternative treatment. No significant change was observed for all other hip ranges. Adverse effects/safety NR	SIGN critical appraisal grade: AQ (+)
Authors Brantingham JW, Parkin- Smith G, Cassa TK, Globe GA, Globe D, Pollard H, deLuca K, Jensen M, Mayer S, Korporaal C <u>Title</u> Full Kinetic Chain Manual and Manipulative Therapy Plus Exercise Compared with Targeted Manual and Manipulative Therapy Plus Exercise for Symptomatic Osteoarthritis of the Hip: A Randomized Controlled Trial <u>Year</u> 2012 <u>Study type</u> RCT	Objective To determine the short-term effectiveness of full kinematic chain manual and manipulative therapy (MMT) plus exercise compared with targeted hip MMT plus exercise for symptomatic mild to moderate hip osteoarthritis (OA). Number of subjects Convenience sample of eligible participants (N111) with symptomatic hip OA were consented and randomly allocated to receive either the experimental or comparison treatment, respectively. Intervention/dosage Participants in the experimental group received full kinematic chain MMT plus exercise. Participants Practitioner qualifications and background Thirteen senior chiropractic interns, under the supervision of 3 experienced chiropractors with a special interest in extremity joint disorders, participated as treating practitioners in this trial.	Outcome measures Western Ontario and McMasters Osteoarthritis Index (WOMAC), Harris hip score (HHS), and Overall Therapy Effectiveness, alongside estimation of clinically meaningful outcomes. <u>Effectiveness</u> • No statistically significant differences were found between the 2 groups for any of the outcome measures (analysis of covariance, P.45 and P.79 for the WOMAC and HHS, respectively). • The results of this study provides guidance to musculoskeletal practitioners who regularly use MMT that the full kinematic chain approach does not appear to have any benefit over targeted treatment. Adverse effects/safety NR	SIGN critical appraisal grade: HQ (++)
<u>Authors</u> Poulsen E, Hartvigsen J, Christensen HW, Roos EM, Vach W, Overgaard S <u>Title</u> Patient education with or	Objective To investigate the effectiveness of a patient education (PE) program with or without the added effect of manual therapy (MT) compared to a minimal control intervention (MCI) Number of subjects 118 patients with clinical and radiographic unilateral hip osteoarthritis (OA)	Outcome measures Primary outcome was self-reported pain severity on an 11-box numeric rating scale (NRS) immediately following a 6-week intervention period. Patients were followed for 1 year. Effectiveness • Primary analysis included 111 patients (94%). • In the combined group (PE + MT), a clinically relevant reduction in pain severity compared to the MCI of 1.90	SIGN critical appraisal grade:
without manual therapy compared to a control	from primary care were randomized into one of three groups: PE, PE plus MT or MCI.	points (95% confidence interval (CI) 0.9e2.9) was achieved. Effect size (Cohen's d) for the PE + MT minus the MCI was 0.92 (95% CI 0.41e1.42). Number needed to treat for PE b MT was 3 (95% CI 2e7).	HQ (++)



Study	Methodology	Results	Appraisal
group in patients with osteoarthritis of the hip. A proof-of principle three- arm parallel group randomized clinical trial <u>Year</u> 2013 <u>Study type</u> RCT <u>Authors</u>	Intervention/dosage The PE was taught by a physiotherapist involving five sessions. The MT was delivered by a chiropractor involving 12 sessions and the MCI included a home stretching program. Practitioner qualifications and background MT delivered by Chiropractors Objective	 No difference was found between the PE and MCI groups, with mean difference 0.0 (95% CI 1.0 to 1.0). At 12 months, not including patients receiving hip surgery the statistically significant difference favoring PE + MT was maintained. <u>Adverse effects/safety</u> A standardized questionnaire was used to assess adverse reactions in all groups including questions on location, severity, onset, duration, and influence on activities of daily living (ADL). Patients were asked at the last sessions in the PE and PE b MT groups whereas the MCI group was interviewed by a secretary by phone immediately after the 6 weeks intervention period. Adverse events were only collected for the last 50% of patients completing the trial since the benefit of assessing adverse events. In the PE b MT group, seven patients reported discomfort, muscle soreness or mild pain appearing up to 24 h after MT, lasting for no more than 24 h and not affecting ADL. One patient reported moderate pain appearing after 4 weeks of therapy, lasting for 2 weeks, and having some effect on ADL. In the MCI group, two patients reported worsening of hip pain following home stretches. The pain lasted for more than 2 days and had a moderate effect on ADL. Both patients stopped the specific home stretches.	SIGN critical
Autnors Thorman P, Dixner A, Sundberg T <u>Title</u> Effects of Chiropractic Care on Pain and Function in Patients With Hip Osteoarthritis Waiting for Arthroplasty: A Clinical Pilot Trial <u>Year</u> 2010 <u>Study type</u> RCT (Pilot)	DijectiveThe purpose of this study was to explore the short-term effects of chiropractic care on pain and function in patients with hip osteoarthritisNumber of subjectsA convenience sample of 14 patients waiting to undergo unilateral hip arthroplasty at a large university hospital received either chiropractic care (n = 7) or no additional treatment (n = 7) during a 3-week period.Intervention/dosagePatients receiving chiropractic care, on average 4.4 (SD ±1.0) treatments over 3 weeksThe chiropractic care was pragmatic and based on the analysis of different functions, such as mobility, tenderness, muscle tension and tone, and each patient's relative symptoms. Thus, the chiropractic techniques were tailored to optimize hip function in each individual patient and could include high- velocity and low-amplitude adjustments to the hip, spine, and lower extremities, as well as soft-tissue or myofascial techniques, arthrokinematics stabilizing exercises for the hip, or a combination of thesePractitioner qualifications and backgroundAll patients were assessed and treated by research assistants (fifth-year chiropractic students), and the clinical care was supervised by state-registered chiropractic students), and the clinical care was supervised by state-registered chiropractic students).	 Ditcome measures The main outcome was the change in self-rated hip pain on a 100 mm Visual Analogue Scale (VAS, 0-100). Secondary outcomes were the change in the five Hip disability and Osteoarthritis Outcome Subscales (HOOS, 0-100) Effectiveness The experimental group showed a clinically and statistically significant improvement in self-rated hip pain, VAS - 26.0 (SD ±28.4), P = .043. The chiropractic patients also had clinically important, but not statistically significant, improvement scores in HOOS function in daily living 18.6 (SD ±18.5), pain 15.4 (SD ±17.2), and hip-related quality of life 12.4 (SD ±19.6) The waiting list controls had no statistically significant improvements in any outcome measured, but a clinically relevant improvement in HOOS Pain 12.2 (SD ±18.2), P = .051 was observed. There were no statistically significant differences between the groups. Approximately 25 patients per arm would be required to adequately power a full scale randomized controlled trial with VAS for hip pain as the main outcome measure. Adverse effects/safety NR 	appraisal grade: LQ (-)
<u>Authors</u> Hains G, Hains F <u>Title</u> Patellofemoral pain	Objective To measure the efficacy of myofascial manual therapy (ischemic compression) directly to the knee for chronic patellofemoral pain syndrome. Number of subjects	Outcome measures Changes in pain intensity were assessed in both groups using a visual analog pain scale and a 5-point scale to monitor the patient's response to the patellar-grinding test. Effectiveness	SIGN critical appraisal grade:
syndrome managed by ischemic compression to the trigger points located in the peri-patellar and	Experimental group (N = 27) Control group (N = 11) Intervention/dosage The experimental group received 15 sessions of manual ischemic compression applied to peri-patellar and retro-patellar regions.	 The experimental group showed a significant (p < 0.05) reduction in pain that was maintained at 30 days (from 5.97 0.32 to 3.4 0.45) and 6 months (from 5.97 +/- 0.32 to 3.5 +/- 0.53). Patellar-grinding scores improved only in the experimental group (from 3.4 +/- 0.13 to 1.2 +/- 0.19). <u>Adverse effects/safety</u> No significant side effects were reported during or after treatments. 	LQ (-)



Study	Methodology	Results	Appraisal
retro-patellar areas: A	The control group received 15 sessions of manual ischemic compression on		
randomized clinical trial	trigger points over the hip muscles.		
Year	Practitioner qualifications and background		
2010	The patellar-grinding tests (PGTs) were performed by an independent		
Study type	chiropractor, who was blinded with respect to participant treatment		
RCT	allocation		
Authors	<u>Objective</u>	Outcome measures	SIGN critical
Dwyer L, Parkin-Smith GF,	To examine the methodological integrity, sample size requirements, and	The primary outcome was a description of the research methodology and sample size estimation for a confirmatory	appraisal
James W Brantingham JW	short-term preliminary clinical outcomes of manual and manipulative therapy	study. The secondary outcome was the short-term preliminary clinical outcomes. Data were collected at baseline	grade:
Korporaal C, Cassa TK,	(MMT) in addition to a rehabilitation program for symptomatic knee	and 5 weeks using the Western Ontario and McMasters Osteoarthritis Index questionnaire, goniometry for knee	
Globe G, Bonnefin D, Tong	osteoarthritis (OA).	flexion/extension, and the McMaster Overall Therapy Effectiveness inventory	HQ (++)
V	Number of subjects	Effectiveness	
<u>litle</u>	Eighty-three patients were randomly allocated to 1 of the 3 groups (27, 28,	• A minimum of 462 patients is required for a confirmatory 3-arm trial including the respective interventions,	
Manual and Manipulative	and 28, respectively). There were 5 dropouts, the data from 78 participants	accounting for cluster effects and a 20% dropout rate	
Dehebilitation for	was available for analysis with 10% of scores missing.	Statistically significant and clinically meaningful changes in scores from baseline to week 5 were found for all	
Renabilitation for	Intervention/dosage	groups for the Western Untario and McMasters Osteoarthritis Index ($P \le .008$), with a greater change in scores for	
Assessor Blind	Participants with knee OA were randomized to 3 groups. 6 Mini Sessions	Mixil and Mixil plus renabilitation	
Assessor-Billio Randomized Dilet Trial	alone, training in renabilitation followed by a nome renabilitation program	Between-group comparison did not reveal statistically significant differences between group scores at week 5 for	
	In the MMT treatment group. E cossions were provided to participants over	any of the outcome measures ($P \ge .46$).	
2015	the 4 week treatment period. The treatment comprised joint mehilization	Adverse effects/safety	
2013 Study type	(grades 1-4) and joint manipulation (grade 5: high velocity low-amplitude	Each session was approximately 20 minutes, during which time each participant was also assessed for adverse signs	
BCT Pilot	(grades 1-4) and joint manipulation (grade 5, nigh-velocity, low-amplitude,	such as pain, joint swelling, or redness. The treatment would then be adjusted to participant tolerance, at the	
Net Thot	snine)	uscretion of the children ware reported (such as parsistent, source paravolving pain, stiffages, or	
	The rehabilitation program included nationt education exercise prescription	No adverse events of complications were reported (such as persistent, severe nonrevolving pair), sumess, or disability) and no patients were known to have left that trial baseure of side offects, but rather apparent to dram	
	soft tissue treatment, and passive stretches (on treatment days only) to the	usability), and no patients were known to have left the that because of side effects, but hather appeared to drop out by choice. Although there were included eaces of transient, being symptoms of tilffates, or pair reported	
	knee and elsewhere along the full kinetic chain, where needed, based on	but by choice. Although there were isolated cases of transient, being symptoms of sumers, or pain reported,	
	functional assessment.	these beingh side effects subsequently resolved in an eases and were not reported as diverse effects.	
	Practitioner gualifications and background		
	Treatment sessions were provided by a chiropractic intern under supervision		
	or by an experienced chiropractor.		
Authors	Objective	Outcome measures	SIGN critical
Lubbe, D., Lakhani, E.,	To compare manipulative therapy (MT) plus rehabilitation to rehabilitation	The primary outcome measures were the Foot and Ankle Disability Index and the visual analogue pain scale, with	appraisal
Brantingham, J. W., Parkin-	alone for recurrent ankle sprain with functional instability (RASFI) to	the secondary outcome measure being joint motion palpation. Data were collected at the baseline and during week	grade:
Smith, G. F., Cassa, T. K.,	determine short-term outcomes.	5. Missing scores were replaced using a multiple imputation method. Statistical analysis of the data composed of	•
Globe, G. A., & Korporaal,	Number of subjects	repeated-measures analysis of variance.	HQ (++)
C.	Thirty-three eligible participants with RASFI	Effectiveness	
<u>Title</u>	Experimental group n=15	Between-group analysis demonstrated a difference in scores at the final consultation for the visual analogue scale	
Manipulative therapy and	Control group n=18	and frequency of joint motion restrictions ($P \le .006$) but not for the Foot and Ankle Disability Index ($P = .26$).	
rehabilitation for recurrent	Intervention/dosage	Adverse effects/safety	
ankle sprain with	Each participant was randomly allocated to receive rehabilitation alone or	Furthermore, no adverse events or complications (defined as persistent severe stiffness, pain, or disability) were	
functional instability: a	chiropractic MT plus rehabilitation. All participants undertook a daily	reported, and no participants were known to have left the trial due to adverse effects or significant side effects	
short-term, assessor-blind,	rehabilitation program over the course of the 4-week treatment period. The		
	participants receiving MT had 6 treatments over the same treatment period.		

Study	Methodology	Results	Appraisal
parallel-group randomized trial <u>Year</u> 2015 <u>Study type</u> RCT <u>Authors</u> Joseph LC, de Busser N, Brantingham JW, Globe GA, Cassa TK, Korporaal C, Bonello R, <u>Title</u> The Comparative Effect of Muscle Energy Technique vs. Manipulation for the Treatment of Chronic Recurrent Ankle Sprain <u>Year</u> 2010 <u>Study type</u> RCT	Practitioner qualifications and background In the MMT group joints were manipulated by an experienced chiropractic clinician Objective To compare the use of high-velocity, low-amplitude (HVLA) manipulation and Muscle Energy Technique mobilization in the treatment of chronic ankle sprains Number of subjects N=40 Intervention/dosage Group 1: Received HVLA ankle axial elongation Manipulation. Six treatments were given over three weeks with post-visit measurements after the fourth and sixth treatments Group 2: Received MET, as described by Greenman, to the ankle joint. This consisted of five repetitions of applying ankle dorsiflexion to patient resistance (or gently at the barrier/end range of motion but not into pain) with simultaneous anterior-to-posterior pressure against the talus, held isometrically for 3-5 seconds each. Post-isometric contraction was followed with a gentle increase ("mobilization") into dorsiflexion and additional A-P pressure against the talus and held for a duration of 10 seconds. This is a post-isometric relaxation (PIR) technique applied to increase ankle dorsiflexion stretch (and increase A-P joint glide) of the talus. Six treatments were given over three weeks with post-visit measurements administered as described above.	Outcome measures • One Leg Standing Test (OLST) • ROM Effectiveness The One Leg Standing Test and Numerical Pain Rating Scale-101 had statistically significant and clinically meaningful intra-group changes. The One Leg Standing Test eyes closed showed an increase with High Velocity Low Amplitude manipulation of 10.24 seconds and with Muscle Energy Technique mobilization of 10.05 seconds, both t-tests p=.003 suggestive of a centrally mediated positive neurological effect on the function of the locomotive system. The Numerical Pain Rating Scale-101 showed significant decrease in High Velocity Low Amplitude manipulation of 37.1 points and Muscle Energy Technique of 39.6 points, both t-tests p<0.000.	SIGN critical appraisal grade: LQ (-)
Authors	Not reported Objective	Outcome measures	SIGN critical
du Plessis M, Zipfel B, Brantingham JW, Parkin- Smith GF, Birdsev P. Globe	To test an innovative protocol of manual and manipulative therapy (MMT) and compare it to standard care of a night splint(s) for symptomatic mild to moderate HAV.	Visual analogue scale (HAV-related pain), foot function index (HAV-related disability) and hallux dorsiflexion (goniometry). Effectiveness	appraisal grade:
G, Cassa TK <u>Title</u> Manual and manipulative	<u>Number of subjects</u> A convenience sample of 75 patients was assessed for eligibility, with 30 participants (15 per group) to the control group (standard care with a night	 There were no statistical (p < 0.05) or clinically meaningful differences (MCID < 20%) between the two groups based on outcome measure scores. The outcome measure scores in the control group (night splint) regressed between the 1-week follow-up and 1- 	HQ (++)
therapy compared to night splint for symptomatic hallux abducto valgus: An exploratory randomised clinical trial <u>Year</u> 2011	splitterparts (25 per group) to the control group (Standard care with a hight splitt) or the experimental group (MMT). Intervention/dosage Participants in the control group used a night splint(s) and those in the experimental group (MMT) received a structured protocol of MMT, with the participants in the experimental group receiving 4 treatments over a 2-week period. Experimental group: the Brantingham protocol.	 month follow-up, while the scores in the experimental group (MMT) were sustained up to the 1-month follow-up. The within-group data analysis produced statistically and clinically significant changes from baseline to the 1-week flow-up across all outcome measures. Definitive trial would require a minimum of 102 participants per group (N = 204) to achieve satisfactory power of ≥80%. <u>Adverse effects/safety</u> 	



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Study	Methodology	Results	Appraisal
Study - G RCT - Ja til - A icit - M Con - T p Prace This teac part supp over diso	Methodology Graded joint mobilization of the 1st MTPJ, ranging from grades 1 to 4 Joint manipulation, usually grade 5 high velocity, low amplitude, controlled thrust (HVLA). All treatments are initially followed by post-treatment cold therapy using ice to decrease the possibility of side effects. Mobilization/manipulation of other foot and ankle joints as indicated pontrol group: night splint The night splint, which holds the great toe in an adducted or corrected position ractitioner qualifications and background nis exploratory study was implemented in the chiropractic outpatient taching clinic of the University of Johannesburg, South Africa. The articipating chiropractors consisted of a senior chiropractic intern and upervising clinicians with at least 3 years clinical experience. The project was verseen by an experienced chiropractor with a special interest in foot sorders in order to maintain treatment quality control and standardised	Results No serious adverse reactions or side effects were experienced by any of the participants. Regarding 'intention to treat' analysis, there were no exclusions or dropouts over the duration of the study and no data was missing.	Appraisal

Part 3 : Upper Limb Conditions

study iviethodology	Results	Appraisal
AuthorsObjectiveHains G, Descarreaux M, and Hains FTo evaluate the effect of myofascial therapy treatme compression on shoulder trigger points in patients w pain.Chronic shoulder pain of myofascial origin: a using ischemicNumber of subjects 59randomized clinical trial using ischemicIntervention/dosage Experimental: 41 patients received 15 treatments, w ischemic compressions on trigger points located in su muscle, the infraspinatus muscle, the deltoid muscle 2010Year 2010Control: Eighteen patients received the control treat ischemic compression treatments of trigger points loc and upper thoracic areas. Practitioner qualifications and background	Outcome measures 1. Shoulder Pain and Disability Index (SPADI) 2. Patients perceived improvement was also measured using a numerical scale from 0% to 100% Outcome measure evaluation was completed for both groups at baseline after 15 treatments, 30 days after the last treatment, and finally for the experimental group only, 6 months later Effectiveness After the first 15 treatments, the experimental group had a significant reduction in their Shoulder Pain and Disability Index (SPADI) score compared with the control group (62% vs 18% amelioration). This reduction in SPADI scores was still present after 6 months (Tukey P < .001). 9ps Moreover, the patients perceived percentages of amelioration were higher in the experimental group after 15 treatments (75% vs 29%). Adverse effects/safety NR	SIGN critical appraisal grade: HQ (++)



Appendix 8 - Primary studies reported in included reviews

Systematic Reviews reported in reviews

Study	No.
Hondras 2005	1
Proctor 2006	1
Gross 2010	1
Walker 2020	1
Rubinstein 2011	1

RCTs reported in Systematic Reviews (and number of times reported)

Study	No.		Study	No
Hawks et al 2002	1		Learman et al 2013	1
Hawks et al 2005	2		Leaver et al 2010	1
Bergman et al 2004	1		Lee et al 2016	1
Beyerman 2006	1		Maieres 2018	1
Bishop et al 2010,	1		Martel 2011	1
Blanchette 2011	1		McMorland et al 2010	1
Boline et al 1995	1		Meade et al 1990	1
Bove and Nilsson 1998	1		Mohseni et al 2006	1
Brantingham 2005	1		Morton JE 1999	1
Brantingham et al 2009	1		Moustafa et al 2013	1
Brantingham et al 2013	1		Muller 2005	1
Brønfort 1989	1		Munday et al 2007	2
Bronfort et al 1996	1		Nelson et al 1998	1
Bronfort et al 2011	1		Nilsson et al 1995	1
Bronfort et al 2001	1		Nilsson et al 1997	3
Burke et al 2007	1		Palmgren et al 2006	1
Burton etal. 2000	1		Panahi et al 2011	1
Chaibi et al 2017	1		Pellow 2001	1
Cherkin et al 1998	1		Petersen 2003	1
Cleland et al 2007	1		Petersen 2011	1
Cramer et al 1993	1		Pikula 1999	2
Crothers et al 2016	1		Plaugher et al 2002	1
Davis et al 1998	1		Pope 1994	1
Descarreaux et al 2004	1		Postacchini 1988	1
Diab 2012	1		Radpasand 2009	1
Donkin et al 2002	1		Raigani et al 2002	1
Dougherty et al 2014	1	1	Rubinstein et al 2007	1
Eklund 2018	1		Sanders et al 1990	1
Enix et al 2015	1		Santilli et al 2006	1
Evans et al 2003	1		Savolainen et al 2004	1
Fink et al 2012	1		Sawyer et al 1999	1
Gemmell & Miller 2010	1		Schafer et al 2012	1
Gemmell et al 2009	1		Schneider et al 2010	1
Gemmell et al 1995	1		Senna 2011	1
Giles et al 1999	1		Shearar et al 2001	1
Giles et al 2003	1		Skargren et al 1997	1
Gudavalli 2006	1	1	Skargren et al 1998	1
Haas et al 2014	1	1	Strunk and Hondras 2008	1
Haas et al 2010	3		Thiel et al 2007	1
Haas et al 2018	1		Tuchin et al 2000	1
Haas et al 2003	1		UK BEAM trial 2004	1
Harrison et al 2002	1		Varrie 2003	1
Hawk et al 2005	1		Vavrek, Haas & Peterson 2010	1
Hawk etal 2006	1		Vernon et al 2009	1
Herzog 1991	1		Waagen et al 1986	1
Hoiiris et al 2004	1		Waagen et al 1986	1
Hondras et al 2009	1	1	Walker 2013	1
Hondras etal 1999	1		Walker et al 2013	1
Hsieh et al 2002	1	1	Whittingham and Nilsson 2001	1
Hsieh et al 1992	1		Wilkey et al 2008	1
Hurwitz et al 2002	1	1	Winters et al 1997	1
Hurwitz et al 2005	1		Wood et al 2001	1
Hurwitz et al 2006	1		Xia 2016	1
Hurwitz et al 2004	1		Yurkiw & Mior 1996	1
Juni et al 2008	1		Langen-Pieters 2003	1



Study	No.		Study	No
Ailliet et al 2010	1		Liliedahl 2010	1
Allen 2014	1		Lin et al	1
Axen 2008	1		Lyngberg et al 2005	1
Axen 2009	1		Malmqvist 2009	1
Axen 2013	1		Matthews et al	1
Barrett and Breen 2000	1		Moller 2009	1
Barrett et al 2000	2		Morelli et al	1
Beck et al 2003	1	1	Mosley 1996	1
Bigal et al 2008	1		Myburgh 2013	1
Bringsli 2012	1		Ndetan et al 2009	1
Brown et al 2014	1		Ossendorf et al 2009	1
Brown et al 2013	1		Phelan 2004	1
Butler 2010	1		Prasad et al	1
Cagnie et al 2004	1		Rossi et al 2005	1
Cassidy et al	1		Rossi et al 2006	1
Cherkin et al 2002	1		Rossi et al 2008	1
Chung et al	1		Rothwell et al	1
Cifuentes 2011	2		Rubinstein et al 2008	2
Cooke et al 2010	1		Rubinstein et al 2008	1
Coulter et al 2002	1		Sandnes 2010,	1
Dittrich et al	1		Senstad et al 1997	1
Engelter et al	1		Senstad et al 1996	1
Fitz-Ritson 1995	1		Shekelle 195	1
French et al 2013	1		Smith 1997	2
Garner et al 2007	1		Stano 1993	1
Gaumer 2006	1		Stano 1994	1
Giles et al 2003	1		Stano 1995	1
Gilkey 2008	1		Stano 1996	1
Grieves 2009	1		Stano 1997	1
Hansen 2010	1		Strauss et al	1
Hartvigsen et al 2003	1		Suh et al	1
Jackson 2001	1		Thiel et al 2007	1
Jarvis 1997	1		Thomas et al	1
Johnson 1999	1		Vukovic et al 2010	1
Kristoffersen et al 2012	1		Weigel et al 2013	1
Kurbanyan and Lessell	1		Wells et al 2010	1
Kusnezov et al	1		Wells et al 2011	1
Langworthy and Breen 2007	1		Wilson et al	1
Leboeuf-Yde et al 1997	2		Xue et al 2008	1

Observational studies reported in Systematic Reviews



Study	No.		Study	No
Alcantara 2002	1		Lin et al 2016	1
Ali Cherif et al 1983	1		Livingstone 1971	2
Beck et al 2003	1		Lopez-Gonzales and Peris Celda 2011	2
Buchberger 1993	1		Lorenz and Vogelsang 1972	1
Buchberger 1999	1		Malmivaara and Pohjola 1982	1
Cassidy et al 2008	2		Markowitz and Dolce 1997	1
Chung et al 20002	1		Mas et al 1989	1
Dabbert et al 1970	1		Matthews et al 2006	1
DeVocht et al 2003	1		Modde 1985	1
DeVocht et al 2005	1		Moreau and Moreau 2001	1
Dittrich et al 2007	1		Morelli et al 2006	1
Domenicucci et al 2007	1		Nia 1994	1
Dziewas et al 2003	1		Nielsen 1984	1
Engelter et al 2013	1		Oppenheim et al 2005	2
Fernando et al 2021	1		Osterbauer et al 1993	1
Fisher 1994	2		Peters et al 1995	1
Ford and Clark 1956	1		Prasad et al 2006	1
Gajeski and Kettner 2004	1		Pratt-Thomas & Berger 1947	2
Gallinaro and Cartesegna	1		Pribicevic and Pollard 2004	1
Gardner et al 2013	1		Raskind and North 1990	1
Gimblet et al 1999	1		Richard 1967	1
Haldeman et al 2002	1		Rothwell et al 2001	2
Haldeman and Rubinstein 1983	1		Ruelle et al 1999	3
Hammer 1993	1		Ryan 1993	1
Haynes 1994	1		Rydell and Raf 1999	1
Hdeib et al 2016	1		Schmitt 1976	1
Hensell 1976	1		Sharp 1999	1
Hipp et al 1961	1		Sherman et al 1981	1
Hooper 1973	1		Sherman et al 1987	1
Horrigan et al 1994	1		Shrode 1994	1
Houle et al 2009	1		Shvartzman and Abelson 1988	1
Hudkins 2012	1		Skappak and Saude 2018	1
Jaffe and Bonsall 1998	1		Slater and Spencer 1992	1
Jentzen et al 1987	1		Smith 2000	1
Jeret et al 2001	1		Smith and Estridge 1962	1
Kaczorowska 2014	1		Smith et al 2003	1
Kampschroeder et al 1990	1		Solheim et al 2007	1
Kazemi 1999	1		Sozio and Cave 2008	1
Klougart et al 1996	1		Staff 1993	1
Kornberg 1988	1		Stoddard and Johnson 2000	1
Krueger and Okazaki 1980	1		Straus et al 2005	1
Kurbanyan et al 2007	1		Suh et al 2005	1
Kurtz 2004	1		Sullivan 1992	1
Kusnezov et al 2013	1		Tamburelli et al 2011	2
Lanska et al 1987	1		Thomas et al 2011	1
Leahy 1991	1		Wang et al 2006	1
Lee et al 2011	2	1	Wilson et al 2015	1
Lehmann et al 1991	1		Zak and Carmody 1984	1

Case studies/series reported in Systematic Reviews

