

Executive summary

Objectives

- 1) To catalogue the research evidence on the effects of manual therapy
- 2) To evaluate and summarise the effects of manual therapy as reported by systematic reviews, randomised controlled trials (RCTs) and comparative effectiveness studies not included in the Bronfort report (2010)
- 3) To review systematically the cost-effectiveness and cost-utility of manual therapy interventions relative to no treatment, placebo, or other active treatments
- 4) To capture a stakeholder perspective on the evidence identified at dissemination event at the University of Warwick

Background

Manual therapy is a non-surgical type of conservative management that includes different skilled hands/fingers-on techniques directed to the patient's body (spine and extremities) for the purpose of assessing, diagnosing, and treating a variety of symptoms and conditions.

Manual therapy is used both within the traditional medical context (physiotherapy, orthopaedics, sports medicine) and as part of complementary and alternative medicine (mainly chiropractic and osteopathy). A major difference between the two contexts is that both chiropractic and osteopathy subscribe to a holistic model of health and healthcare where any manual treatment of the musculoskeletal system may have an influence on the rest of the system, whereas orthopaedic / physiotherapeutic manual therapy is based on the traditional biomedical / biopsychosocial model of health and healthcare. One consequence is that while all three professions emphasise the treatment of neuromuscular disorders, both the chiropractic and osteopathic professions will also treat non-neuromuscular conditions to some extent, either using manual treatment or using adjunctive treatment and advice. By contrast, the focus of orthopaedic / physiotherapeutic manual therapy is on neuromuscular conditions only.

Manual therapy constitutes a wide variety of different techniques which may be categorised into four major groups: a) manipulation (thrust manipulation), b) mobilisation (non-thrust manipulation), c) static stretching, and d) muscle energy techniques. The definition and purpose of manual therapy varies across health care professionals.

The current review builds on the "UK evidence report" by Bronfort and colleagues (2010) on the effectiveness of manual therapies commissioned by the UK General Chiropractic Council (GCC). Bronfort and colleagues referred to the limitations of the available evidence and a range of issues that needed exploring in a more extensive review. The current work aimed to:

- Synthesise evidence in addition to the RCTs and systematic reviews captured by the Bronfort report, such as controlled cohort studies, non-randomised controlled clinical trials (CCTs), cost-effectiveness, and qualitative studies
- Synthesise evidence additional to the Bronfort report (RCTs and systematic reviews published since the Bronfort report and additional study types)

- Compare conclusions from the additional studies summarised (new RCTs and systematic reviews and additional study types) to those of the Bronfort report, focusing in particular on areas where the Bronfort report stated that the available evidence was inconclusive or that manual therapy was not effective.
- Identify the limitations of the Bronfort report and gaps in evidence

Methods

Search strategy

A comprehensive literature search was undertaken in 10 major medical, health-related, science and health economic electronic bibliographic databases. In addition, various health service research and guideline producing bodies were consulted via the internet. We utilised the expertise within the group and consulted with national and international experts where necessary. The main search was carried out in August 2011, with some search updates in PubMed up to July 2012.

Inclusion criteria

Types of studies

Systematic reviews, RCTs and CCTs, cohort studies with a comparison group, qualitative studies of patients' views on manual therapy, and cost-effectiveness studies.

For the cost-effectiveness review, studies reporting the assessment of cost-effectiveness and/or cost-utility of manual therapy were eligible for inclusion. The eligible studies had to report cost-effectiveness and/or cost-utility analysis. Full text reports of primary comparative studies (RCTs, CCTs, comparative cohort studies), study protocols (of completed or on-going studies), or systematic reviews were eligible.

Types of participants

Patients of any age and in any setting treated for any musculoskeletal or non-musculoskeletal condition (within indications for chiropractic, osteopathic and orthopaedic manual therapy as defined by the respective professions).

Types of interventions

Studies assessing any manual treatment / therapy were included (alone or in combination). Emphasis was on interventions typically carried out by a manual therapist / chiropractor / osteopath. Comparisons were against any other therapy.

Types of outcome measures

Pain intensity, pain-related disability, analgesic use, function, mobility (e.g. walking distance), and other relevant symptoms, characteristic symptoms or indicators of disease, patient satisfaction, quality of life, activities of daily living, views / themes from qualitative data, adverse events (e.g. strokes, fractures, pain), and mortality.

Outcomes for the cost-effectiveness review: effectiveness outcome measures (e.g., pain, disability, quality of life, utility) and costs; incremental cost-effectiveness ratios (ICERs).

Quality assessment

The following assessment tools were used: AMSTAR (for systematic reviews); Cochrane Risk of Bias (for RCTs); CRD checklist (for controlled cohort studies); CASP (for qualitative studies); Drummond checklist (for cost-effectiveness studies). Based on the quality results, studies were rated as high, medium or low quality and using the same criteria as the Bronfort report (based on consistency between studies, study size, quality etc.) the evidence was rated as 'high quality positive/negative evidence', 'moderate quality positive/negative evidence', or 'inconclusive favourable/non-favourable/unclear evidence'.

Study selection and data extraction

The inclusion/exclusion criteria were applied to the studies identified through the searches by screening the titles/abstracts of the identified records and the full text of any records appearing to fulfil the inclusion criteria. A part (20%) of the full search results were checked in duplicate by two reviewers and good agreement was achieved. For the cost-effectiveness review, the full text of articles appearing to be relevant was checked in duplicate by two independent authors. Agreement was achieved by discussion. Data were extracted using *a priori* developed data extraction forms.

Results

Clinical effectiveness

Search results

The initial database searches yielded 25,539 records. The final version of the evidence catalogue contained 1014 bibliographic records. The majority of relevant studies identified were RCTs and systematic reviews, with only a small number of non-randomised comparative studies. Approximately 17% of studies in the catalogue were published since the searches in the Bronfort report. The majority of studies (approximately 75%) related to treatment of musculoskeletal conditions and approximately 67% of these were concerned with spinal disorders. Studies on back pain were common, followed by studies on neck pain or other disorders. Other identified studies focussed on foot, ankle, knee, or hip disorders or surgery / injury rehabilitation. Studies on shoulder disorders were also common, followed by studies of lateral epicondylitis (tennis elbow). Small numbers of relevant studies were identified on a large range of non-musculoskeletal disorders.

Clinical outcomes

Musculoskeletal

Combined chiropractic treatment (spinal manipulation as part of a chiropractic intervention package) for low back pain was not considered by Bronfort, although moderate (positive) evidence has now been identified. Furthermore, support for the moderate (positive) rating by Bronfort on low back pain (acute) using spinal manipulation / mobilisation was confirmed in the current study. However, the authors of this review rated the overall evidence for low back pain (chronic) as moderate (positive) in contrast to Bronfort, who rated the evidence as high grade (positive). The majority of interventions (mobilisation / massage) for the spinal musculoskeletal conditions (sciatica / radiating leg pain, neck pain, mid back pain, coccydynia, temporomandibular disorders) reported by Bronfort had inconclusive (favourable) ratings, and the level of evidence remained unchanged despite new evidence being identified. Literature on other musculoskeletal conditions / treatments not reported by Bronfort were identified: a) whiplash-associated disorder (subacute) cervical / thoracic manipulation, (chronic) chiropractic cervical manipulation, cranio-sacral therapy; b) temporomandibular disorders (mandibular manipulation); and c) intra-oral myofascial therapy, osteopathic manual therapy (cervical and temporomandibular joint regions) and myofascial pain syndrome (ischaemic compression, integrated neuromuscular inhibition technique). However, the new evidence on these musculoskeletal conditions not reported by Bronfort was in the majority of cases rated as inconclusive (favourable or unclear) or in one case, inconclusive (non-favourable) for myofascial pain syndrome trigger point release. Only whiplash-associated disorder (acute) using mobilisation with exercise was rated moderate (positive) evidence by the current study and Bronfort.

The current review identified new evidence for interventions on upper extremity disorder conditions (shoulder disorders: rotator cuff disorder using manipulation / mobilisation [with exercise]) which changed the evidence ratings reported by Bronfort from inconclusive (favourable) to moderate (positive). Evidence for the majority of upper extremity disorders remained inconclusive (favourable) (carpal tunnel syndrome using mobilisation and trigger point therapy, lateral epicondylitis with manual tender point therapy and mobilisation with exercise). Evidence on lateral epicondylitis with manipulation was rated as inconclusive (non-favourable) and shoulder girdle pain / dysfunction using manipulation / mobilisation (mobilisation with movement) and adhesive capsulitis using high grade mobilisation, was rated as moderate (positive), this was in agreement with Bronfort. Several additional interventions for upper extremity disorders not reported by Bronfort were rated as inconclusive (unclear or favourable) including: a) carpal tunnel syndrome using diversified chiropractic care, neurodynamic technique, soft tissue mobilisation (with or without Graston instrument) and b) shoulder disorders such as adhesive capsulitis (mobilisation with movement, osteopathy – Niel-Asher technique, or manual therapy with exercise) and minor neurogenic shoulder pain (cervical lateral glide mobilisation and / or high velocity low amplitude manipulation with soft tissue release and exercise). Finally, evidence on other interventions for conditions not reported by Bronfort (soft tissue shoulder disorders using myofascial treatments such as ischaemic compression, deep friction massage, therapeutic stretch) was rated as moderate (positive).

The identified evidence on interventions for lower extremity disorders (ankle sprains, ankle fracture rehabilitation, morton's neuroma / metatarsalgia, hallux limitus, plantar fasciitis, hallux abducto valgus, hip osteoarthritis, knee osteoarthritis, patellofemoral pain syndrome) did not change the conclusions drawn by Bronfort. It was noted that interventions for the following conditions did have moderate (positive) supporting evidence: a) plantar fasciitis (manipulation / mobilisation with exercise; b) hip osteoarthritis (manipulation / mobilisation); c) knee osteoarthritis (mobilisation with

exercise); and d) patellofemoral pain syndrome (manipulation / mobilisation with exercise). Evidence on interventions for several conditions not reported by Bronfort (ankle sprains using muscle energy technique, ankle fracture rehabilitation using Kaltenborn-based manual therapy, plantar fasciitis using trigger point therapy) was rated inconclusive (favourable).

The current review did not identify any new evidence in addition to the Bronfort report on cervicogenic headaches involving spinal manipulation, self-mobilising apophyseal glides, friction massage and trigger points. However, new evidence on mobilisation interventions for cervicogenic and miscellaneous headaches changed the conclusions drawn by Bronfort from inconclusive (unclear) to moderate (positive). The evidence for the treatment of migraine headache using spinal manipulation remained moderate (positive) as reported by Bronfort, although there are considerable limitations in the evidence reported. For a range of other related conditions including migraine headache, tension-type headache, balance in elderly people, and fibromyalgia there were no changes to the evidence ratings reported by Bronfort (inconclusive with the exception of cervicogenic dizziness that was rated moderate (positive)).

Non-musculoskeletal

The evidence ratings in the current report for the majority of non-musculoskeletal conditions considered by Bronfort remain unchanged (asthma using osteopathic manual therapy, paediatric nocturnal enuresis using spinal manipulation, infant colic using spinal manipulation, cranial osteopathic manual therapy, dysmenorrhoea using spinal manipulation, premenstrual syndrome using spinal manipulation, stage 1 hypertension using spinal manipulation added to diet, upper cervical using spinal manipulation, instrument assisted spinal manipulation, otitis media and pneumonia in elderly adults using osteopathic manual therapy). However, the new evidence identified on asthma treatment using spinal manipulation has changed Bronfort's rating from moderate (negative) to inconclusive (unclear). Additional evidence was identified concerning several conditions and interventions that were not reported by Bronfort (asthma using cranio-sacral therapy, ADHD, cancer care, cerebral palsy, chronic fatigue syndrome / myalgic encephalomyelitis, chronic pelvic pain - interstitial cystitis / painful bladder syndrome / chronic prostatitis / chronic pelvic pain in women / chronic prostatitis, cystic fibrosis, paediatric dysfunctional voiding, paediatric nocturnal enuresis using Chinese pinching massage, menopausal symptoms, gastrointestinal disorders using reflux disease, duodenal ulcer and irritable bowel syndrome, stage 1 hypertension using osteopathic manual therapy and Gonstead full spine chiropractic care, intermittent claudication, insomnia, Parkinson's disease, COPD in elderly adults, back pain during pregnancy, care during labour / delivery, care of preterm infants, surgery rehabilitation, stroke rehabilitation, systemic sclerosis). However, the new evidence on these non-musculoskeletal conditions not reported by Bronfort was in the majority of cases rated as inconclusive (favourable or unclear). Only in one case there was moderate negative evidence: in some types of cancer such as osteosarcoma, manipulative therapy may have significant adverse effects and is contraindicated.

Adverse events

Seven systematic reviews and seven primary studies were identified concerning adverse events. With manual therapy, mild-to-moderate adverse events of transient nature (e.g., worsening symptoms, increased pain, soreness, headache, dizziness, tiredness, nausea, vomiting) were relatively frequent. For example, evidence from high, medium, and low quality systematic reviews specifically focussing on adverse events suggest that approximately half of the individuals receiving manual therapy

experienced mild-to-moderate adverse event which had resolved within 24-74 hours. In agreement with the Bronfort report, evidence indicated that serious (or major) adverse events after manual therapy were very rare (e.g., cerebrovascular events, disc herniation, vertebral artery dissection, cauda equine syndrome, stroke, dislocation, fracture, transient ischemic attack). Evidence on safety of manual therapies in children or paediatric populations was scarce; the findings from two low quality cohort studies and one survey were consistent with those for adults that transient mild to moderate intensity adverse events in manual treatment were common compared to more serious or major adverse events which were very rare. However, the evidence on adverse events in manual therapy warrants caution due to relative paucity of evidence and poor methodological quality of the included primary studies.

Cost-effectiveness and cost-utility

Search results

Our searches identified 42 relevant publications, representing 28 unique studies (11 systematic review/health technology assessment reports, 16 RCTs, and 1 controlled cohort study), which were included in the review. A total of 11 systematic review/health technology assessments, 5 primary study protocols, and 12 completed primary study reports were identified as eligible for the section of economic evaluation of the review.

Cost outcomes

This section focused on the results reported in 12 primary studies, of which 11 were RCTs and one was an observational prospective cohort study. Briefly, the studies evaluated participants recruited from general primary care practices, chiropractors' or physiotherapists' offices. The study participants in the majority of studies presented with non-specific back and/or neck pain. The mean age of the study population ranged from 37 to 51 years. The economic evaluations included assessments of cost-effectiveness (based on pain intensity and disability measures) and/or cost-utility (QALYs based on quality of life measures) of manual treatment techniques (manipulation, mobilisation) compared to usual general practitioner (GP) care, physiotherapist (PT) advice, pain management, exercise, or PT. Most interventions lasted from 6 to 12 weeks. The costs were evaluated from societal, public payer/primary care, or both perspectives. Given the short follow-up of most studies (12 months), no discounting was considered.

All economical evaluations except for one study were conducted alongside RCTs. In all or most studies the research question was clearly formulated with sufficient information on the test intervention, control group intervention, costs, and comparative effectiveness results including uncertainty around the estimates. For more than half of the studies costs were not individually itemized, and therefore, it was not clear what types of costs were included in the calculations. The valuation methods of costs reported in the studies were judged as adequate.

In studies of low back and shoulder pain, the use of manual therapy interventions (i.e., osteopathic spinal manipulation, physiotherapy consisting of manipulation and mobilisation techniques, chiropractic manipulation) resulted in at least numerically greater total costs and improvements in

pain, disability, and QALYs gained compared to alternative treatments such as usual GP care, pain management, spinal stabilisation, GP advice, or exercise. The observed extra costs needed for one unit improvement in low back or shoulder pain/disability score or one QALYs gained were lower than the willingness-to-pay thresholds reported across the studies. Given the estimates of ICERs and corresponding uncertainties, the manual treatments (chiropractic, osteopathic spinal manipulation or combination of manipulation and mobilisation), in addition or alone, were shown to be more cost-effective options at least for short term in the treatment of low back pain and disability compared to usual GP care (ICER: £3,560 per QALY gained), spinal stabilisation (ICER: £1,055 per QALY gained), GP advice (ICER: £318 and £49 per score improved in pain and disability, respectively), advice to remain active (ICER: £3,010 per QALY gained), or brief pain management (ICER: £156 per score improved in disability and ICER: £2,362 per QALY gained). Similarly, the use of manipulation plus mobilisation for treating shoulder pain was more cost-effective compared to GP care with respect to recovery (ICER: £1,812), pain (ICER: £110.25), disability (ICER: £3.15), and general health (ICER: £1,860). The findings from the UK BEAM study indicated that the addition of chiropractic and osteopathic manipulations to exercise and GP care was dominant (less costly and more effective) over the combination of exercise and GP care. In the same study, the addition of manipulation alone (ICER: £4,800) or manipulation plus exercise (ICER: £3,800) to GP care was more cost-effective than GP care alone. According to the UK BEAM study results, the most cost-effective treatment option for patients with low back pain was the addition of manipulation alone to GP care (the willingness-to-pay \geq £10,000 per QALY gained).

In the neck pain studies, the use of manual therapy interventions (chiropractic manipulation plus joint mobilisation with low-velocity passive movements) incurred lower total costs compared to alternative treatments such as behavioral graded physical activity program, PT, GP care, or advice plus exercise. Results on cost-effectiveness of manual therapy for reducing neck pain, disability, and QALYs gained compared to other treatments were not consistent across these studies. For example, in one study of patients with subacute neck pain, the behavioral graded physical activity (BGA) was more cost-effective than manual therapy (small amplitude thrust manipulation plus large-amplitude mobilisation) in reducing pain intensity (ICER: £209) and disability (£77.70). However, there was no difference between the two treatments in cost-utility. In another study, the manual therapy (various chiropractic manipulation techniques plus low-velocity articular mobilisation) dominated either PT (ICER: -£19,620 per QALY gained) or GP care (ICER: -£9,769 per QALY gained). The results of one neck pain study on cost-effectiveness of manual therapy (hands-on passive or active movements, mobilisation, soft-tissue/joint spinal manipulation) compared to advice and exercise were inconclusive due to high uncertainty.

Discussion

Clinical effectiveness

The current report catalogued and summarised recent systematic reviews, RCTs and comparative effectiveness studies that were not all included in the Bronfort report (e.g. non-English literature) and compared results and updated conclusions. A large number of studies were included (over 1000 in the evidence catalogue, over 100 in the more detailed summaries). The majority of studies were concerned with musculoskeletal conditions, and the majority of these were about spinal disorders. The

most common study design was the RCT. There were relatively few non-randomised comparative and qualitative studies meeting the current inclusion criteria.

The majority of conditions previously reported to have “inconclusive” or “moderate” evidence ratings by Bronfort remained the same. Only in three cases, evidence ratings changed in a positive direction from inconclusive to moderate evidence ratings (manipulation / mobilisation (with exercise) for rotator cuff disorder, mobilisation for cervicogenic and miscellaneous headache). It was also noted that some evidence ratings by Bronfort changed in the current report in a negative direction from moderate to inconclusive evidence or high to moderate evidence ratings. In addition, evidence was identified on a large number of non-musculoskeletal conditions that had not previously been considered by Bronfort; all this evidence was rated as inconclusive.

Overall, it was difficult to make conclusions or generalisations on all the conditions due limitations in quality of evidence, short follow-up periods reported (<12 months), and high uncertainty in the effectiveness measures. Most reviewed evidence was of low to moderate quality and inconsistent due to substantial methodological and clinical diversity, thereby rendering some between-treatment comparisons inconclusive. The differences in the therapy provider’s experience, training, and approaches may have additionally contributed to the inconsistent results.

Cost-effectiveness

Twelve primary studies compared cost-effectiveness and/or cost-utility of manual therapy interventions to other treatment alternatives in reducing non-specific musculoskeletal pain (spinal, shoulder, ankle). All economic evaluations except for one were conducted alongside RCTs. It remains difficult to draw definitive conclusions regarding the comparative cost-effectiveness of manual therapy techniques in patients presenting with spinal pain due to the paucity and clinical heterogeneity of the identified evidence.

Manual therapy techniques such as osteopathic spinal manipulation, physiotherapy consisting of manipulation and mobilisation techniques, and chiropractic manipulation in addition to other treatments or alone appeared to be more cost-effective than usual GP care (alone or with exercise), spinal stabilisation, GP advice, advice to remain active, or brief pain management for improving low back/shoulder pain/disability and QALYs gained during one year. Moreover, chiropractic manipulation dominated (i.e., less costly and more effective than alternative treatment) either physiotherapy or GP care in improving neck pain and QALYs gained.

An advantage of this review over others is that it includes only those studies that evaluated costs and effectiveness simultaneously through cost-effectiveness and/or cost-utility analyses by providing ICERs and the associated uncertainty measures.

The main limitation of the cost-effectiveness review stems from the reviewed evidence itself. Namely, the current review found a paucity of evidence of cost-effectiveness/cost-utility evaluations for manual therapy interventions. The review extracted only those outcomes used in the economical evaluations of included studies. The findings of the cost-effectiveness review warrant caution given the following issues a) lack of blinding and its effect on subjective outcomes (pain, disability, recovery) and b) contextual effects (e.g., care giver experience).

Overall, manual therapy techniques such as osteopathic spinal manipulation, physiotherapy consisting of manipulation and mobilisation techniques, and chiropractic manipulation in addition to other treatments or alone appeared to be more cost-effective than usual GP care (alone or with exercise), spinal stabilisation, GP advice, advice to remain active, or brief pain management for improving low back/shoulder pain/disability and QALYs gained during one year. Moreover, chiropractic manipulation dominated (i.e., less costly and more effective than alternative treatment) either physiotherapy or GP care in improving neck pain and QALYs gained. The evidence regarding cost-effectiveness of manual therapy (hands-on passive or active movements, mobilisation, soft tissue/joint spinal manipulation) compared to advice plus exercise in reducing neck pain was limited in amount and inconclusive due to high uncertainty.

Dissemination event

The dissemination event held at the University of Warwick in June 2012 involved 23 people (14 male, 9 female) of which 21 were professionals and two were patients. The attendees were given an opportunity to provide the research team with their thoughts about the overall findings. A series of questions were explored with the attendees.

The attendees were in agreement that the findings provided a useful platform or baseline for future research. They were encouraged by the findings as they felt there were now the reasons for developing collaborative research. They recognised that there had been a plethora of evidence published, but concluding anything from it was very difficult due to the limited high quality research. They wanted to see more high quality research being funded, widespread dissemination to clinicians and students being educated on how to undertake high quality research.

It was suggested that trials on specific conditions might be undertaken and further investigations about patients' experiences in terms of satisfaction, acceptability and attitudes towards treatment outcomes. There was discussion about the need for a prospective RCT, possibly between chiropractic versus usual GP care on the clinical and cost-effectiveness of manual therapy on specific conditions. The attendees recognised the value of evaluating the cost-effectiveness of interventions. They also would like to see more evaluation and synthesis of the available trial evidence, as the current review was limited in the amount of detail it could report due to the large number of conditions included.

The attendees would like to be kept up-to-date with the College of Chiropractors overall findings and recommendations. They stated that different undergraduate colleges need to work together and discuss the mechanism to maintain the catalogue. There was a suggestion that greater communication could take place through forums or a Wiki.

Research needs / recommendations

The current research has highlighted the need for long-term large pragmatic head-to-head trials reporting clinically relevant and validated efficacy outcomes along with full economic evaluations. Ideally, future studies should use and report unit cost calculation and costs need to be broken down by each service to allow the judgment as to whether all relevant costs applicable to a given perspective were considered and how the total costs were calculated. If ethically justifiable, future trials need to include sham or no treatment arm to allow the assessment and separation of non-specific effects (e.g.,

patient's expectation) from treatment effects. Furthermore, future research needs to explore which characteristics of manual therapies (e.g., mode of administration, length of treatments, number of sessions, and choice of spinal region/points) are important in terms of their impact on clinically relevant and patient-centered outcomes. Also, strong efforts are needed to improve quality of reporting of primary studies of manual therapies.

The following key research needs and recommendations were highlighted from the report findings:

- There is a need to maintain and update the catalogue;
- The current research provides a strong argument in support of further trials in this area (e.g. funding from NIHR Health Technology Assessment Programme) through research collaboration;
- Provision of more training and education in research for the chiropractic community is needed – this includes training in secondary research;
- Studies need to be developed that involve qualitative research methods to explore patient attitudes, satisfaction and acceptability towards manual therapy treatments, this could also take the form of mixed methods studies exploring both effectiveness and patient views;
- Greater consistency is needed across research groups in this area in terms of definition of participants, interventions, comparators and outcomes;
- More research is needed on non-musculoskeletal conditions;
- High quality, long-term, large, randomised trials reporting effectiveness and cost-effectiveness of manual therapy are needed for more definitive conclusions.

Conclusions

The current report provides a platform for further research into the clinical and cost-effectiveness of manual therapy for the management of a variety of musculoskeletal and non-musculoskeletal conditions. There is need to maintain and update the catalogue. Limited research had been published on many non-musculoskeletal conditions. Raising awareness about the importance of undertaking high quality research is needed among the chiropractic community. The magnitude of benefit and harm of all manual therapy interventions across the many conditions reported cannot be reliably concluded due to the paucity, poor methodological quality and clinical diversity of included studies.

Overall, manual therapy techniques such as osteopathic spinal manipulation, physiotherapy consisting of manipulation and mobilisation techniques, and chiropractic manipulation in addition to other treatments or alone appeared to be more cost-effective than usual GP care (alone or with exercise), spinal stabilisation, GP advice, advice to remain active, or brief pain management for improving low back/shoulder pain/disability and QALYs gained during one year. Moreover, chiropractic manipulation dominated (i.e., less costly and more effective than alternative treatment) either physiotherapy or GP care in improving neck pain and QALYs gained. The evidence regarding cost-effectiveness of manual therapy (hands-on passive or active movements, mobilisation, soft tissue/joint spinal manipulation) compared to advice plus exercise in reducing neck pain was limited in amount and inconclusive due to high uncertainty. Further research and good quality evidence from well-conducted studies is needed to draw more definitive conclusions and valid recommendations for policy making.

It is important to consider whether the evidence which is available provides a reliable representation of the likely success of manual therapy as provided in the UK. Given the considerable gaps in the evidence and the inconsistent reporting on techniques and interventions used (and often a lack of

description of techniques used), and the fact that many reported studies failed to consider the generalisability of the findings to the range of settings in which manual therapy is practised in the UK, this is unlikely. There is a need to consider the whole package of care, rather than just single manipulation or mobilisation interventions. A mixed methods approach should be considered for expanding the evidence base and addressing the complexities of this important discipline in health care.