ASERNIP-S

Australian Safety and Efficacy Register of New Interventional Procedures - Surgical

Rapid Review

Arthroscopy for Knee Osteoarthritis: Review of Clinical Evidence and Guidelines

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Australian Safety & Efficacy Register of New Interventional Procedures – Surgical

The Royal Australasian College of Surgeons

This report has been produced for the Victorian Government Department of Health

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Please note that this brief report, while broad in some aspects of systematic review methodology, should not be considered a comprehensive systematic review. Rather, this is a rapid review in which the methodology has been limited in one or more of the following areas to shorten the timeline for its completion: search strategy, inclusion criteria, assessment of study quality and data analysis. This report also contains non-systematic elements, such as qualitative information gathered from local surgeons. However, it is considered that these amendments would not significantly alter the overall findings of the rapid review when compared to a full systematic review.

The methodology used for the rapid review is described in detail, including the limits for this particular topic. These limits were applied following the requirements of the specific review topic, in consultation with the requester.

For a more comprehensive understanding of this topic, a broader analysis of the literature may be required. As such, all readers of this document should be aware of the limitations of this review.

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Declaration of competing interest:

The authors of this publication claim no competing interests.

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Scope of the Report

The objective of this rapid systematic review is to facilitate the appropriate use of arthroscopy in patients with knee osteoarthritis by providing a synthesis of the evidence on the following research questions.

1. Is there a specific clinical threshold of pathology below which arthroscopic surgery is of low clinical value in patients with knee osteoarthritis?
2. Is there evidence of effective alternative treatments to arthroscopic surgery for knee osteoarthritis where knee replacement is not currently indicated?
3. Are these effective alternative treatments for knee osteoarthritis available throughout Victoria?

Executive Summary

Context and policy issues

Osteoarthritis (OA) is a progressive, degenerative disease characterised by degradation of the cartilage in synovial joints. Changes in muscles, tendons, synovial fluid accumulation and bone proliferation can cause pain, stiffness, locking and decreased range of motion, limiting daily activities and reducing quality of life. OA treatment aims to preserve joint function and slow disease progression. Patients with symptoms that are refractory to conservative management may eventually require surgical intervention.

Various arthroscopic procedures are used to treat different aspects of OA, including: washing the joint with saline to remove cartilage fragments and calcium phosphate crystals; debriding torn menisci and ligaments; resecting proliferative synovium; removing loose cartilage and smoothing lesions; and removing osteophytes and drilling osteochondral lesions. Arthroscopy was used routinely to treat knee OA based on results from case series suggesting that arthroscopy alleviated OA-related pain. However, subsequent randomised controlled trials (RCTs) involving patients with moderate to severe OA showed no detectable difference in pain or quality of life between arthroscopy and a control at two years' follow-up. Despite this, geographical variation exists in the number of knee arthroscopies performed across Victoria, and the overall rate of knee arthroscopy has remained unchanged over time.

Therefore, the objective of this rapid systematic review (SR) is to facilitate the appropriate use of arthroscopy in patients with knee osteoarthritis by providing a synthesis of the evidence on the following research questions.

1. Is there a specific clinical threshold of pathology below which arthroscopic surgery is of low clinical value in patients with knee osteoarthritis?
2. Is there evidence of effective alternative treatments to arthroscopic surgery for knee osteoarthritis where knee replacement is not currently indicated?
3. Are these effective alternative treatments for knee osteoarthritis available throughout Victoria?

Methods

A systematic search of MEDLINE, EMBASE, *The Cochrane Library*, the NHS Centre for Reviews and Dissemination databases and the websites of various international health technology assessment agencies and clinical practice guideline (CPG) clearinghouses was conducted to identify relevant SRs, health technology assessments, clinical guidelines and comparative studies published in English from January 2005 (January 2009 for guidelines) to July 2014. A focused internet search was also conducted to identify grey literature. Study selection, data extraction and quality appraisal were undertaken by one

reviewer. Two orthopaedic surgeons from Melbourne, Victoria were surveyed to identify which arthroscopic procedures and alternative non-surgical interventions are available in Victoria to patients with knee OA and what resources could be developed to better support surgeons in treating patients when knee replacement surgery is not indicated.

Key results

Evidence regarding the clinical threshold of pathology below which arthroscopic surgery is of low clinical value for knee OA was derived from a guideline synthesis, a CPG, a SR and a health technology assessment. A guideline synthesis and a CPG provided evidence regarding the effectiveness of pharmacological and non-pharmacological alternatives to arthroscopic surgery where knee replacement is not currently indicated. One SR examined survival time to knee replacement by pooling the results of three poor quality studies. Evidence may be incomplete and there may be potential for bias based on the methods used to identify and select the CPGs included in the synthesis report on which much of the evidence is derived. Studies included in the SRs may not be generalisable to OA patients and may not cover all of the interventions relevant to Victoria. Outcome measures of self-reported pain relief and function are subjective and can be affected by confounding factors such as concomitant use of analgesic and non-steroidal anti-inflammatory drugs (NSAIDs), and significant variation was observed across the studies included in the SRs. It is not clear how these factors were considered in formulating the conclusions of the SRs. Studies in most of the SRs contained insufficient numbers of patients to ascertain the potential for serious adverse events after arthroscopic surgery.

Threshold of pathology for arthroscopic knee surgery

Arthroscopy with debridement should not be recommended for the management of symptomatic knee OA of indiscriminate cause, but it may be of value for patients with a clear history of mechanical locking, localised lesions on the medial femoral condyl or medial compartmental knee OA. Factors that may be associated with poorer outcomes after arthroscopy included OA of longer than two years duration, obesity, smoking, presence of tibial osteophytes, tibial sclerosis or calcifications, absence of effusion and prior meniscectomy. While one SR reported a mean survival time to knee replacement of 42.7 months after arthroscopy (34% of patients required an arthroplasty after four years), there was significant variation across the three poor quality studies from which these data were derived.

Effectiveness of alternative treatments for knee osteoarthritis

Paracetamol was recommended as a first-line treatment for symptomatic OA; second-line agents included topical anti-inflammatory agents and low dose, short duration oral NSAIDs. While tramadol was recommended for refractory symptoms, cyclooxygenase-2 inhibitors, opioids and duloxetine may also be considered. Intra-articular corticosteroid injections were recommended as an adjunct therapy for moderate to severe OA. Non-pharmacological interventions involving self-management, education, low-impact

exercise and weight loss were strongly recommended. Walking aids and assistive devices that improve activities of daily living were recommended, as were thermal modalities.

Availability of effective alternative treatments in Victoria

Two surgeons from Melbourne provided expert opinion regarding the availability of alternative therapies for OA throughout Victoria. The main evidence-based non-surgical interventions available to patients as standard of care prior to surgery include: paracetamol, NSAIDs, opioids, topical anti-inflammatory agents, intra-articular corticosteroid injections, activity modification, weight loss, exercise, physiotherapy and walking aids. Additional therapies available throughout Victoria, for which evidence was controversial, insufficient or inconclusive include: intra-articular injections of hyaluronic acid, platelet-rich plasma or anaesthetic, bracing techniques and knee joint aspiration. The use of glucosamine and chondroitin was generally not recommended by the CPGs.

Conclusions and policy implications

Evidence suggested that arthroscopy with debridement should not be recommended for the management of symptomatic knee OA of indiscriminate cause, but it may be of value for patients with a clear history of mechanical locking, localised lesions on the medial femoral condyl or medial compartmental knee OA. Patient characteristics that may be associated with poorer outcomes included OA of longer than two years' duration, obesity, smoking, presence of tibial osteophytes, tibial sclerosis or calcifications, absence of effusion and prior meniscectomy. However, it was unclear whether poorer outcomes are more likely to occur in patients with higher grades of disease severity.

General practitioners, rheumatologists and orthopaedic surgeons should be encouraged not to prescribe intra-articular injections of hyaluronic acid, platelet-rich plasma or anaesthetic, bracing, knee joint aspiration, glucosamine or chondroitin until such time as there is evidence of their effectiveness. Promoting easier, timelier access to the many effective non-surgical alternatives, including community-based resources (e.g. physiotherapy and hydrotherapy), available in Victoria for patients with knee OA would encourage surgeons to appropriately refer patients back to primary care as required.

Decision makers should consider that while these results are in favour of reducing arthroscopic lavage and debridement for symptomatic OA of indiscriminate cause, further studies are needed to determine whether arthroscopic surgery is effective for patients with earlier stages of OA arising from a specific cause, and to evaluate the effectiveness of arthroscopic surgery compared with the effective alternatives available throughout Victoria. It is currently unclear whether arthroscopic treatment of patients with knee OA delays the time to knee replacement. The overall rate of knee arthroscopy has remained relatively unchanged in Victoria in recent years. If many of these arthroscopies are unnecessary, this could represent ineffective clinical management as well as unnecessary resource utilisation. Multidisciplinary orthopaedic clinics and

prognostic tools to identify patients who would benefit from arthroscopic surgery may encourage the appropriate use of non-surgical interventions for knee OA.

Important note:

The information contained in this report is a synthesis of the best available evidence located at the time the searches were completed.

Abbreviations

AAOS	American Academy of Orthopaedic Surgeons
AGREE	Appraisal of Guidelines for Research and Evaluation
AIMS	Arthritis Impact Measurement Scales
AIMS2-WB	Arthritis Impact Measurement Scales 2 walking and bending subscale
AMSTAR	Assessment of Multiple Systematic Reviews
CI	confidence interval
COX-2	cyclooxygenase-2
CPG	clinical practice guideline
FU	follow-up
GDG	guideline development group
HTA	health technology assessment
IRR	incidence rate ratio
KSPS	Knee Specific Pain Scale
MA	meta-analysis
NICE	National Institute for Health and Care Excellence
NNTB	number needed to treat for an additional beneficial outcome
NNTH	number needed to treat for an additional harmful outcome
NSAID	non-steroidal anti-inflammatory drug
OA	osteoarthritis
OAHKS	Osteoarthritis Hip and Knee Service
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	randomised controlled trial
RR	relative risk
SD	standard deviation
SMD	standardised mean difference
SR	systematic review
TENS	transcutaneous electrical nerve stimulation
WMD	weighted mean difference
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index

1. Context and Policy Issues

Osteoarthritis (OA), the most common form of arthritis, is a highly prevalent, disabling condition associated with significant healthcare utilisation. OA is a chronic, progressive, degenerative disease characterised by degradation of the cartilage in synovial joints (Ashford and Williard 2014). It commonly affects the hands, feet, hips and knees during times of mechanical stress when self-repair by joints is insufficient. The development of primary OA of the knee has been associated with hereditary factors, previous joint injury and obesity, while secondary OA is related to congenital disorders, diabetes, inflammatory diseases and injuries to the joints or ligaments (Ashford and Williard 2014).

The lifetime risk of developing symptomatic knee OA is approximately 40 per cent in men and 47 per cent in women (Neogi and Zhang 2013). The age- and sex-standardised incidence rate for knee OA is 240 cases per 100,000 person-years, with the incidence rising sharply after 50 years of age and levelling off after 70 years (Neogi and Zhang 2013). The prevalence of OA in the United States rose from 21 million in 1995 to 27 million in 2005 due to the increasing age and obesity of the population (Nelson et al. 2014; Neogi and Zhang 2013). In Australia, more than 1.4 million people (7.3% of the population) reported having OA, which is the tenth most commonly managed problem in general practice and costs over $1 billion per day (Brand et al. 2011; Royal Australian College of General Practitioners 2009).

During the onset of OA increased water content and a loss of proteoglycans and collagen cause cartilage to become susceptible to degradation. Inflammation of the surrounding joint capsule occurs when torn cartilage, or meniscus, is released into the synovial space and cells lining the joint attempt to remove it. Bony outgrowths, or osteophytes, can form in an effort to improve the congruence of joint surfaces. As OA develops, irregularities in the joint surface may cause mechanical obstruction (Felson 2010). Changes in muscles and tendons, synovial fluid accumulation and bone proliferation can cause joint pain, stiffness, locking and decreased range of motion, limiting daily activities and reducing quality of life.

According to the American College of Rheumatology and the Osteoarthritis Research Society International, a diagnosis of primary OA of the knee involves knee pain and at least three of the following criteria: age over 50 years, stiffness lasting less than 30 minutes, crepitus, bony tenderness and enlargement, no palpable warmth, an eosinophil sedimentation rate of less than 40 mm per hour, a rheumatoid factor of less than 1:40 and clear synovial fluid (Ashford and Williard 2014). Confirmation by X-ray is based on joint space narrowing, increased bone formation, subchondral cyst formation and presence of osteophytes (Ashford and Williard 2014). The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) is used to assess pain, stiffness and physical function, while the Outerbridge classification system is used to grade chondral damage in the knee (Health Quality Ontario 2005). The WOMAC descriptors

range from no pain, stiffness or difficulty with physical function to extreme pain, stiffness and difficulty with physical function, whereas the Outerbridge classification ranges from grade 0 (normal cartilage) to IV (cartilage erosion exposing subchondral bone) (Health Quality Ontario 2005).

OA treatment programs aim to preserve joint function and prevent disease progression (Ashford and Williard 2014). For mild to moderate OA, the Royal Australian College of General Practitioners guideline recommends analgesics, short-term oral non-steroidal anti-inflammatory drugs (NSAIDs), weight loss and land-based exercises (Royal Australian College of General Practitioners 2009). Analgesics, NSAIDs, corticosteroid injections, viscosupplementation with hyaluronic acid and opioid therapy are used to manage moderate to severe OA symptoms. Referral to a rheumatologist or an orthopaedic surgeon is appropriate when symptoms are refractory to conservative management. Surgical options for OA consist of arthroscopic debridement and lavage, osteotomy, cartilage transplant and joint replacement (Ashford and Williard 2014).

Arthroscopy is a minimally invasive procedure during which a fibre optic endoscope is inserted into the knee joint through a small incision, while surgical instruments inserted through a second incision are used to debride or resect damaged tissue. All forms of arthroscopy involve joint lavage and allow for the evaluation and staging of OA (Felson 2010). Various arthroscopic procedures are used to treat different aspects of OA including: washing the joint with saline to remove cartilage fragments and calcium phosphate crystals; debriding torn menisci and ligaments; resecting proliferative synovium; removing loose cartilage and smoothing lesions; and removing osteophytes and drilling osteochondral lesions (Felson 2010).

Arthroscopy was used routinely to treat knee OA based on the results from uncontrolled case series suggesting that arthroscopy alleviated OA-related pain (Hubbard 1996). However, subsequent randomised controlled trials (RCTs) of patients with moderate to severe OA found no detectable difference in pain or quality of life between arthroscopy and a control at two years' follow-up (Dervin et al. 2003; Kirkley et al. 2008; Moseley et al. 2002). In 2008, a Cochrane review concluded that neither arthroscopic lavage nor debridement offered any improvement in pain or function when compared with each other or placebo (Laupattarakasem et al. 2008). Various organisations, including the American College of Rheumatology, the European League Against Rheumatism, the Osteoarthritis Research Society International, and the American Academy of Orthopaedic Surgeons (AAOS) have developed guidelines to facilitate evidence-based treatment of knee OA (Dhawan et al. 2014). There is broad agreement across these organisations that arthroscopy with lavage and/or debridement should not be recommended for non-mechanical, symptomatic knee OA (Nelson et al. 2014; Royal Australian College of General Practitioners 2009; Zhang et al. 2010).

In the United States, there is a significant gap between AAOS recommendations and clinical practice as approximately one in five patients underwent inappropriate

arthroscopic treatment for knee OA between 2004 and 2009 (Dhawan et al. 2014). An Australian retrospective cohort study reported no significant change in the overall rate of knee arthroscopy between 2000 and 2008 (Harris et al. 2013). While the rate of arthroscopic surgery declined in public hospitals (-1.25%, 95% confidence interval [CI] -2.39 to -0.10), it remained unchanged in private hospitals (0.42%, 95% CI -1.43 to 0.60) over the same time period (Harris et al. 2013).

In Victoria, the overall rate of knee arthroscopy remained relatively unchanged between 2004 (10,718 procedures) and 2013 (10,200 procedures). Of the 10,200 arthroscopic procedures conducted in 2013, 3,317 were performed in public hospitals and 6,883 were performed in private hospitals. The number of arthroscopic meniscectomy procedures performed in public versus private hospitals changed from 1,418 and 2,582 to 756 and 3,118, respectively, between 2004 and 2013, while arthroscopic debridement procedures changed from 616 and 1,038 to 1,023 and 895, respectively (Victoria Department of Health 2014).

Significant geographical variation has been reported in the rates of knee arthroscopy for OA among patients in Victoria (Bohensky et al. 2014). The region with the highest incidence rate ratio (IRR) was Barwon South Western (IRR 1.26, 95% CI 1.16 to 1.36), while the lowest IRR was reported in the Gippsland region (IRR 0.89, 95% CI 0.8 to 0.98) (Bohensky et al. 2014). It is unclear whether the geographical variation in rates of arthroscopy is due to differences in OA prevalence, clinical decision making or access to care, or a combination of these factors (Bohensky et al. 2014).

The objective of this rapid systematic review (SR) is to facilitate the appropriate use of arthroscopy in patients with knee OA by summarising the evidence regarding the following research questions.

Research questions

1. Is there a specific clinical threshold of pathology below which arthroscopic surgery is of low clinical value in patients with knee OA?
2. Is there evidence of effective alternative treatments to arthroscopic surgery for knee OA where knee replacement is not currently indicated?
3. Are these effective alternative treatments for knee OA available throughout Victoria?

2. Methodology

Literature review

Literature search strategy

A limited search of MEDLINE, EMBASE, *The Cochrane Library* (Issue 3, 2014), the NHS Centre for Reviews and Dissemination databases and the websites of international health technology assessment (HTA) agencies and clinical practice guideline (CPG) clearinghouses was conducted to identify relevant research published in English from January 2005 (January 2009 for guidelines) to July 2014. A focused internet search was also conducted to identify grey literature. Filters were applied to limit the retrieval to SRs, HTAs, meta-analyses, guidelines, RCTs and non-randomised comparative studies. Details of the search strategies are provided in Appendix A.

Study selection criteria and methods

One reviewer screened all citations and selected studies. On initial screening, titles and abstracts were reviewed for relevance. Full-text publications were retrieved and assessed for inclusion based on the criteria in Table 1. Only studies conducted in Australia, Canada, Japan, New Zealand, the United States and European countries (except for those with transitional economies) were included for review. These countries, which have developed economies as defined by the United Nations, are likely to have populations whose health status, cultural norms, access to health care and disease burden are comparable to those in Australia (United Nations 2009).

Table 1: Study selection criteria

Population	Individuals with knee osteoarthritis
Intervention	Arthroscopic knee surgery
Comparator	Non-surgical interventions Comparisons between arthroscopic surgical modalities when the study relates to threshold of pathology for surgery
Outcomes	Including, but not limited to, pain, function, disability, need for joint replacement, morbidity
Study design	HTA, SR, MA, RCT, non-randomised comparative study Evidence-based CPGs that provide criteria for or recommendations on knee arthroscopy as a treatment for osteoarthritis

CPG: clinical practice guideline; HTA: health technology assessment; MA: meta-analysis; RCT: randomised controlled trial; SR: systematic review

Exclusion criteria

Studies were excluded if they: did not meet the selection criteria; were included in a selected SR or synthesis of guidelines; were duplicate or preliminary results; had incomplete or inappropriate methods; were an ineligible study design; or involved

diagnostic arthroscopy. RCTs and non-randomised comparative studies published prior to the literature search end date reported in the most recent eligible systematic review were also excluded.

Given the timeline for review, a best available evidence approach was used to select studies. Randomised and non-randomised comparative studies published after the search end date of the most recent SR were later excluded in the interest of timelines.

Data extraction and analysis

One reviewer extracted data on patient characteristics, long-term clinical benefits and harms and guideline recommendations on arthroscopic surgery for knee OA.

Critical appraisal of included studies

One reviewer evaluated the methodological quality of the included studies. SRs were evaluated using the 11-item Assessment of Multiple Systematic Reviews (AMSTAR) checklist (Shea et al. 2007), while the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument was used to appraise CPGs (Brouwers et al. 2010). The domains assessed by AMSTAR include design, study selection and data extraction, literature searching, study characteristics, quality assessment, methods used to combine findings, publication bias and conflict of interest. The domains assessed by AGREE II include scope and purpose, stakeholder involvement, rigour of development, clarity and presentation, applicability and editorial independence. Instead of calculating numeric scores, the strengths and weaknesses were described narratively for each study. The evidence presented in the selected studies was classified, where possible, using the levels of evidence defined by the National Health and Medical Research Council (Merlin et al. 2009) (Appendix B).

Data analysis

Study design, heterogeneity of interventions and populations and timelines prevented formal meta-analysis. Study characteristics, quality assessment and results were summarised narratively in relation to the research questions.

Expert opinion

Two orthopaedic surgeons from Melbourne, Victoria were identified through personal referrals and the Victorian Government Department of Health. The following set of seven questions, developed in consultation with the Victorian Government Department of Health, was emailed to each surgeon.

1. What arthroscopy procedures are currently used in Victoria to treat or manage the symptoms of knee OA?
2. Which of the above procedures have proven effectiveness?

3. Are you aware of any guidelines used by Victorian surgeons who treat patients with knee OA?
4. What non-surgical interventions are available in Victoria to patients with knee OA?
5. Are the abovementioned non-surgical interventions available throughout Victoria?
6. Are there resources that could be developed to better support Victorian surgeons in treating patients with knee OA when knee replacement surgery is not currently indicated?
7. In your opinion, does arthroscopy provide any advantage over imaging in diagnosing or staging OA?

Responses were de-identified, grouped into themes and reported narratively.

3. Studies Included in the Review

Literature search results

The literature search yielded 1,895 citations. Upon screening titles and abstracts, 16 potentially relevant articles were retrieved for full-text review. Reviewing references of studies and searching of grey literature identified another two potentially relevant reports. Of the 18 potentially relevant reports, three were included in a SR or synthesis of recommendations from CPGs, five contained an irrelevant or indeterminate intervention, two were outdated guidelines and two were an ineligible study design. Six studies were included in this review (Health Quality Ontario 2005; Laupattarakasem et al. 2008; National Institute for Health and Care Excellence 2014; Nelson et al. 2014; Reichenbach et al. 2010; Spahn et al. 2013) The study selection process is outlined in Appendix A (Figure A.1) and the excluded studies are listed in Appendix C.

Description of studies

Evidence regarding the threshold of pathology for arthroscopic surgery in patients with knee OA patients was obtained from a synthesis of guideline recommendations on the management of OA (Nelson et al. 2014), a CPG by the National Institute for Health and Care Excellence (NICE) (National Institute for Health and Care Excellence 2014), three SRs (Laupattarakasem et al. 2008; Reichenbach et al. 2010; Spahn et al. 2013) and one HTA (Health Quality Ontario 2005). The guidelines also provided information regarding effective alternative treatments to arthroscopic knee surgery for OA where knee replacement is not currently indicated. The recommendation and evidence grading categories used in the guideline synthesis and CPG are summarised in Appendix D (Table D.1); the characteristics of the included SRs and the HTA are summarised in Appendix D (Table D.4).

Synthesis of guideline recommendations

The guideline synthesis was a SR of 16 CPGs published between 2005 and 2013, including five from the United States (Cibulka et al. 2009; Herndon et al. 2008; Hochberg et al. 2012; Jevsevar et al. 2013; Michigan Quality Improvement Consortium 2007), one from Canada, (Loew et al. 2012), eight from Europe, (Gélis et al. 2008; Jordan et al. 2003; Mazières et al. 2008; National Collaborating Centre for Chronic Conditions 2008; Peter et al. 2011; Roddy et al. 2005; Zhang et al. 2005; Zhang et al. 2007), one from Asia (Pongparadee et al. 2012) and an international CPG (Zhang et al. 2008) developed with input from experts in Canada, Europe and the USA. Most recommendations were directed toward physicians and allied health professionals, and most of the guidelines received input from general practitioners, rheumatologists, orthopaedists and physical therapists (Nelson et al. 2014). Included CPGs achieved high AGREE II scores (Brouwers et al. 2010) for the following: describing objectives and target populations; using systematic methods; citing strengths and limitations of the evidence; the methods

used to formulate the recommendations; considering risks and benefits; and clearly linking recommendations with supporting evidence (Nelson et al. 2014). CPGs scored lower in discussing facilitators and barriers to implementation; providing advice for practical use; considering resource implications; and providing monitoring and audit criteria (Nelson et al. 2014). Three authors independently reviewed recommendations extracted from the CPGs and generated summary recommendations as "recommend," "inconclusive" or "do not recommend" (Nelson et al. 2014) (Appendix D, Table D.1).

Clinical practice guideline

The CPG by NICE provided evidence-based recommendations regarding the pharmacological and non-pharmacological management of OA, referral for surgery and patient follow-up (National Institute for Health and Care Excellence 2014). The guideline development group (GDG) formulated the recommendations based on a SR of the literature. Considerations for making the consensus-based recommendations included the benefits and harms of interventions, quality of the evidence, costs, current practices, patient preferences and equality issues. The strength of recommendations was based on the certainty with which recommendations were made. The GDG used "must" or "must not" only where there was a legal duty to apply a recommendation, "offer" when there was confidence about an intervention and "consider" when there was confidence an intervention will do more good than harm for most patients and will be cost-effective, although other options may be similarly cost-effective (National Institute for Health and Care Excellence 2014) (Appendix D, Table D.1).

Systematic reviews

The three SRs (level I evidence) contained between 3 and 30 studies involving between 212 and 3,616 patients (Laupattarakasem et al. 2008; Reichenbach et al. 2010; Spahn et al. 2013). Spahn et al. (2013) evaluated arthroscopy and alternative treatments in patients with knee OA with respect to the standardised mean difference (SMD) in knee scores at 42 months' follow-up, the frequency of "excellent or good" outcomes and the frequency of knee replacement up to four years post-procedure. Thirty studies met their inclusion criteria; 13 contributed to the meta-analyses on knee scores, 17 to the meta-analysis on "excellent or good" outcomes and three to evaluating conversion to arthroplasty (Spahn et al. 2013). Studies ranged from level II to IV evidence, with level IV being predominant. All studies reported arthroscopic debridement as the index treatment, but the types of alternative interventions used as controls were not specifically reported. The review authors found no RCTs comparing conservative and arthroscopic treatments for knee OA (Spahn et al. 2013). The rates of patient withdrawal or dropout in the included studies ranged from 0% to 67% (Spahn et al. 2013).

Reichenbach et al. (2010) meta-analysed three RCTs (level II evidence) comparing arthroscopic lavage and formal sham intervention in patients with knee OA with respect to the SMD in knee pain and function at three months and one year post-intervention. The mean average age of the included patients was 60 years (range 46 to 67) and 56 per

cent were women—the mean duration of symptoms ranged from 2.7 to 10.6 years. Outcomes of interest included pain and function based on a visual analogue scale and WOMAC scores (Reichenbach et al. 2010).

Laupattarakasem et al. (2008) systematically reviewed three RCTs to evaluate knee pain and function after arthroscopic debridement compared with lavage, closed-needle lavage, washout or placebo. The three RCTs involved a total of 271 patients with a diagnosis of primary or secondary knee OA without other joint involvement or a need for prolonged NSAID use. One included RCT measured pain and functional status using the Arthritis Impact Measurement Scales (AIMS) (Chang et al. 1993), one used a modified Lysholm score (Hubbard 1996) and the third measured outcomes using the Knee Specific Pain Scale (KSPS) and AIMS (Moseley et al. 2002). Follow-up ranged from one to five years, and baseline characteristics were similar across the study groups (Laupattarakasem et al. 2008) (Appendix D, Table D.1).

Health technology assessment

One HTA (Health Quality Ontario 2005) reviewed two existing HTAs (level I evidence) (Allgood 2003; Centers for Medicare & Medicaid Services 2003), two RCTs (level II evidence) (Kalunian et al. 2000; Moseley et al. 2002) and two non-randomised comparative studies (level III evidence) (Bernard et al. 2004; Bohnsack et al. 2002) on arthroscopic lavage, as well as two RCTs (level II evidence) (Hubbard 1996; Moseley et al. 2002) and five non-randomised comparative studies (level III evidence) (Dervin et al. 2003; Fond et al. 2002; Krystallis et al. 2004; McGinley et al. 1999; Menetrey et al. 2002) on arthroscopic debridement.

The existing HTAs both examined the effectiveness of arthroscopic lavage with or without debridement for the treatment of knee OA (Allgood 2003; Centers for Medicare & Medicaid Services 2003). One HTA contained five RCTs (level II evidence) and two non-randomised comparative studies (level III evidence) (Allgood 2003), while the other contained four RCTs (level II evidence) (Centers for Medicare & Medicaid Services 2003).

The RCT by Kalunian et al. (2000) randomly assigned 90 patients who had OA symptoms for less than five years to arthroscopic lavage or irrigation. WOMAC aggregate scores were examined at 12 months' follow-up in addition to visual analogue scale assessment. Moseley et al. (2002) was a single-centre RCT involving 180 men with severe OA who had failed standard therapy. One orthopaedic surgeon conducted all interventions (Moseley et al. 2002). Outcomes of pain and function were reported using KSPS and AIMS2. Hubbard et al. (1996) reported on 76 patients who had severe OA (Outerbridge grade III or IV) of the medial femoral condyle with unremitting symptoms for a year before arthroscopy. A comparison of patient outcomes after debridement plus lavage with lavage alone was made at three and 12 months and up to five years. The HTA authors reported this study to be of very poor quality (Health Quality Ontario 2005). Five non-randomised comparative studies were included in the HTA (Dervin et al.

2003; Fond et al. 2002; Krystallis et al. 2004; McGinley et al. 1999; Menetrey et al. 2002). Patients ranged in age from 33 to 82 years, with follow-up ranging from 2 to 10 years. Interventions included lavage, debridement and resection, debridement of meniscal tears and lavage with partial meniscectomy (Appendix D, Table D.4).

Appraisal of study quality

Summaries of the appraisal of the guideline synthesis, CPG, SRs and HTA are provided in Appendix D (Tables D.2 and D.5).

Synthesis of guideline recommendations

The synthesis of CPG recommendations was based on a librarian-assisted literature search of MEDLINE, complemented by internet searching of specific websites, including the National Guideline Clearinghouse, based on a protocol adherent to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Nelson et al. 2014). However, at least two electronic sources should be searched and supplemented by grey literature searching, or evidence may be incomplete. Titles and abstracts were screened by a single reviewer; the titles that remained after excluding those prior to 2003 were reviewed independently by all authors. Two reviewers independently selected CPGs using predefined criteria and appraised their quality using the validated AGREE II instrument (Brouwers et al. 2010) A list of excluded CPGs was not reported, nor was publication bias assessed. Included CPGs scored lowest for quality in describing barriers to application, advice for practical use, consideration of resource implications and monitoring/audit criteria, thereby hindering their use in practice. Two reviewers independently extracted recommendations from each guideline. Three authors generated consensus-based summary recommendations after independently reviewing extracted data for all CPGs and considering the scientific quality of the included CPGs. Most of the recommendations were concordant across the various good quality CPGs. None of the authors of the guideline synthesis were involved in developing any of the CPGs in the synthesis, but many of the authors received grants and some consulted for industry (Nelson et al. 2014) (Appendix D, Tables D.2).

Clinical practice guideline

The NICE guideline is an update of previous guidance (National Collaborating Centre for Chronic Conditions 2008) regarding care and management of OA in adults (National Institute for Health and Care Excellence 2014). A multidisciplinary GDG comprising all relevant professionals and patient groups developed the recommendations to assist health professional in offering best practice to adults with OA. Recommendations were formulated by expert consensus based on evidence from a SR. Barriers to care reported by patients included inadequate supply of medications, gastrointestinal problems, difficulty associated with attending clinics due to finance or transportation issues and dealing with problems that require rapid intervention. The CPG will be updated after a review to determine whether the evidence has progressed significantly enough to warrant

an update. Tools for baseline assessment and costing were available to facilitate implementation of the guideline for systems improvement and audit (National Institute for Health and Care Excellence 2014) (Appendix D, Table D.2).

Systematic reviews

All three SRs conducted comprehensive literature searches based on predefined criteria (Laupattarakasem et al. 2008; Reichenbach et al. 2010; Spahn et al. 2013)—two were Cochrane reviews (Laupattarakasem et al. 2008; Reichenbach et al. 2010). While all SRs reported independent study selection by two reviewers based on inclusion criteria, only two SRs performed duplicate data extraction and quality assessment (Laupattarakasem et al. 2008; Reichenbach et al. 2010). Spahn et al. (2013) did not report the methods used to extract data or to assess study quality. Laupattarakasem et al. (2008) listed excluded studies and reasons for exclusion, whereas neither of the other reviews provided lists of excluded studies. Spahn et al. (2013), however, reported the reasons for exclusion. Two reviews tabulated the characteristics of the included studies (Laupattarakasem et al. 2008; Reichenbach et al. 2010). Two SRs contained meta-analyses and used funnel plots to assess publication bias (Reichenbach et al. 2010; Spahn et al. 2013). Spahn et al. (2013) contained a large number of studies and reported considerable heterogeneity, which suggested inconsistencies across the studies and possibly inappropriate pooling of data. The two Cochrane reviews considered study quality when formulating the conclusions. While the authors of Spahn et al. (2013) stated that the general scientific level of the studies was poor—most were case series studies and inter-study heterogeneity was very high—it is unclear how these factors were considered in formulating the review conclusions. Reichenbach et al. (2010) stated that the reporting of adverse events and dropout rates was unsatisfactory in the included trials. Only one of the three SRs reported funding sources and conflicts of interest (Laupattarakasem et al. 2008) (Appendix D, Tables D.5).

Health technology assessment

The HTA by the Medical Advisory Secretariat of the Ontario Ministry of Health and Long-term Care was based on a comprehensive literature search using pre-defined criteria (Health Quality Ontario 2005). While the inclusion criteria were listed, the methods by which studies were selected and assessed for quality were not reported. Characteristics of included studies were tabulated and results were reported narratively. While risk of bias was not formally assessed, study quality was reported in terms of levels of evidence and considered in formulating the summary of findings. No competing interests were declared (Health Quality Ontario 2005) (Appendix D, Tables D.5).

4. Literature Review Results

Threshold of pathology for arthroscopic knee surgery

Synthesis of guideline recommendations

A synthesis of evidence-based recommendations from four CPGs (published between 2003 and 2013) from the United States (Jevsevar et al. 2013), Europe (Jordan et al. 2003; National Collaborating Centre for Chronic Conditions 2008) and an international collaboration (Zhang et al. 2008) suggested a clinical threshold of pathology for arthroscopic knee surgery (Nelson et al. 2014) (Table 2). Neither arthroscopy with debridement nor needle lavage was recommended for symptomatic knee OA (Jevsevar et al. 2013; National Collaborating Centre for Chronic Conditions 2008). Limited recommendations were made for osteotomy or partial joint replacement for unicompartmental knee OA (Jevsevar et al. 2013; Jordan et al. 2003; Zhang et al. 2008). Study authors provided a summary recommendation stating that arthroscopy with debridement should not be recommended for the management of symptomatic knee OA based on evidence-based recommendations from two CPGs (Jevsevar et al. 2013; National Collaborating Centre for Chronic Conditions 2008).

It should be noted that potentially relevant CPGs may have been missed due to incomplete searching of the literature and first stage screening of titles and abstracts by a single reviewer. CPGs included in the synthesis provided limited information regarding barriers to application, resource implications and monitoring and audit criteria to facilitate implementation in clinical practice.

Clinical practice guideline

A CPG by NICE (National Institute for Health and Care Excellence 2014) updated previous guidance (National Collaborating Centre for Chronic Conditions 2008) that was included in the guideline synthesis by Nelson et al. (2014) (Table 2). While the evidence was not re-evaluated, the recommendation on arthroscopy was reworded from "should not be offered" to "do not refer" for arthroscopic lavage and debridement in the treatment of OA, unless the person has knee OA with a clear history of mechanical locking as opposed to morning joint stiffness, "giving way" or X-ray evidence of "loose bodies" (National Institute for Health and Care Excellence 2014). The rationale for the change was that a review of the clinical and cost-effectiveness evidence from the original guideline led to a more specific recommendation on the indication for which arthroscopic lavage and debridement was judged to be clinically effective and cost-effective (National Institute for Health and Care Excellence 2014).

Systematic reviews

One SR provided some evidence regarding a clinical threshold of pathology below which arthroscopic debridement or lavage of the knee is of low clinical value for patients with

OA (Table 2). Laupattarakasem et al. (2008) (level I evidence) systematically reviewed the results of three RCTs individually owing to differences in comparison groups and heterogeneity of clinical and methodological aspects. Two RCTs reported no significant differences in pain or function following arthroscopic debridement versus closed-needle lavage at 12 months (weighted mean difference [WMD] 0.3, 95% CI -1.1 to 1.8) (Chang et al. 1993) or lavage at 24 months (WMD -0.6, 95% CI -8.3 to 7.1) (Moseley et al. 2002). Hubbard et al. (1996) reported that arthroscopic debridement provided a significant improvement in pain relief at one (relative risk [RR] 5.76, 95% CI 2.52 to 13.18; number needed to treat for an additional beneficial outcome [NNTB]=2) and five years' follow-up (RR 5.15, 95% CI 1.71 to 15.49; NNTB=3), compared with washout. Hubbard et al. (1996) included participants with degenerative lesions (grade III or IV on the Outerbridge classification) confined to the medial femoral condyle. This study provided some information regarding type and stage of severity of OA in which arthroscopic debridement is most effective. Moseley et al. (2002) reported significantly less improvement in pain scores at 12 months following arthroscopic debridement, compared with placebo (WMD 6.9, 95% CI 0.4 to 13.4; number needed to treat for an additional harmful outcome=9). While this review contained studies of higher quality than those in Spahn et al. (2013), the quality of the studies was low and the patient numbers were smaller. In addition, the outcome measure of pain is subjective and may be modified by confounding factors, such as the rescue analgesics used by many participants.

Four studies suggested that clinical outcomes may be correlated with radiological grade such that worse outcomes are associated with greater disease severity, while three studies did not confirm these findings. The results of one study suggested that clinical outcome may be correlated with age as patients older than 60 years had worse outcomes than younger patients. A retrospective analysis of 1,200 arthroscopies showed that worse outcomes were associated with: OA of longer than two years' duration; obesity; smoking; presence of tibial osteophytes, tibial sclerosis or calcifications; absence of effusion; or prior meniscectomy.

Health technology assessment

An existing HTA of five RCTs and two non-randomised comparative studies concluded that while one good quality RCT suggested that arthroscopic lavage or debridement did not improve patient-reported pain or function at the two year follow-up, there was insufficient evidence to determine the effectiveness of these treatments (Health Quality Ontario 2005) (Table 2). Another existing HTA containing four RCTs suggested that there was insufficient evidence to conclude that lavage alone is not reasonable or necessary for knee OA and that debridement is not reasonable or necessary for patients with knee pain only or severe OA (Outerbridge grade III or IV). Based on RCTs included in other reviews (Kalunian et al. 2000; Moseley et al. 2002), together with two case series studies (Bernard et al. 2004; Bohnsack et al. 2002), the Ontario HTA reported no significant difference in pain or function at 24 months following arthroscopic lavage or alternative treatment (Health Quality Ontario 2005). Based on two RCTs included in

other reviews, together with five non-randomised comparative studies, the HTA reported that arthroscopic debridement was only effective for medial compartmental OA and that other indications should be reviewed in an effort to reduce the inappropriate use of arthroscopic debridement in patients with knee OA. The authors concluded that there was very poor quality evidence on the effectiveness of debridement with partial meniscectomy in cases of meniscal tears in patients with knee OA.

Table 2: Summary of evidence on threshold of pathology for arthroscopic knee surgery

Intervention	Evidence Statements/Recommendations
Arthroscopic debridement	• Not recommended for managing symptomatic knee OA. [Synthesis of 2 CPGs] • While it did not appear that study quality was taken into consideration, authors concluded that arthroscopic debridement was a potential and sufficient treatment for knee OA up to four years and that the procedure results in excellent or good outcomes in approximately 60% of patients within five years (predominantly level IV evidence). [1 SR] • Arthroscopic debridement provides no significant benefit for OA of indiscriminate cause (level II evidence). [1 SR] • Arthroscopic debridement provides more successful results for localised lesions on the medial femoral condyle than arthroscopic washout (lower quality evidence). [1 SR] • Arthroscopic debridement was only effective for medial compartmental OA; other indications should be reviewed with a view to reducing the use of arthroscopic debridement as a treatment for knee OA. [1 HTA]
Arthroscopic lavage	• Arthroscopic joint lavage should be discouraged as it does not result in relevant pain relief or improvement in function; insufficient numbers of patients have been studied to exclude potential for adverse events. [1 SR] • Arthroscopic lavage is not indicated for any stage of knee OA. [1 HTA]
Arthroscopic lavage and debridement	• Do not refer for arthroscopic lavage and debridement for treating OA unless the person has knee OA with a clear history of mechanical locking (as opposed to morning stiffness, "giving way" or X-ray evidence of loose bodies). [1 CPG]
Needle lavage	• Not recommended for managing symptomatic knee OA. [Synthesis of 2 CPGs]
Arthroscopic partial meniscectomy	• There is poor quality evidence on the effectiveness of debridement with partial meniscectomy in cases of meniscal tears in knee OA. [1 HTA]
Osteotomy or partial joint replacement	• Limited recommendation for unicompartmental knee OA. [Synthesis of 3 CPGs]

CPG: clinical practice guideline; HTA: health technology assessment; OA: osteoarthritis; SR: systematic review

Survival time to knee replacement

A meta-analysis of three studies (level III and IV evidence) (Bernard et al. 2004; Pearse and Craig 2003; Raaijmaakers et al. 2010) involving 409 patients reported a mean survival time to knee replacement of 42.7 months (95% CI 14.5 to 71.1) after arthroscopic surgery (Spahn et al. 2013). After four years, 34.1 per cent (95% CI 22.8 to 47.6) of patients required arthroplasty. Heterogeneity (I^2 statistic) was 87.2%, indicating significant variation across the studies. Patients with grade III and IV OA had a significantly higher risk ($P<0.001$) for conversion to knee replacement than patients with grade I or II OA (odds ratio 3.4, 95% CI 2.1 to 5.6; $I^2=48.7$)(Crevoisier et al. 2001;

Raaijmaakers et al. 2010; van den Bekerom et al. 2007). While it did not appear that study quality was taken into consideration in conducting the analyses, the authors concluded that arthroscopic debridement was a potential and sufficient treatment for knee OA in the middle-term (up to four years), and that the procedure resulted in an excellent or good outcome for approximately 60% of patients within five years (Spahn et al. 2013).

Effectiveness of alternative treatments

Systematic reviews

While some SRs included studies with conservative controls, these interventions were not specified. For example, Reichenbach et al. (2010) (level I evidence) observed no differences in pain (SMD 0.21, 95% CI -0.06 to 0.48; P<0.27) or function (SMD 0.01, 95% CI -0.26 to 0.29; P=0.43) three months after either arthroscopic debridement or conservative management (Reichenbach et al. 2010), but no details were provided on the types of treatments comprising the conservative management. The SR by Spahn et al. (2013) found no RCTs comparing conservative and arthroscopic treatments for knee OA. Instead, they pooled the results from 13 studies (predominantly level IV evidence), involving 857 patients, and found a significant improvement in knee scores among patients treated with arthroscopy (2.3, 95% CI 1.5 to 3.1; P<0.001). However, the heterogeneity (I^2 statistic) was 97.6%, denoting significant inconsistency across the studies (Spahn et al. 2013).

Given that the actual treatments used as controls were not discernible in the available evidence, it could not be used to inform the effectiveness of alternative treatments to arthroscopic surgery. Consequently, the CPGs that were eligible for inclusion in this review were used to provide some evidence on the effectiveness of alternative treatments to arthroscopic surgery.

Synthesis of guideline recommendations

The synthesis of guideline recommendations provided evidence on alternative pharmacological and non-pharmacological management for knee OA (Nelson et al. 2014) (Tables 3 and 4). Most CPGs included recommendations for pharmacological management (Cibulka et al. 2009; Herndon et al. 2008; Hochberg et al. 2012; Jevsevar et al. 2013; Jordan et al. 2003; Michigan Quality Improvement Consortium 2007; National Collaborating Centre for Chronic Conditions 2008; Pongparadee et al. 2012; Zhang et al. 2008). Paracetamol was recommended as first-line therapy for symptomatic OA according to a synthesis of six CPGs (Cibulka et al. 2009; Jordan et al. 2003; Michigan Quality Improvement Consortium 2007; National Collaborating Centre for Chronic Conditions 2008; Pongparadee et al. 2012; Zhang et al. 2008). In contrast, recent guidelines by the AAOS found the evidence regarding paracetamol inconclusive (Jevsevar et al. 2013).

Table 3: Summary of evidence on pharmacological alternatives to arthroscopic knee surgery

Intervention	Evidence Statements/Recommendations
Paracetamol	• First-line agent for symptomatic OA. [Synthesis of 7 CPGs]
Topical and oral NSAIDs	• Second-line agent for symptomatic OA. [Synthesis of 8 CPGs (topical), 9 CPGs (oral)] • Consider paracetamol and/or NSAIDs before oral NSAIDs, COX-2 inhibitors or opioids. [1 CPG] • Consider topical NSAIDs in addition to core treatments for knee OA. [1 CPG] • Consider topical NSAIDs and/or paracetamol before oral NSAIDs, COX-2 inhibitors or opioids [1 CPG]
NSAIDs and COX-2 inhibitors	• Consider substituting oral NSAIDs/COX-2 inhibitors where paracetamol or topical NSAIDs are ineffective or insufficient [1 CPG] • Use oral NSAIDs/COX-2 inhibitors at lowest effective dose for shortest possible time. [1 CPG]
Capsaicin	• Second-line agent for symptomatic OA. [Synthesis of 5 CPGs] • Consider topical capsaicin as an adjunct treatment for knee OA. [1 CPG]
Tramadol	• Recommended for patients with refractory symptoms. [Synthesis of 3 CPGs]
Opioids	• Consider for patients with refractory symptoms. [Synthesis of 6 CPGs] • Consider adding opioid analgesics if paracetamol or topical NSAIDs are insufficient for pain relief. [1 CPG]
Duloxetine	• Consider for patients with refractory symptoms. [Synthesis of 1 CPG]
Intra-articular corticosteroid injections	• Recommended for knee OA. [Synthesis of 6 CPGs] • Consider corticosteroid injections as an adjunct to core treatments for relief of moderate to severe pain. [1 CPG]
Intra-articular hyaluronan injections	• Insufficient evidence to provide a summary recommendation. [Synthesis of 4 CPGs] • Do not offer intra-articular hyaluronan injections for OA management. [1 CPG]

COX-2: cyclooxygenase-2; CPG: clinical practice guideline; NSAID: non-steroidal anti-inflammatory drug; OA: osteoarthritis

Recommended agents for second-line treatment included topical capsaicin and NSAIDs and oral NSAIDs, with appropriate risk stratification and gastroprotective strategies, based on syntheses of five (Hochberg et al. 2012; Jordan et al. 2003; Michigan Quality Improvement Consortium 2007; National Collaborating Centre for Chronic Conditions 2008; Zhang et al. 2008) and nine CPGs (Cibulka et al. 2009; Herndon et al. 2008; Hochberg et al. 2012; Jevsevar et al. 2013; Jordan et al. 2003; Michigan Quality Improvement Consortium 2007; National Collaborating Centre for Chronic Conditions 2008; Pongparadee et al. 2012; Zhang et al. 2008), respectively. Tramadol was recommended for refractory symptoms based on a synthesis of three CPGs (Hochberg et al. 2012; Jevsevar et al. 2013; Michigan Quality Improvement Consortium 2007) and consideration may be given to opioids (Cibulka et al. 2009; Hochberg et al. 2012; Jordan et al. 2003; Michigan Quality Improvement Consortium 2007; National Collaborating Centre for Chronic Conditions 2008; Zhang et al. 2008) and duloxetine (Hochberg et al. 2012). While intra-articular corticosteroid injections were recommended for knee OA based on a synthesis of six CPGs (Cibulka et al. 2009; Hochberg et al. 2012; Jordan et al. 2003; Michigan Quality Improvement Consortium 2007; National Collaborating Centre for Chronic Conditions 2008; Zhang et al. 2008), there was insufficient evidence to

provide a summary recommendation regarding intra-articular injections of hyaluronan (Nelson et al. 2014) (Table 3).

All CPGs included in the synthesis of recommendations, with the exception of Herndon et al. (2008), provided guidance regarding non-pharmacological management (Nelson et al 2014) (Table 4). The main treatment categories were education and self-management, exercise and weight loss, assistive devices, alternative and complementary approaches and surgical interventions. Most (12 of 15) guidelines reported strong recommendations for self-management and education for patients with OA, including instruction in joint protection and individualised treatment programs. A variety of specific recommendations were summarised as low-impact aerobic exercise and were strongly recommended by 12 of the 15 guidelines for managing knee OA (Nelson et al. 2014). Walking aids and assistive devices were often recommended, but there was inconclusive evidence for bracing and medial or lateral heel wedges as treatments for knee OA (Nelson et al. 2014). While alternative and complementary therapies were often controversial, summary recommendations suggested that thermal modalities be used to manage knee OA. Therapeutic ultrasound was not recommended, and there was insufficient evidence for acupuncture, Tai Chi and transcutaneous electrical nerve stimulation (Nelson et al. 2014) (Table 4).

Table 4: Summary of evidence on non-pharmacological alternatives to arthroscopic knee surgery

Intervention	Evidence Statements/Recommendations
Education and self-management	• Provide or refer patients to self-management programs; provide education, regular contact to promote self-care, joint protection and individualised treatment plans for patients with OA. [Synthesis of 12 CPGs]
Exercise and weight loss	• Patients should be advised to engage in low-impact aerobic exercise and, if overweight, to lose weight; consider range of motion/flexibility exercises, exercise in combination with manual therapy, endurance/strengthening exercises and physical/occupational therapy referral. [Synthesis of 12 CPGs] • Exercise should include muscle strengthening and aerobic fitness as core treatment. [1 CPG] • Weight loss interventions should be offered to overweight patients. [1 CPG]
Assistive devices	• Walking aids and assistive devices are recommended as needed for knee OA. [Synthesis of 8 CPGs] • There is inconclusive evidence for bracing or medial or lateral heel wedges for knee OA. [Synthesis of 6 CPGs] • Offer appropriate footwear as core treatment; consider bracing, insoles and assistive devices as adjuncts for joint pain or instability. [1 CPG]
Alternative therapies	• Thermal modalities are recommended for knee OA. [Synthesis of 3 CPGs] • Therapeutic ultrasound is not recommended. [Synthesis 3 CPGs] • Insufficient evidence to provide a summary recommendation for acupuncture, Tai Chi or TENS. [Synthesis of 6 CPGs] • Consider the use of TENS as an adjunct to core treatments for pain relief. [1 CPG] • Do not offer acupuncture, glucosamine or chondroitin for OA management. [1 CPG]

CPG: clinical practice guideline; NSAIDs: non-steroidal anti-inflammatory drugs; OA: osteoarthritis; TENS: transcutaneous electrical nerve stimulation

Clinical practice guideline

The NICE guideline also provided evidence on pharmacological and non-pharmacological alternatives to arthroscopy for knee OA (National Institute for Health and Care Excellence 2014) (Tables 3 and 4). While this guideline was an update of guidance issued in 2008 (National Collaborating Centre for Chronic Conditions 2008), recommendations regarding the pharmacological management of knee OA remained unchanged. Regarding oral analgesics, NICE guidelines recommended that: paracetamol be considered for pain relief in addition to core treatments; paracetamol and/or NSAIDs should be considered prior to oral NSAIDs, cyclooxygenase-2 (COX-2) inhibitors or opioids; and opioid analgesics could be added if paracetamol or topical NSAIDs are insufficient for pain relief. Also, topical NSAIDs may be considered in addition to core treatments for knee OA; topical NSAIDs and/or paracetamol should be considered before oral NSAIDs, COX-2 inhibitors or opioids; and topical capsaicin should be considered as an adjunct treatment for knee OA. Low dose, short duration, oral NSAIDs or COX-2 inhibitors can be substituted when paracetamol or topical NSAIDs are ineffective or insufficient. It was also recommended that while intra-articular corticosteroid injections should be considered as an adjunct to core treatments for relieving moderate to severe pain, intra-articular hyaluronan injections should not be offered (National Institute for Health and Care Excellence 2014) (Table 3).

For the non-pharmacological management of knee OA, the NICE guideline advised exercise and manual therapy, involving muscle strengthening and aerobic exercise, as core treatment irrespective of age, comorbidity, pain severity or disability (National Institute for Health and Care Excellence 2014) (Table 4). Weight loss interventions should be offered as a core treatment for overweight patients. While transcutaneous electrical nerve stimulation should be considered as an adjunct to core treatments for pain relief, acupuncture, glucosamine and chondroitin should not be offered for managing OA. The NICE guideline recommended that appropriate footwear, bracing, joint support, insoles and assistive devices be considered as adjunct treatments for joint pain and instability (National Institute for Health and Care Excellence 2014) (Table 4).

5. Expert Opinion

Responses were received from two orthopaedic surgeons, each from a major hospital in Melbourne, Victoria, who were asked to provide their expert opinion on the seven questions below.

Question 1: What arthroscopy procedures are currently used in Victoria to treat or manage the symptoms of knee OA?

Arthroscopic procedures for knee OA are uncommon in Victoria, but they are sometimes undertaken for mechanical symptoms. In selected cases of knee OA where there are clinical indications, arthroscopy may be used for:

- washout and removal of loose bodies arising from the arthritic process;
- debridement of degenerative (fibrillated) cartilage (for inflammatory symptoms);
- debridement of acute or chronic degenerative meniscal tears causing unremitting mechanical symptoms and pain.

Question 2: Which of the above procedures have proven effectiveness?

No procedures have proven effectiveness. Anecdotally, patients report short-term pain relief after arthroscopy with washout, which may be due to the removal of tiny pieces of fibrillated cartilage or inflammatory mediators in the synovial fluid. Patients undergoing arthroscopy with debridement of a loose "flap" of degenerative meniscus that was causing mechanical symptoms may also experience pain relief.

Question 3: Are you aware of any guidelines used by Victorian surgeons who treat patients with knee OA?

There are no specific clinical guidelines. Based on experience, various surgeons will use a number of different clinical scores to measure outcomes rather than to provide a threshold for surgery. There are also a number of hospital-level clinical pathways for total knee replacement.

The Osteoarthritis Hip and Knee Service (OAHKS) clinics in Victorian public hospitals were introduced to triage orthopaedic arthroplasty waiting lists using the Multi-attribute Arthritis Prioritisation Tool score. However, the OAKHS is sometimes used by clinics as a screening tool to determine surgical referral rather than by surgeons to determine the threshold for surgery.

Question 4: What non-surgical interventions are available in Victoria to patients with knee OA?

Non-surgical interventions are the standard of care prior to surgery, which is only considered when all non-surgical options have been trialled. Non-surgical interventions may include:

- oral analgesics such as paracetamol, NSAIDs and narcotic analgesics;
- glucosamine, chondroitin and topical anti-inflammatory creams;
- knee joint aspiration;
- intra-articular injections of steroid, hyaluronic acid, platelet-rich plasma or local anaesthetic;
- activity modification;
- walking aids;
- bracing techniques;
- physiotherapy (e.g. interferential treatments, hydrotherapy and range of motion/flexibility, muscle strengthening or balance exercises);
- weight loss;
- pain control clinics.

There is no strong evidence for the long-term efficacy of any of these therapies.

Question 5: Are the abovementioned non-surgical interventions available throughout Victoria?

Yes; these are prescribed by general practitioners, specialist rheumatologists or orthopaedic surgeons. They may be available through independent providers or through community centres or group practices, although the cost of some treatments can be prohibitive.

Question 6: Are there resources that could be developed to better support Victorian surgeons in treating patients with knee OA when knee replacement surgery is not currently indicated?

The non-surgical treatments listed above are readily available in Victoria. It would be helpful if local community-based resources (e.g. physiotherapy and hydrotherapy) were better known and more easily accessible (in a timely fashion) to surgeons. The OAHKS clinics in public hospitals perform this role to a degree, but surgeons need to be better educated about the role of these clinics and what they can offer. This will help surgeons correctly refer patients back to primary care when indicated. Multidisciplinary orthopaedic clinics involving rheumatologists and pain specialists would also be valuable, and surgeons should be made aware of the most current information from the Australian Orthopaedic Association National Joint Replacement Registry.

There is a need to develop prognostic tools to identify patients with knee OA who would benefit from arthroscopic surgery and those for whom alternative treatment strategies may be an option. At present it is difficult to predict who will respond well to arthroscopic surgery, and up to one in five patients continue to exhibit pain and dissatisfaction despite well-performed surgery.

Question 7: In your opinion, does arthroscopy provide any advantage over imaging in diagnosing or staging OA?

No, as knee OA can be adequately identified in the majority of cases by clinical symptoms and signs, with associated imaging such as plain radiographs. Based on the clinical history and examination, the surgeon will make the decision as to whether further investigation is required or the cause is clear enough to proceed directly to a therapeutic arthroscopy. When there is a diagnostic dilemma magnetic resonance imaging may be of assistance.

If patients have pain or mechanical symptoms without a visible bone cause, then soft tissue causes such as meniscal pathology, chondral flaps, cruciate ligament abnormalities, synovial abnormalities and intra-articular tumours may need to be excluded. In a very small number of patients, arthroscopy may be used for diagnostic purposes prior to unicompartmental arthroplasty, or when all investigations and conservative treatments have failed.

6. Discussion

Findings

This rapid review summarised the evidence regarding the clinical threshold of pathology below which arthroscopic surgery is of low clinical value in patients with knee OA, the effectiveness of alternative treatments to arthroscopic surgery where knee replacement is not currently indicated and expert opinion regarding the availability of alternative non-surgical treatments throughout Victoria.

Threshold of pathology for arthroscopic surgery

Evidence regarding the clinical threshold of pathology below which arthroscopic surgery is of low clinical value for patients with knee OA was derived from a guideline synthesis (Nelson et al. 2014), a CPG (National Institute for Health and Care Excellence 2014), a SR (Laupattarakasem et al. 2008) and an HTA (Health Quality Ontario 2005). Arthroscopy with debridement should not be recommended for managing symptomatic knee OA according to CPGs by the AAOS and NICE (Jevsevar et al. 2013; National Institute for Health and Care Excellence 2014). The latter guideline recommended that arthroscopic lavage and debridement not be offered unless the patient has knee OA with a clear history of mechanical locking, as opposed to morning joint stiffness, "giving way" or X-ray evidence of "loose bodies" (National Institute for Health and Care Excellence 2014). A Cochrane SR concluded that while arthroscopic debridement provided no significant benefit for OA of indiscriminate cause, it may be effective for certain patient groups or levels of disease severity (Laupattarakasem et al. 2008). Arthroscopic debridement may result in better outcomes for localised lesions on the medial femoral condyle (Hubbard 1996) and for medial compartmental knee OA (Health Quality Ontario 2005). Contrary to these findings, one SR concluded that arthroscopic debridement was a sufficient treatment for knee OA in the middle-term (up to four years), with excellent or good outcomes being achieved in 60% of patients within five years (Spahn et al. 2013) However, unlike other reviews and guidelines, Spahn et al. (2013) pooled data from a large number of poor quality case series studies. While inter-study heterogeneity was very high, it is unclear how these factors were considered in formulating the conclusions of the SR.

Arthroscopic lavage, in the absence of debridement, should be discouraged according to one SR; it provided no greater pain relief or improvement in function than control interventions and may be associated with serious adverse events including joint infection, effusion, haemarthrosis and deep vein thrombosis (Reichenbach et al. 2010). These results concurred with responses from clinical experts in Victoria who stated that no particular arthroscopic procedure has proven effectiveness, although debridement may offer some benefit to patients with mechanical knee symptoms.

Patient characteristics that may be associated with poorer outcomes included OA of longer than two years' duration, obesity, smoking, presence of tibial osteophytes, tibial sclerosis or calcifications, absence of effusion or prior meniscectomy. It was unclear whether poorer outcomes were more likely to occur in patients with higher grades of disease severity.

Alternative treatments to arthroscopic surgery

A guideline synthesis and a CPG provided evidence on the effectiveness of pharmacological and non-pharmacological alternatives to arthroscopic surgery where knee replacement is not currently indicated (National Institute for Health and Care Excellence 2014; Nelson et al. 2014). Paracetamol was recommended as first-line therapy for symptomatic OA; second-line agents included topical capsaicin and NSAIDs and low dose, short duration oral NSAIDs (National Institute for Health and Care Excellence 2014; Nelson et al. 2014). For refractory symptoms, tramadol (Nelson et al. 2014) was recommended, with consideration for opioids (National Institute for Health and Care Excellence 2014; Nelson et al. 2014), COX-2 inhibitors (National Institute for Health and Care Excellence 2014) and duloxetine (Nelson et al. 2014). Intra-articular corticosteroid injections should be considered as an adjunct to core treatments for relieving moderate to severe OA-related pain (National Institute for Health and Care Excellence 2014; Nelson et al. 2014).

Non-pharmacological alternatives to arthroscopic surgery consisted mainly of education and self-management, exercise and weight loss, assistive devices and complementary and alternative therapies. The majority of CPGs reported strong recommendations for self-management and education, including joint protection strategies and individualised treatment programs (National Institute for Health and Care Excellence 2014; Nelson et al. 2014). Most guidelines strongly recommended low-impact aerobic exercise and weight loss interventions as core treatment for knee OA (National Institute for Health and Care Excellence 2014; Nelson et al. 2014). Assistive devices and walking aids should be considered as adjunct treatments for joint instability (National Institute for Health and Care Excellence 2014; Nelson et al. 2014). Thermal modalities may also be used to manage knee OA (Nelson et al. 2014).

Availability of effective alternative treatments in Victoria

Two surgeons from Melbourne provided expert opinion regarding the accessibility of alternative treatments for knee OA throughout Victoria. The main evidence-based non-surgical interventions available to patients as standard of care prior to surgery include paracetamol, NSAIDs, opioids, topical anti-inflammatory agents, intra-articular corticosteroid injections, activity modification, weight loss, exercise, physiotherapy and walking aids. Additional therapies available throughout Victoria, for which evidence is controversial, insufficient or inconclusive, include intra-articular injection of hyaluronic acid, platelet-rich plasma or anaesthetic, bracing techniques and knee joint aspiration. Glucosamine and chondroitin are not recommended by some CPGs. Prescribed by

general practitioners, rheumatologists or orthopaedic surgeons, the above-mentioned interventions are available through independent providers, community centres or group practices.

While non-surgical alternatives are readily available in Victoria, expert opinion suggested that it would be helpful if local community-based resources, such as physiotherapy and hydrotherapy, were more widely known and more easily accessible to surgeons. Surgeons need more information about what these resources can offer to ensure that patients are correctly referred back to primary care when indicated. The development of prognostic tools would also assist in helping to identify those patients with knee OA who would benefit from surgery and those for whom non-surgical interventions may be an option.

Limitations of the evidence

Evidence regarding the clinical threshold of pathology below which arthroscopic surgery may be of low clinical value for knee OA and effective alternatives to arthroscopy may be incomplete. The guideline synthesis from which much of the evidence was derived only searched the MEDLINE literature database and specific websites to identify relevant CPGs for inclusion. However, a search of at least two electronic literature databases and the grey literature is recommended to avoid source bias. There is also potential for bias in the selection of CPGs included for review as a single reviewer conducted the initial screening of titles and abstracts. The CPGs include in the synthesis scored lowest for quality in describing barriers to application, providing advice for practical use, discussing resource implications and providing monitoring and audit criteria, thereby hindering their use in practice. In addition, while many of the alternative treatments listed by the guidelines are available in Australia, no Australian CPGs were found, which potentially limited the generalisability of these results to the Australian context.

Given the short timelines for this rapid review and the dearth of high-level evidence comparing arthroscopic knee surgery with non-surgical treatments, the CPGs that were eligible for inclusion in this review were used to provide some evidence on the effectiveness of alternative treatments. However, only those guidelines that contained recommendations on arthroscopic surgery had been selected. Consequently, this represents only a small sample of all the guidelines available on knee OA. While additional information was also derived from SRs and an HTA, they also hold limitations. Though not always specified, control interventions consisted primarily of placebo, sham surgery, closed-needle joint lavage and washout. Outcomes measures of self-reported pain relief and function are subjective and may be confounded by various factors such as the use of rescue analgesics, NSAIDs and concomitant therapies. Significant variation was observed across studies in terms of interventions, patient selection and use of concomitant therapies, and it was not clear how these factors were considered in formulating the conclusions of the SRs. Also, the studies included in most SRs contained insufficient numbers of patients to ascertain the potential for serious adverse events such as joint infection, effusion, haemarthrosis or deep vein thrombosis following arthroscopic surgery. Only one SR examined survival time to knee replacement

and conversion to arthroplasty by pooling the results of three poor quality (level III and IV evidence) studies.

This report was also limited in that only a guideline synthesis, a CPG, SRs and an HTA were identified for review. This limited the scope of comparisons between arthroscopic surgery and control interventions. Thus, it was not possible to address all possible comparisons between arthroscopic surgery and the alternative treatments available in Victoria.

7. Conclusions and Implications for Policy

There is consensus in the evidence that arthroscopy with debridement should not be recommended for managing symptomatic knee OA of indiscriminate cause, but it may be of value for patients with a clear history of mechanical locking, localised lesions on the medial femoral condyl or medial compartmental knee OA. Similarly, needle lavage was not recommended. However, there was poor quality evidence on the effectiveness of arthroscopic partial meniscectomy for meniscal tears in OA and limited recommendations on the use of osteotomy or partial replacement for unicompartmental knee OA. Patient characteristics that may be associated with poorer outcomes after arthroscopy included OA of longer than two years' duration, obesity, smoking, presence of tibial osteophytes, tibial sclerosis or calcifications, absence of effusion and prior meniscectomy. While one SR reported a mean survival time to knee replacement of 42.7 months after arthroscopic surgery, with 34% of patients requiring arthroplasty after four years, there was significant variation across the three poor quality studies pooled.

While there are many effective non-surgical alternatives available in Victoria for patients with knee OA, local community-based resources need to become more widely known and more easily accessible to assist surgeons in the appropriate referral of patients back to primary care. It would also be helpful to establish multidisciplinary orthopaedic clinics involving rheumatologists and pain specialists. In addition to the evidence-based interventions, there are other therapies available in Victoria for which the evidence is controversial, insufficient or inconclusive. Use of these therapies may prove costly and may hinder the utilisation of evidence-based treatments.

Decision makers need to consider that while the results are in favour of reducing arthroscopic lavage and debridement for symptomatic OA of indiscriminate cause, the evidence was primarily based on a few higher quality studies with small numbers of participants. Further studies are needed to determine whether arthroscopic surgery is effective for patients with earlier stages of OA arising from a specific cause, and to evaluate the effectiveness of arthroscopic surgery compared with effective pharmacological and non-surgical alternatives available throughout Victoria. The overall rate of knee arthroscopy has varied little over the last few years in Victoria. Multidisciplinary orthopaedic clinics and prognostic tools to identify the small number of patients who may benefit from arthroscopic surgery may facilitate the more appropriate use of non-surgical interventions for knee OA in the state.

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Appendix A: Literature Search and Retrieval

The search was developed and carried out prior to the study selection process.

Databases searched and search terms

The databases and resources searched are shown in Table A.1. Searches were restricted to studies published in English from January 2005 (January 2009 for CPGs) to July 2014. A focused internet search for HTA reports and CPGs on arthroscopic surgery for knee osteoarthritis was also conducted. In addition, the websites of relevant specialist societies were also searched. (Table A.1).

Table A.1: Databases and resources searched

Database	Edition/Date Searched
Ovid MEDLINE (including In-Process & Other Non-Indexed Citations)	2005 to 2014, July 9, 2014 (RCTs and clinical trials) 2009 to 2014, July 9, 2014 (SRs and meta-analyses)
EMBASE	2005 to 2014, July 9, 2014 (RCTs and clinical trials) 2009 to 2014, July 9, 2014 (SRs and meta-analyses)
The Cochrane Library	Issue 7, July 2014 2005 to 2014, 5 March 2014
NHS Centre for Reviews and Dissemination databases	2005 to 2014, July 9, 2014
HTA agencies	
Agency for Healthcare Research and Quality (AHRQ) http://search.ahrq.gov/	July 7, 2014
BlueCross BlueShield Association http://www.bcbs.com/blueresources/tec/	July 7, 2014
Canadian Agency for Drugs and Technologies in Health (CADTH) http://www.cadth.ca/en/	July 7, 2014
Institute of Health Economics http://www.ihe.ca/	July 7, 2014
MSAC http://www.msac.gov.au/	July 7, 2014
NICE http://www.nice.org.uk/	July 7, 2014
Clinical practice guidelines	
Guidelines International Network (G-I-N) http://www.g-i-n.net/library/international-guidelines-library	July 7, 2014
National Guideline Clearinghouse http://www.guideline.gov/	July 7, 2014
Scottish Intercollegiate Guidelines Network (SIGN) http://www.sign.ac.uk/search.html	July 7, 2014
Clinical Practice Guideline (NHMRC) http://www.clinicalguidelines.gov.au/	July 7, 2014
Canadian Medical Association Infobase http://www.cma.ca/cpgs/	July 7, 2014

Table A.1: Databases and resources searched (cont'd)

Database	Edition/Date Searched
NICE guidance http://guidance.nice.org.uk/	July 7, 2014
New Zealand Guidelines Group http://www.health.govt.nz/about-ministry/ministry-health-websites/new-zealand-guidelines-group	July 7, 2014
Targeted internet search	
American Academy of Orthopaedic Surgeons http://www.aaos.org	July 7, 2014
New Zealand Orthopaedic Association http://www.nzoa.org.nz/guidelines	July 7, 2014
Australian Society of Orthopaedic Surgeons http://www.asos.org.au/	July 7, 2014
Australian and New Zealand Orthopaedic Research Society http://www.anzors.org.au/	July 7, 2014
British Orthopaedic Association http://www.boa.ac.uk/	July 7, 2014
VIC Health http://www.health.vic.gov.au/	July 7, 2014

RCT: randomised controlled trial; SR: systematic review

Search terms

For MEDLINE, searches on the key concepts of treatment of knee osteoarthritis with arthroscopic surgery are detailed in Table A.2. This search strategy was translated to the EMBASE syntax, with searches again being restricted by language and year. In addition, a NOT MEDLINE limiter was also applied to the EMBASE searches.

Table A.2: Ovid MEDLINE search

Search ID	Key Concept	Search
1	Osteoarthritis	Osteoarthritis, Knee/ OR (Osteoarthritis and knee).ab,kw,ti
2	Therapy non-surgical	drug therapy/ OR hydrotherapy/ OR individualized medicine/ OR magnetic field therapy/ OR nutrition therapy/ OR pain management/ OR patient care/ OR physical therapy modalities/ OR rehabilitation/ OR (drug and therapy).ab,kw,ti. OR hydrotherapy.ab,kw,ti. OR (individualized and medicine).ab,kw,ti. OR (magnetic adj field adj therapy).ab,kw,ti. OR (nutrition and therapy).ab,kw,ti. OR (pain and management).ab,kw,ti. OR (patient and care).ab,kw,ti. OR (physical and therapy and modalities).ab,kw,ti. OR rehabilitation.ab,kw,ti. OR lavage.ab,kw,ti. OR Therapeutic Irrigation/
3	Osteoarthritis & therapy non-surgical	1 AND 2
4	Limited to systematic reviews	3 restricted to systematic reviews & meta-analysis, English language, year 2005 - 2014
5	Limited to clinical trials	3 restricted to RCT & clinical trials, English language, year 2005 - 2014

Table A.2: Ovid MEDLINE search (cont'd)

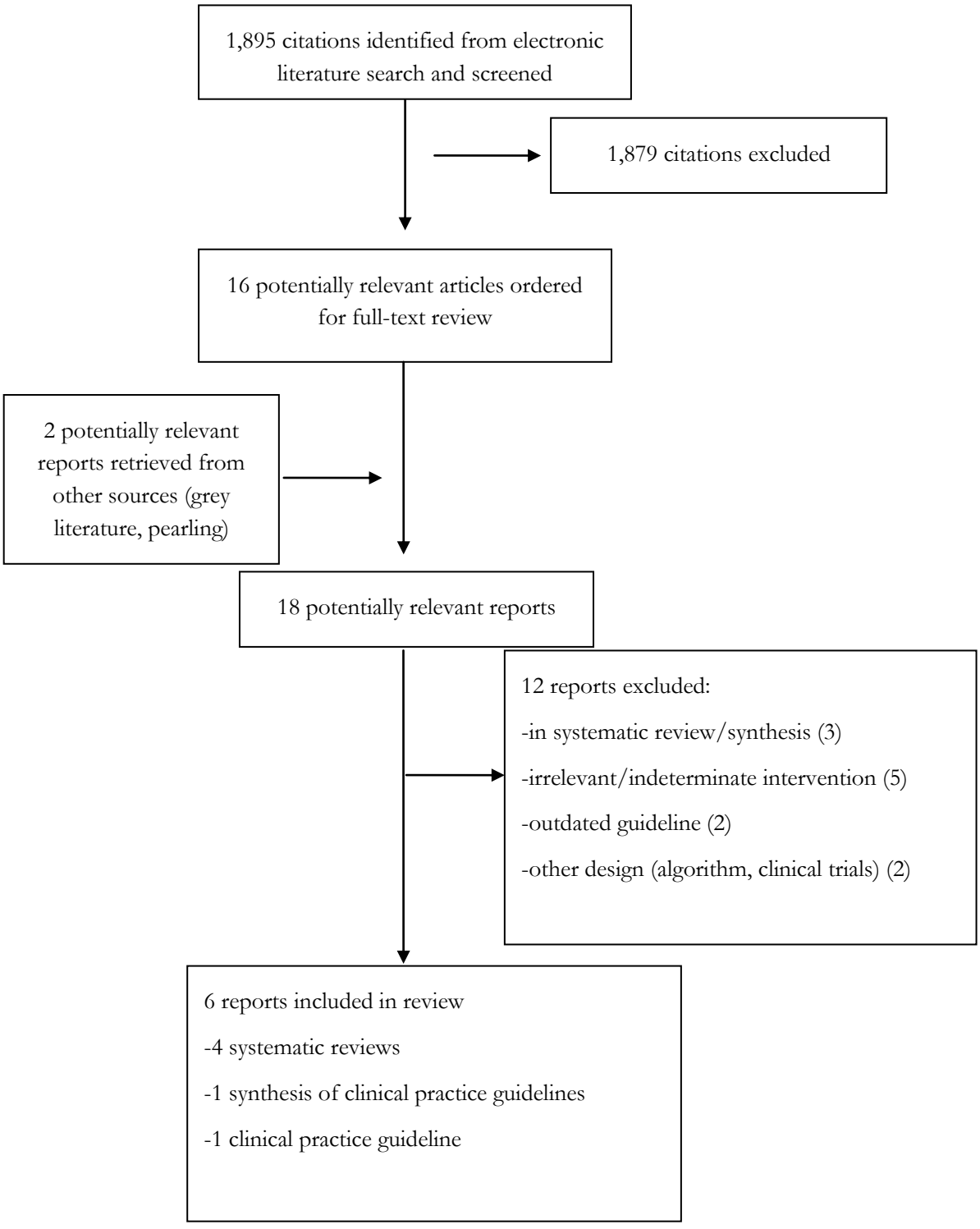
Search ID	Key Concept	Search
6	Limited to guidelines	3 restricted to CPGs, English language, year 2009 - 2014
7	Combined results for Osteoarthritis & Therapy non-surgical	4 OR 5 OR 6
8	Arthroscopy or arthroplasty	(Arthroscopy/ AND (Knee Joint/ or Knee/)) OR (knee adj scope).ab,kw,ti. OR (knee and surgery).ab,kw,ti. OR Arthroplasty, Replacement, Knee/ OR (Arthroplasty and knee).ab,kw,ti. OR (Arthroscopy and Knee).ab,kw,ti.
9	Osteoarthritis & (Arthroscopy or arthroplasty)	1 AND 8
10	Diagnosis	Diagnosis/ OR (diagnos* adj arthroscopy).ab,kw,ti.
11	Arthroscopy or arthroplasty excluding Diagnosis	9 NOT 10
12	Limited to systematic reviews	11 restricted to systematic reviews & meta-analysis, English language, year 2005 - 2014
13	Limited to clinical trials	11 restricted to RCT & clinical trials, English language, year 2005 - 2014
14	Limited to guidelines	11 restricted to CPGs, English language, year 2009 - 2014
15	Combined results for Osteoarthritis & (Arthroscopy or Arthroplasty)	12 OR 13 OR 14
16	Overall result	7 OR 15

CPG: clinical practice guideline; RCT: randomised controlled trial

Note: review ti=title, ab=abstract, kw=keyword original title; MEDLINE search was adapted to EMBASE and limited to non-MEDLINE journals

Study selection

Figure A.1: Flow diagram of the study selection process



Appendix B: Evidence Hierarchy

Table B.1: National Health and Medical Research Council evidence hierarchy (Merlin et al. 2009)

Level	Intervention	Diagnostic accuracy	Prognosis	Aetiology	Screening Intervention
I	A systematic review of level II studies	A systematic review of level II studies	A systematic review of level II studies	A systematic review of level II studies	A systematic review of level II studies
II	A randomised controlled trial	A study of test accuracy with: an independent, blinded comparison with a valid reference standard, among consecutive persons with a defined clinical presentation	A prospective cohort study	A prospective cohort study	A randomised controlled trial
III-1	A pseudo-randomised controlled trial (i.e. alternate allocation or some other method)	A study of test accuracy with: an independent, blinded comparison with a valid reference standard, among non-consecutive persons with a defined clinical presentation	All or none	All or none	A pseudo-randomised controlled trial (i.e. alternate allocation or some other method)
III-2	A comparative study with concurrent controls: ▪ Non-randomised, experimental trial ▪ Cohort study ▪ Case-control study ▪ Interrupted time series with a control group	A comparison with reference standard that does not meet the criteria required for Level II and III-1 evidence	Analysis of prognostic factors amongst persons in a single arm of a randomised controlled trial	A retrospective cohort study	A comparative study with concurrent controls: ▪ Non-randomised, experimental trial ▪ Cohort study ▪ Case-control study
III-3	A comparative study without concurrent controls: ▪ Historical control study ▪ Two or more single arm study ▪ Interrupted time series without a parallel control group	Diagnostic case-control study	A retrospective cohort study	A case-control study	A comparative study without concurrent controls: ▪ Historical control study ▪ Two or more single arm study
IV	Case series with either post-test or pre-test/post-test outcomes	Study of diagnostic yield (no reference standard)	Case series, or cohort study of persons at different stages of disease	A cross-sectional study or case series	Case series

Appendix C: Excluded Studies

Included in systematic review or synthesis

American Academy of Orthopaedic Surgeons (AAOS) 2013, *American Academy of Orthopaedic Surgeons clinical practice guideline on treatment of osteoarthritis of the knee. 2nd edition*. AAOS, Rosemont, IL, viewed August 2014, <http://www.aaos.org/research/guidelines/treatmentofOsteoarthritisoftheKneeGuideline.pdf>.

Hochberg, MC, Altman, RD, April, KT, Benkhalti, M, Guyatt, G, McGowan, J, Towheed, T, Welch, V, Wells, G & Tugwell, P 2012, 'American College of Rheumatology 2012 recommendations for the use of nonpharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee', *Arthritis care & research*, vol.64(4), pp. 465-74.

van Jonbergen, HP, Poolman, RW & van Kampen, A 2010, 'Isolated patellofemoral osteoarthritis', *Acta Orthopaedica*, vol.81(2), pp. 199-205.

Irrelevant or indeterminate intervention

Avouac, J, Vicaut, E, Bardin, T & Richette, P 2010, 'Efficacy of joint lavage in knee osteoarthritis: meta-analysis of randomized controlled studies', *Rheumatology*, vol.49(2), pp. 334-40.

McAlindon, TE, Bannuru, RR, Sullivan, MC, Arden, NK, Berenbaum, F, Bierma-Zeinstra, SM, Hawker, GA, Henrotin, Y, Hunter, DJ, Kawaguchi, H, Kwoh, K, Lohmander, S, Rannou, F, Roos, EM & Underwood, M 2014, 'OARSI guidelines for the non-surgical management of knee osteoarthritis', *Osteoarthritis and cartilage*, vol.22(3), pp. 363-88.

Parmigiani, L, Furtado, RN, Lopes, RV, Ribeiro, LH & Natour, J 2010, 'Joint lavage associated with triamcinolone hexacetonide injection in knee osteoarthritis: a randomized double-blind controlled study', *Clinical Rheumatology*, vol.29(11), pp. 1311-5.

Smink, AJ, van den Ende, CH, Vliet Vlieland, TP, Swierstra, BA, Kortland, JH, Bijlsma, JW, Voorn, TB, Schers, HJ, Bierma-Zeinstra, SM & Dekker, J 2011, '"Beating osteoARThritis": development of a stepped care strategy to optimize utilization and timing of non-surgical treatment modalities for patients with hip or knee osteoarthritis', *Clinical Rheumatology*, vol.30(12), pp. 1623-9.

Wallis, JA & Taylor, NF 2011, 'Pre-operative interventions (non-surgical and non-pharmacological) for patients with hip or knee osteoarthritis awaiting joint replacement surgery--a systematic review and meta-analysis', *Osteoarthritis and cartilage*, vol.19(12), pp. 1381-95.

Outdated guidelines

Richmond, J, Hunter, D, Irrgang, J, Jones, MH, Levy, B, Marx, R, Snyder-Mackler, L, Watters, WC, 3rd, Haralson, RH, 3rd, Turkelson, CM, Wies, JL, Boyer, KM, Anderson, S, St Andre, J, Sluka, P, McGowan, R & American Academy of Orthopaedic, S 2009, 'Treatment of osteoarthritis of the knee (nonarthroplasty)', *Journal of the American Academy of Orthopaedic Surgeons*, vol.17(9), pp. 591-600.

Zhang, W, Nuki, G, Moskowitz, RW, Abramson, S, Altman, RD, Arden, NK, Bierma-Zeinstra, S, Brandt, KD, Croft, P, Doherty, M, Dougados, M, Hochberg, M, Hunter, DJ, Kwoh, K, Lohmander, LS & Tugwell, P 2010, 'OARSI recommendations for the management of hip and knee osteoarthritis: part III: Changes in evidence following systematic cumulative update of research published through January 2009', *Osteoarthritis and cartilage*, vol.18(4), pp. 476-99.

Other design

Risberg, MA 2009, 'Arthroscopic surgery provides no additional benefit over physiotherapy and medication for the treatment of knee osteoarthritis', *Australian Journal of Physiotherapy*, vol.55(2), pp. 137.

Royal Australian College of General Practitioners 2009, *Diagnosis and management of hip and knee osteoarthritis*, Royal Australian College of General Practitioners, Melbourne, viewed August 2014, <http://www.racgp.org.au/download/documents/Guidelines/Musculoskeletal/oa_algorithm.pdf>.

Appendix D: Summary of Evidence

Table D.1: Grading of recommendations and levels of evidence

Study, Country	Recommendation Grading	Evidence Categories/Grading
Synthesis of CPG recommendations		
Nelson et al. (2014) USA	Two independent reviewers extracted recommendations and the strength of recommendations from guidelines. Three authors independently reviewed recommendations extracted for all guidelines and generated summary recommendations as follows: R: recommend, I: inconclusive and NR: not recommended.	Where all three authors agreed (44/58 recommendations or 76%), a summary recommendation (R, I, or NR) was provided; where no agreement was reached (14/58 recommendations or 24%), the summary recommendation was listed as inconclusive (I).
CPGs		
NICE (2014) United Kingdom	*Must not be used*: only if there is a legal duty to apply the recommendation and the consequences of not following the recommendation could be serious or life threatening. *Should (or should not) be used – "Strong" Recommendation*: when there is confidence that, for the majority of patients, an intervention will do more good than harm, and be cost effective. Similarly, 'do not offer' is used when there is confidence that an intervention will not be of benefit for most patients. *Could be used*: 'consider' is used when there is confidence an intervention will do more good than harm for most patients, and will be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention, is more likely to depend on the patient's values and preference than for a strong recommendation.	High: further research is very unlikely to change confidence. Moderate: further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate. Low: further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate. Very low: any estimate of effect is very uncertain.

CPG: clinical practice guideline; NICE: National Institute for Health and Care Excellence

Table D.2: Summary of critical appraisal of CPG synthesis and the National Institute for Health and Care Excellence (NICE) CPG

Study, Country	Strengths	Limitations
Synthesis of CPG recommendations		
Nelson et al. (2014) USA	Protocol was adherent to PRISMA guidelines. Study selection performed by two independent reviewers based on predefined criteria. Two reviewers independently extracted recommendations from each guideline and recorded the strength of recommendation, and two authors independently verified extracted data. Two reviewers independently appraised CPGs using the validated AGREE II quality assessment tool (Brouwers et al. 2010). Three authors independently reviewed extracted data for all CPGs and generated summary recommendations as: R: recommended, I: inconclusive, and NR: not recommended. Where all three authors agreed, a summary recommendation (R, I or NR) was provided; where no agreement was reached, the summary recommendation was listed as inconclusive. A list of included studies was provided, grades of recommendations from individual organizations were described and scientific quality of included CPGs was documented and considered in formulating summary recommendations. Most recommendations were agreed upon across various good quality CPGs. Most recommendations had multidisciplinary input from general practitioners, rheumatologists, orthopaedists and physical therapists. Conflicts of interest were stated and none of the authors were involved in developing any of the CPGs considered in the manuscript.	A librarian-assisted literature search of MEDLINE electronic database (2000 to January 2013), internet searching of the National Guideline Clearinghouse and handsearching for English-language articles. However, at least two electronic sources should be searched and supplemented by grey literature searching as some evidence may have been missed. A single reviewer screened titles and abstracts; all authors reviewed remaining titles after including only those articles published from January 2003 onward followed by independent full-text review by two authors. A list of excluded studies was not reported and publication bias was not assessed. Funding source was not reported for the study and many authors received grants, with consulting for industry. Included CPGs scored lowest for quality in describing barriers to application, providing advice for practical use, discussing resource implications and providing monitoring or audit criteria, which may hinder the use of CPGs in practice.

Table D.2: Summary of critical appraisal of CPG synthesis and the National Institute for Health and Care Excellence (NICE) CPG (cont'd)

Study, Country	Strengths	Limitations
CPGs		
NICE (2014) United Kingdom	Evidence-based recommendations were developed by a multidisciplinary guideline development group, supported by a systematic review (searches of MEDLINE, EMBASE and *The Cochrane Library* up to May 2013) by the National Clinical Guideline Centre. Objective, clinical questions and target population were specifically described. Guideline development group included all relevant professional and patient groups and defined the target audience as health professionals offering best practice advice to adults with OA. Methods for developing the research questions, outcomes, study selection, grading of evidence and data synthesis were reported. Recommendations were formulated by expert consensus. Health benefits, risks and costs were considered in formulating the recommendations. Guideline recommendations are current and will be updated after a review to determine whether the evidence has progressed significantly to warrant update. Barriers to care reported by patients include inadequate supply of medications, gastrointestinal problems, barriers to attending clinic based on finances or transportation and problems requiring rapid intervention. Tools for baseline assessment and costing were available to facilitate implementation of this CPG, systems improvement and audit.	None identified.

AGREE: Appraisal of Guidelines for Research and Evaluation; CPG: clinical practice guideline; OA: osteoarthritis; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Table D.3: CPG recommendations on treatment for osteoarthritis

Guideline, Author, Year, Country	Recommendations
Synthesis of guideline recommendations Nelson et al. (2014) USA	16 CPGs from the USA (Cibulka et al. 2009; Herndon et al. 2008; Hochberg et al. 2012; Jevsevar et al. 2013; Michigan Quality Improvement Consortium 2007), Canada (Loew et al. 2012), Europe (Gélis et al. 2008; Jordan et al. 2003; Mazières et al. 2008; National Collaborating Centre for Chronic Conditions 2008; Peter et al. 2011; Roddy et al. 2005; Zhang et al. 2005; Zhang et al. 2007), Asia (Pongparadee et al. 2012) and an international CPG (Zhang et al. 2008) developed with input from the Canada, Europe and the USA published between 2005 and 2013. *Pharmacological management (11 CPGs)*: First- and second-line therapy: paracetamol should be used as first-line in symptomatic OA (7 CPGs); second-line agents include topical capsaicin and NSAIDs and oral NSAIDs (risk stratification with gastroprotective strategies) for refractory symptoms; tramadol (3 CPGs) is recommended with consideration to opioids (n=6) or duloxetine (n=1). Intra-articular corticosteroid injections: recommended for knee OA (6 CPGs); insufficient evidence regarding intra-articular hyaluronan injections. *Non-pharmacological management (15 CPGs)*: Education and self-management: moderate to strong recommendation for self-management programs, education, regular contact to promote self-care, joint protection strategies and individualised treatment plans (12 CPGs). Exercise and weight loss: moderate to strong recommendation for low-impact aerobic exercise (12 CPGs) and weight loss for overweight patients with hip or knee OA (7 CPGs); consideration to exercise in combination with manual therapy and physical or occupational therapy referral (4 CPGs). Assistive devices and taping: assistive devices are recommended as needed (6 CPGs); inconclusive evidence for bracing or heal wedges for knee OA (7 CPGs). Alternative and complementary therapies: thermal modalities are recommended for knee OA (3 CPGs); therapeutic ultrasound is not recommended for use; insufficient evidence for acupuncture, Tai Chi and TENS (5 CPGs). Surgical modalities: joint replacement is recommended for appropriate patients with knee or hip OA (3 CPGs); arthroscopy with debridement is not recommended for the managing symptomatic knee OA (4 CPGs).
NICE (2014) United Kingdom	*Pharmacological management:* Oral analgesics: - consider paracetamol for pain relief in addition to core treatments; - consider paracetamol and/or NSAIDs before oral NSAIDs, COX-2 inhibitors or opioids; - consider adding opioid analgesics if paracetamol or topical NSAIDs are insufficient for pain relief. Topical treatments: - consider topical NSAIDs in addition to core treatments for knee OA; - consider topical NSAIDs and/or paracetamol before oral NSAIDs, COX-2 inhibitors or opioids; - consider topical capsaicin as adjunct for knee OA; do not offer rubefacients for treating OA. NSAIDs and COX-2 inhibitors: - consider substituting oral NSAIDs/COX-2 inhibitors where paracetamol or topical NSAIDs are ineffective; - consider adding oral NSAIDs/COX-2 inhibitors to paracetamol were paracetamol or topical NSAIDs are insufficient;

Table D.3: CPG recommendations on treatment for osteoarthritis (cont'd)

Guideline, Author, Year, Country	Recommendations
	- use oral NSAIDs/COX-2 inhibitors at lowest effective dose for shortest possible time; - when offering oral NSAID/COX-2 inhibitor, first choice should be a standard NSAIDs or COX-2 inhibitors with co-prescribed proton-pump inhibitors; - when choosing an oral NSAID/COX-2 inhibitor consider patient risk factors and monitoring; - consider other analgesics before substituting or adding an NSAID or COX-2 inhibitor (with proton-pump inhibitor) if patient needs to take low-dose aspirin. Intra-articular injections: - corticosteroid injections should be considered as an adjunct to core treatments for relief of moderate to severe pain; - do not offer intra-articular hyaluronan injections for the management of OA. *Non-pharmacological management:* Exercise and manual therapy: exercise should include muscle strengthening and aerobic fitness as core treatment irrespective of age, comorbidity, pain severity or disability; manipulation and stretching should be adjunct to core treatments. Weight loss: offer interventions to achieve weight loss as core treatment for people who are overweight. Electrotherapy: consider the use of TENS as adjunct to core treatments for pain relief. Nutraceuticals: do not offer glucosamine or chondroitin for management of OA. Acupuncture: do not offer acupuncture for management of OA. Aids and devices: offer appropriate footwear as core treatment; consider bracing, joint support, insoles and assistive devices as adjunct for joint pain or instability. Invasive treatments: do not refer for arthroscopic lavage and debridement as treatment for OA unless patient has knee OA with history of mechanical locking (as opposed to morning stiffness, "giving way" or X-ray evidence of loose bodies). *Referral for joint surgery:* - clinicians responsible for referring an OA patient for consideration of joint surgery should ensure the patient has been offered at least the core non-surgical treatment options; - base decisions on referral on discussions between patient representatives, referring clinicians and surgeons, rather than scoring tools for prioritisation; - consider referral for joint surgery for OA patients with symptoms that substantially impact quality of life and are refractory to non-surgical treatment; - refer for consideration of surgery before prolonged and established functional limitation and severe pain; - patient-specific factors (age, sex, smoking, obesity and comorbidities) should not be barriers to referral for surgery; - when discussing the possibility of surgery, check the patient has been offered at least the core treatments for OA and provide information about the benefits and risks of surgery, the consequences of not having surgery, recovery and rehabilitation, the effects of prosthesis and local care pathways. *Follow-up and review:* Follow-up: regularly review all symptomatic OA patients including monitoring symptoms and ongoing impact on daily activities and quality of life, long-term course of the condition, discussion of patient's concerns, personal preferences and ability to access services, review effectiveness and tolerability of treatments and support self-management. Annual review: consider annual review for anyone with troublesome joint pain, more than one symptomatic joint or comorbidity and taking regular medication for OA.

COX-2: cyclooxygenase-2; CPG: clinical practice guideline; NSAID: non-steroidal anti-inflammatory drug; OA: osteoarthritis; TENS: transcutaneous electrical nerve stimulation

Table D.4: Summary of systematic review and health technology assessment characteristics

Study, Country	Study Design	Patient Characteristics	Intervention	Comparator	Outcomes Measured
Systematic reviews					
Spahn et al. (2013) Germany	SR with meta-analysis (30 RCTs) (Aaron et al. 2006; Al-Omran and Sadat-Ali 2009; Bernard et al. 2004; Bin et al. 2008; Bohnsack et al. 2002; Crevoisier et al. 2001; Fond et al. 2002; Harwin 1999; Jackson and Dieterichs 2003; Kirkley et al. 2008; Kruger et al. 2000; Krystallis et al. 2004; Kuraishi et al. 2006; Kuzmanova 2003; Linschoten and Johnson 1997; Mazoochian et al. 2007; McGinley et al. 1999; McLaren et al. 1991; Merchan and Galindo 1993; Moseley et al. 2002; Ogilvie-Harris and Fitsialos 1991; Pearse and Craig 2003; Raaijmaakers et al. 2010; Rand 1985; Roposch et al. 2003; Shannon et al. 2001; Spahn et al. 2006; Steadman et al. 2007; Su et al. 1995; van den Bekerom et al. 2007) Participants: 3,616 patients Literature search: dates not reported Follow-up: >2 years	Patients with knee OA	Arthroscopic debridement	Alternative treatment	Difference in knee scores, time to knee replacement
Reichenbach et al. (2010) Switzerland	SR with meta-analysis of 3 RCTs (Kalunian et al. 2000; Moseley et al. 2002; Moseley et al. 1996) Participants: 212 patients Literature search: up to 2009 Follow-up: at least 1 year	Patients with knee OA	Arthroscopic lavage exclusive of debridement	Non-arthroscopic lavage, sham, placebo injections or non-intervention control	Pain, function and safety
Laupattarakasem et al. (2008) Thailand	SR of 3 RCTs (Chang et al. 1993; Hubbard 1996; Moseley et al. 2002) Participants: 271 patients Literature search: 1900 to 2006 Follow-up: between 1 and 5 years	Patients with knee OA	Arthroscopic debridement	Placebo, sham or non-surgical intervention	Pain, function, time to knee replacement and safety

Table D.4: Summary of review and health technology assessment characteristics (cont'd)

Study, Country	Study Design	Patient Characteristics	Intervention	Comparator	Outcomes Measured
Health technology assessments					
Health Quality Ontario (2005) Canada	HTA of 2 HTAs, 2 RCTs and 2 non-randomised comparative studies on arthroscopic lavage and 2 RCTs and 5 non-randomised comparative studies on arthroscopic debridement (Allgood 2003; Bernard et al. 2004; Bohnsack et al. 2002; Centers for Medicare & Medicaid Services 2003; Dervin et al. 2003; Fond et al. 2002; Hubbard 1996; Kalunian et al. 2000; Krystallis et al. 2004; McGinley et al. 1999; Menetrey et al. 2002; Moseley et al. 2002) Participants: Overall number not reported Literature search: 1995 to 2005 Follow-up: between 1 and 5 years	Patients with knee OA	Arthroscopic lavage and debridement with or without meniscectomy	Placebo or sham arthroscopy	Pain, function, disability, quality of life

HTA: health technology assessment; OA: osteoarthritis; RCT: randomised controlled trial; SR: systematic review

Table D.5: Summary of critical appraisal of the included reviews and health technology assessments

Study, Country	Strengths	Limitations
Systematic reviews		
Spahn et al. (2013) Germany	Meta-analysis performed in accordance with PRISMA criteria. Comprehensive literature search based on pre-defined criteria. Study selection by two independent reviewers according to well-defined criteria. Reasons for exclusion of excluded studies were reported. Publication bias was assessed and presented as funnel plots.	A list of excluded studies was not reported. Methods of data extraction and quality assessment were not reported. Quality was assessed in terms of level of evidence. It was unclear whether other validated assessment tools were used to critically appraise studies. Study characteristics were incomplete. Studies may be pooled inappropriately as heterogeneity scores were high, suggesting inconsistency across studies. It is unclear whether study quality was taken into consideration in the analysis and conclusions. Funding source and conflicts of interest were not reported.
Reichenbach et al. (2010) Switzerland	Comprehensive literature search based on pre-defined criteria and protocol. Grey literature, clinical trial registries, manual searches and content experts were contacted for relevant articles. Studies were selected and assessed for quality independently by two reviewers according to well-defined criteria. Two reviewers independently extracted data. Methods of pooling studies were appropriate. Publication bias was assessed and presented as funnel plots.	A list of excluded studies was not reported. Different instruments were used to measure joint pain and function and SMDs were calculated as a common measure of effectiveness to ensure comparability between outcomes assessed with different instruments. Poor correlation or differences in responsiveness of different instruments may affect the validity of results. Funding source and conflicts of interest were not reported. The small number of studies included, the low number of randomly assigned patients and poor reporting limited quality.
Laupattarakasem et al. (2008) Thailand	Comprehensive literature search based on pre-defined criteria and protocol. Studies were selected and assessed for quality by two independent reviewers according to well-defined criteria. Two reviewers independently extracted data. A list of excluded studies and reasons for exclusion were drafted as a supplemental table. Characteristics of included studies were reported. Risk of bias in included studies was reported. Study quality of the included studies was considered in formulating conclusions. Authors declared no competing interests.	Evidence is based on a small number of studies with a low number of randomly assigned participants. Included studies measured different comparison groups that prevented results from being pooled as a meta-analysis. The primary outcome of pain is a subjective outcome that may be modified by confounding factors such as the use of rescue analgesics.

Table D.5: Summary of critical appraisal of the included reviews and health technology assessments (cont'd)

Study, Country	Strengths	Limitations
Health technology assessments		
Health Quality Ontario (2005) Canada	Comprehensive literature search based on pre-defined criteria supplemented by hand searching. Characteristics of included studies were reported in tables. Study results were reported narratively; no formal meta-analyses were performed. Levels of evidence were provided in the summary of findings. No competing interests or conflicts of interest were declared.	While inclusion criteria were listed, methods by which studies were selected and assessed for quality were not reported. Quality was assessed in terms of level of evidence. No validated assessment tools were reported regarding the critical appraisal of studies. Risk of bias was not formally assessed.

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-analyses; SMD: standardised mean difference

Table D.6: Summary of findings from systematic reviews and health technology assessments

Study, Country	Main Study Findings	Authors' Conclusions
Systematic reviews		
Spahn et al. (2013) Germany	**Arthroscopic debridement versus alternative treatment for knee OA** *Knee scores:* Meta-analysis of 13 studies involving 857 patients (mean FU of 43 months) compared arthroscopic debridement with alternative treatment; reported a SMD for knee scores of 2.3 (95% CI 1.5 to 3.1) representing a significant improvement (P<0.001). Heterogeneity (I^2 statistic) was 97.6% (random-effects model). *Excellent or good outcomes:* Meta-analysis of 17 studies involving 2,265 patients (mean FU of 52 months) compared arthroscopic debridement with alternative treatment; reported that 66.4% (95% CI 60.0 to 72.2) of OA patients had excellent or good results according to the guidelines for well-described knee scores. Heterogeneity (I^2 statistic) was 86.7% (random-effects model). *Survival to knee replacement:* Meta-analysis of 3 studies involving 409 patients (4-year FU) reported a mean survival time to knee replacement of 42.7 months (95% CI 14.5 to 71.1). After 1 year, 6.1% (95% CI 2.1 to 16.6) of patients needed arthroplasty. After 4 years, 34.1% (95% CI 22.8 to 47.6) of patients converted to arthroplasty. Heterogeneity (I^2 statistic) was 87.2% (random-effects model). In 19 studies, 13.3% (95% CI 6.1 to 26.5) of patients required arthroplasty 24 to 30 months after treatment. Studies with longer FU reported higher rates of knee replacement: 16.0% (95% CI 8.8 to 27.5) after 38 months and 19.4% (95% CI 9.6 to 35.5) after >38 months. *Factors influencing outcomes:* Four studies suggested that clinical outcomes may be correlated with radiological grade where worse outcomes were associated with greater disease severity, whereas three studies did not confirm these findings. One study estimated clinical outcome to be correlated with age as patients older than 60 years had worse outcomes. A retrospective analysis of 1,200 arthroscopies showed that worse outcomes were associated with OA duration of longer than 2 years, obesity, smoking, presence of tibial osteophytes, tibial sclerosis or calcifications, absence of effusion and prior meniscectomy.	"Arthroscopic debridement is a potential and sufficient treatment for knee OA in a middle-term interval. This procedure results in an excellent or good outcome in approximately 60% of patients in approximately 5 years." (pp. 1599)

Table D.6: Summary of findings from systematic reviews and health technology assessments (cont'd)

Study, Country	Main Study Findings	Authors' Conclusions
Reichenbach et al. (2010) Switzerland	**Arthroscopic lavage versus alternative treatments for knee OA** *Knee pain:* Meta-analysis of 3 studies involving 212 patients (FU of at least 1 year) compared arthroscopic debridement with alternative treatment; reported a SMD for knee scores of 0.21 (95% CI -0.06 to 0.48), representing no significant improvement at 3 months (P=0.27). Heterogeneity (I^2 statistic) was 0% (random-effects model). *Knee function:* Meta-analysis of 2 studies involving 205 patients (FU of at least 1 year) compared arthroscopic lavage with alternative treatment; reported a SMD for knee function of 0.01 (95% CI -0.26 to 0.29), representing no significant improvement at 3 months (P=0.43). Heterogeneity (I^2 statistic) was 0% (random-effects model). *Adverse events:* One trial reported one dropout in the experimental group due to an acute episode of bipolar disorder.	"Joint lavage does not result in a relevant benefit for patients with knee OA in terms of pain relief or improvement of function. Insufficient numbers of patients have been studied to exclude potential for serious adverse events such as joint infection, effusion, haemarthrosis, or deep vein thrombosis. Joint lavage should be discouraged in patients with OA." (pp. 18)
Laupattarakasem et al. (2008) Thailand	**Arthroscopic debridement versus lavage for knee OA** *Knee pain:* One RCT involving 32 participants reported mean AIMS pain scores of 5.0 for arthroscopic debridement and 5.4 for closed-needle joint lavage with no statistically significant difference between groups (WMD -0.4, 95% CI -1.6 to 0.8) at 3 months' FU. Adjusted mean AIMS scores were 5.3 for arthroscopic debridement and 5.0 for lavage with no statistically significant difference between groups (WMD 0.3, 95% CI -1.1 to 1.8) at 12 months' FU (Chang et al 1993). One RCT, involving 163 participants, reported a decrease in pain scores of approximately 10 points at 2 weeks following arthroscopic debridement and lavage (WMD 2.5, 95% CI -4.4 to 9.4). After 2 weeks and up to 24 months, pain scores fluctuated < 5 points with no statistically significant difference between groups (Moseley et al. 2002) *Knee function:* One RCT involving 163 participants reported no statistically significant difference at 24 months between groups receiving arthroscopic debridement or lavage (WMD -0.6, 95% CI -48.3 to 7.1); 79.7% of arthroscopic debridement recipients and 88.5% of lavage recipients used analgesics (Moseley et al. 2002). **Arthroscopic debridement versus washout for knee OA** *Knee pain:* One RCT involving 76 participants reported a significant difference in pain relief in favour of washout at the 1-year (RR 5.76, 95% CI 2.52 to 13.18) and 5-year FU (RR 5.15, 95% CI 1.71 to 15.49) (Hubbard 1996).	""Based on the results of this review, we conclude that there is gold level evidence (Moseley et al. 2002) that arthroscopic debridement has no significant benefit for OA of indiscriminate cause. Debatable areas remain to be address as there may be groups of patients or levels of severity of disease for which the intervention may be effective. Hubbard et al. (1996) found that arthroscopic debridement provides more successful results for localised lesion on the medial femoral condyle than arthroscopic washout, but the study was of lower methodological quality." (pp. 9)

Table D.6: Summary of findings from systematic reviews and health technology assessments (cont'd)

Study, Country	Main Study Findings	Authors' Conclusions
	Knee function: One RCT involving 76 participants reported mean modified Lysholm function scores without SD for each subgroup having success or failure of pain relief. Scores were similar between groups. Higher mean scores were reported in the success groups with 61 and 58 for debridement and 63 and 59 for washout at 1-year and 5-year FU, respectively. Lower mean scores were reported in failure groups, with 33 for debridement versus 35 for washout at 1-year and 5-year FU (Hubbard 1996). **Arthroscopic debridement versus placebo for knee OA** *Knee pain:* One RCT involving 163 participants reported that arthroscopic debridement offered significantly less pain relief than placebo at 2 weeks' FU (WMD 8.7, 95% CI 1.7 to 15.8; NNTH=5). After 2 weeks and up to 24 months, there was no statistically significant difference in pain scores between groups. (Moseley et al. 2002). *Knee function:* One RCT involving 163 participants reported that arthroscopic debridement offered significantly less improvement in function than placebo at 2-week (WMD 7.7, 95% CI 1.1 to 14.3; NNTH=6) and 12-month FU (WMD 6.9, 95% CI 0.4 to 13.4; NNTH=9). 79.9% of arthroscopic debridement recipients and 91.7% of placebo recipients used analgesics (Moseley et al. 2002).	
Health technology assessment		
Health Quality Ontario (2005) Canada	**Arthroscopic lavage or debridement versus alternative treatment s for knee OA** *Knee pain and function:* One HTA of 5 RCTs and 2 non-randomised comparative studies concluded that while one good quality RCT suggested arthroscopic lavage or debridement did not improve patient-reported pain or function at 2 years' FU, compared with sham arthroscopy, in men, there was insufficient evidence to determine the effectiveness of arthroscopic lavage or debridement as a treatment for OA (Allgood 2003). One HTA of 4 RCTs stated that the evidence was adequate to conclude that lavage alone is not reasonable or necessary for knee OA and debridement is not reasonable or necessary for patients with knee pain only or severe OA (Outerbridge grade III or IV), while other indications for debridement are at contractor discretion.	"Arthroscopic debridement of the knee has thus far only been found to be effective for medial compartmental OA. All other indications should be reviewed with a view to reducing arthroscopic debridement as an effective therapy. Arthroscopic lavage of the knee is not indicated for any stage of OA. There is very poor quality evidence on the effectiveness of debridement with partial meniscectomy in the case of meniscal tears in OA of the knee." (pp 35)

Table D.6: Summary of findings from systematic reviews and health technology assessments (cont'd)

Study, Country	Main Study Findings	Authors' Conclusions
	Arthroscopic lavage versus alternative treatments for knee OA *Knee pain and function:* Two RCTs involving 270 patients (FU at least 1 year) compared arthroscopic lavage with alternative treatment (Kalunian et al. 2000; Moseley et al. 2002). Kalunian et al. (2008) randomly assigned 90 patients to arthroscopic lavage (3 litres of saline) or irrigation (250 mL of saline) and reported no statistically significant difference in WOMAC scores at 12 months' FU. While arthroscopic lavage recipients showed significant improvement in WOMAC pain (P=0.4) and visual analogue pain scores (P=0.02) at 12 months, compared with control, clinically meaningful differences were observed in both groups and Health Quality Ontario did not consider the differences between groups to be clinically meaningful (Kalunian et al. 2000). Moseley et al. (2002) randomly assigned patients to diagnostic arthroscopy, arthroscopic lavage or lavage and debridement and reported no statistically significant differences in knee pain between placebo and lavage recipients at 12 or 24 months' FU: mean absolute scores for placebo and lavage arms were 48.9 (SD 21.9) and 54.8 (SD 19.8) (P=0.14) and 12 months and 51.6 (SD 23.7) and 53.7 (SD 23.7) (P=0.64) at 24 months. No statistically significant difference was observed for function as measured by the AIMS2-WB scale at either time point (Moseley et al. 2002). Two case series studies involving 203 patients (FU 33 months to 5 years) reported outcomes of patients following arthroscopic lavage (Bernard et al. 2004; Bohnsack et al. 2002). Bernard et al. (2004) reported that within 5 years 18 patients (18%) required surgery, including knee replacement (n=11), a high tibial osteotomy (n=4) and a unicondylar knee arthroplasty (n=3) (Bernard et al. 2004). Bohnsack et al. (2002) reported that within 31 months of undergoing arthroscopic lavage 21 patients (20%) required further surgery, including knee replacement (n=8), monocondylar knee arthroscopy (n=3), high tibial osteotomy (n=2) and subsequent arthroscopy (n=4). One HTA of 4 RCTs stated that the evidence was adequate to conclude that lavage alone is not reasonable or necessary for knee OA and that debridement is not reasonable or necessary for patients with knee pain only or severe OA (Outerbridge grade III or IV), while other indications for debridement are at contractor discretion.	

Table D.6: Summary of findings from systematic reviews and health technology assessments (cont'd)

Study, Country	Main Study Findings	Authors' Conclusions
	Arthroscopic debridement versus alternative treatment of knee OA *Knee pain and function:* Two RCTs involving 256 patients (FU 2 to 5 years) compared arthroscopic debridement with alternative treatment (Hubbard 1996; Moseley et al. 2002). Moseley et al. (2002) randomly assigned patients to arthroscopic debridement plus lavage or placebo and reported no statistically significant differences in KSPS scores at 12 or 24 months: 51.6 (SD 23.7) for placebo and 51.4 (SD 23.2) for debridement plus lavage at 24 months (P=0.96 for both comparisons). No statistically significant difference was observed between groups for function as measured using the AIMS2-WB scale: 53.8 (SD 27.5) for placebo and 56.4 (SD 23.2) for debridement (P=0.96 for both comparisons). Hubbard et al. (1996) compared debridement plus lavage with lavage alone and reported that 80% of debridement and 14% of lavage patients were pain-free at 1 year FU (P=0.05). At 5 years the percentages were 59% and 10% for debridement and lavage, respectively (Hubbard 1996). Five case series studies reported on arthroscopic debridement (Dervin et al. 2003; Fond et al. 2002; Krystallis et al. 2004; McGinley et al. 1999; Menetrey et al. 2002). Overall, the studies suggested that debridement with partial meniscectomy was appropriate and may be effective in patients with earlier stages of degeneration, unicompartmental disease, shorter duration of symptoms, sudden onset of mechanical symptoms and full range of motion preoperatively. However, given these findings were derived from case series, identifying the subset of patients that may benefit requires further research (Health Quality Ontario 2005)	

AIMS: Arthritis Impact Measurement Scales; AIMS2-WB: Arthritis Impact Measurement Scales 2 walking and bending subscale; CI: confidence interval; FU: follow-up; KSPS: Knee Specific Pain Scale; NNTH: number needed to treat for an additional harmful outcome; OA: osteoarthritis; RCT: randomised controlled trial; RR: relative risk; SD: standard deviation; SMD: standardised mean difference; WMD: weighted mean difference; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index