

Treatment of knee pain in older adults in primary care: development of an evidence-based model of care

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Objective. To develop a stepped model of care for the treatment of knee pain in older adults in primary care based on recommended interventions.

Methods. A systematic search was undertaken to identify interventions recommended for knee osteoarthritis or knee pain in clinical guidelines and systematic reviews. Following this, a nominal group consensus exercise was conducted with members of the Primary Care Rheumatology Society to allocate the interventions to a stepped model of care.

Results. Twenty-seven recommended interventions were identified from 77 publications following the systematic search. A four-step model of care incorporating these interventions was developed through the consensus exercise. Step 1 comprised ten interventions that should be offered to all older adults with knee pain, but could also be provided through self-care. These included exercise, weight loss, paracetamol and written information. Steps 2 and 3 comprised 10 and 6 interventions, respectively, to be considered for people with persisting pain and disability. These included pharmacological interventions such as non-steroidal anti-inflammatory drugs in step 2 and intra-articular corticosteroids in step 3, and non-pharmacological interventions such as physiotherapy in step 2 and occupational therapy in step 3. Step 4 was referral for surgery.

Conclusions. Previous evidence-based guidelines for the treatment of knee problems have been developed in secondary care. A systematic search for recommended interventions, and a consensus exercise, has now enabled an evidence-based and practical model of care for knee pain in older adults to be developed for use in primary care.

KEY WORDS: Knee osteoarthritis, Knee pain, Treatment, Primary care, Model of care, Consensus exercise.

Background

Knee pain is a common complaint in older adults. Estimates of self-reported annual prevalence range from 33% (pain on most days for one month or longer) [1] to 47% (pain in or around the knee in the last year) [2]. It is also a common problem presenting in primary care, with estimates of the proportion of older adults with knee pain consulting their general practitioner (GP) in a 1-yr period about the problem ranging from 16% [in adults with symptomatic knee osteoarthritis (OA)] [3] to 33% (in adults with self-reported knee pain) [2].

Most knee pain in older adults is attributed to OA, a term that is applied both to a specific pathological disease of the joint identified by typical radiographic features and to the clinical syndrome of pain and stiffness in the joint. Not all painful older knees show radiographic changes of OA, although recent evidence suggests some 70% of older adults with knee pain will have such changes on X-ray [4]. Knee pain, rather than knee OA, is the problem that presents in primary care and guidance on the management of the symptom, rather than the pathology is the requirement in this setting [5]. Whilst evidence-based guidance for the management of knee OA has been developed, for example by the European League Against Rheumatism [6], no guidelines for the management of knee pain in primary care exist. Further, guidance for knee OA has mainly been developed by secondary care clinicians and the only

comprehensive guideline for knee OA in primary care in the UK is not evidence-based [7].

One model for the treatment of chronic conditions, when a range of interventions is available, is 'stepped care' [8, 9]. Step 1 represents interventions to be tried initially, and interventions in higher steps are reserved for those whose condition is not controlled by lower-step treatments. In musculoskeletal medicine a stepped-care model has been advocated for low back pain [10]. Such a model provides a potential framework for the treatment of knee pain in older adults in primary care.

The objective of our study was to develop an evidence-based stepped model of care for the treatment of knee pain in adults aged 50 yrs and over in primary care by (i) conducting a systematic search for clinical guidelines and systematic reviews to identify interventions recommended for knee OA and knee pain in this age group, and (ii) undertaking a consensus exercise with primary care practitioners to assign the interventions to appropriate steps of care.

Methods

Systematic search to identify recommended interventions

Clinical guidelines [11] and systematic reviews of interventions for knee OA or knee pain in older adults, rather than original studies, were the target of the search for recommended interventions.

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Submitted 25 May 2006; revised version accepted 1 September 2006.

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Guidelines and reviews, rather than primary studies, were targeted as this is an extensively reviewed area, and it was felt these would be the sources of guidance sought by primary care practitioners. Guidelines and systematic reviews relating to knee OA were included, as they are an appropriate source of guidance for the treatment of knee pain in the older adult: knee OA is the commonest underlying pathology, and there are only a limited number of other pathologies causing knee pain in this age group.

Search strategies. Publications were retrieved by a computerized search of MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Allied and Complementary Medicine Database (AMED) and British Nursing Index (BNI). Potentially relevant reviews or guidelines were identified using combinations of the search terms; knee, pain, OA, management, guidance, recommendation, guideline, review, treatment. Internet guideline or review sites [The Cochrane Library, Centre for Reviews and Dissemination (York), Clinical Evidence, Bandolier, National Institute for Health and Clinical Excellence, Scottish Intercollegiate Guidelines Network, National Electronic Library for Health, National Guideline Clearing House (USA), New Zealand Guidelines Group] as well as three other internet sites [Agency for Healthcare Research and Quality (USA), American Academy of Orthopaedic Surgeons, Canadian Medical Association] were searched for potentially relevant publications. Citations of full-text publications obtained for evaluation were searched for other potentially relevant papers.

Selection of relevant guidelines and reviews.

Inclusion criteria. (i) English language (ii) published in the last 10 yrs (search date May 2004) (iii) was a clinical guideline, or included guidance or recommendations (based on a systematic identification of the evidence), for the management of knee OA or knee pain in older adults, or was a systematic review of an intervention(s) for the management of knee OA or knee pain in older adults.

Exclusion criteria. (i) was an original study; or that it was related to: (ii) anterior knee pain or patellofemoral syndrome, (iii) knee pain only in the young (aged < 50 yrs), (iv) the assessment or investigation of knee problems, (v) only *in vitro* research, (vi) operative or perioperative details of surgical procedures on the knee, (vii) rare conditions that would not normally present in primary care and (viii) complementary medicine other than acupuncture or symptomatic slow-acting drugs for OA. [This last exclusion was applied (a) in order to keep the number of potential interventions to a reasonable size, (b) because the size of the evidence base for complementary therapies other than those included is relatively small for OA, and (c) the availability, accessibility and uptake of many of these therapies in primary care is unclear and very variable]. Interventions could be self-care or professional care.

The inclusion and exclusion criteria were applied by one author (MP), with the two other authors also applying the criteria on the first 200 titles and first 100 abstracts to assess reliability. Full-text publications were obtained where necessary for further evaluation to ensure that the inclusion and exclusion criteria were satisfied.

Data extraction. A standardized methodology and extraction sheet was used to list all interventions discussed in each included publication, and to record whether the intervention was recommended for use. Recommendations were graded from +2 (strongly recommended) through 0 (no definite recommendation, equivocal recommendation) to -2 (recommendation strongly against use). In grading the strength of the recommendation the level of evidence behind the recommendation

was not assessed, simply the final recommendation made in the paper.

Compilation of the list of recommended interventions. An intervention was included in the list of recommended interventions if a score of +1 or +2 was recorded from at least one guideline or review, provided there were no conflicting recommendations from other guidelines or reviews. A consensus group (MP, PC and KJ) met to review and clarify all the recommendations and agree inclusion, if there were conflicting recommendations, based on the weight of recommendations provided in the relevant reviews.

Development of the model of care

The model of care assumes that any 'red-flag' clinical features and diagnoses for serious causes of knee pain in this age group have been identified, and that the condition being treated is regarded by the clinician as being 'clinical OA' of the knee, regardless of whether there is radiographic evidence or not.

Members of the Primary Care Rheumatology (PCR) Society—a group consisting principally of GPs plus some physiotherapists and nurses with an interest in musculoskeletal problems—were identified as appropriate experts to undertake a nominal group consensus exercise [12, 13]. The aim of this exercise was to develop a model of how the interventions identified from the search could be used in practice in primary care for people aged ≥ 50 yrs with knee pain. The basis of the model of care was that it should be applicable to all degrees of knee pain seen in primary care in older adults, and would cover both self-care and professional care. A stepped-care model would allow the order of use of the interventions to be recommended: interventions in step 1 would be offered initially to all older adults with knee pain before trying interventions in higher steps for adults whose pain or disability persist.

The nominal group consensus exercise was undertaken by delegates to the annual PCR Society conference. During the initial plenary session, delegates were presented with the results of the systematic search and with the methodology for developing a stepped-care model for the treatment of knee pain in primary care (Box 1). Delegates were first asked individually to allocate each intervention to one of the steps in the model of care (round 1). The combined results were then presented in four consecutive workshops (the nominal groups). Discussion focused on interventions for which there had been less than 66% consensus on step allocation. Delegates individually re-allocated interventions to the model of care after the workshops (round 2).

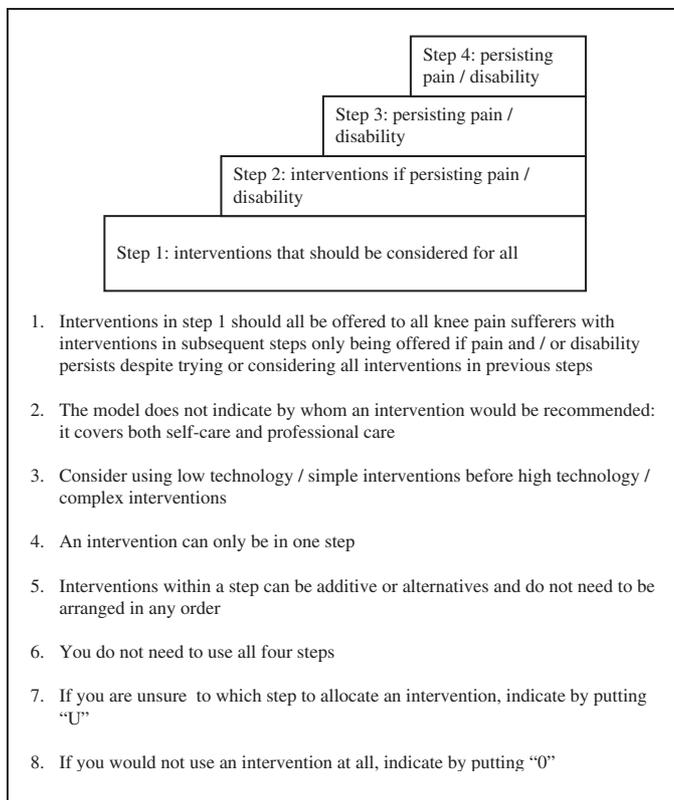
Following round 2, an intervention was assigned to a step in the model of care if there was a 50% or greater consensus for it to be in that step. If this was not achieved then allocations for lower steps were added to those for higher steps until a 50% cumulative consensus was reached. The basis of this was that if, for example, a delegate would use an intervention in step 1, then he or she would logically allow its use in a higher step, if not 'permitted' to use it in a lower step.

Results

Systematic search to identify recommended interventions

A total of 7255 potentially relevant publications were identified and 77 met the inclusion criteria (Fig. 1). Ten were Cochrane Reviews [14–23], 55 were other systematic reviews [24–78], one a health care needs assessment [79] and 11 were clinical guidelines [6, 80–89] (Table 1). Thirty-five interventions were discussed in the 77 publications included in the review, and 27 interventions, or groups of interventions, were included in the final list of recommendations for treating knee pain in adults aged ≥ 50 yrs

Box 1. Structure of model of care and instructions for allocating interventions to the model.



(Table 2). These ranged from common recommendations [exercise in 21 publications, non-steroidal anti-inflammatory drugs (NSAIDs) in 20 and paracetamol in 18] to those recommended by just one publication (diacerein, sleep advice).

Development of model of care

The list of recommended interventions identified in the systematic search was modified as follows to make it relevant for use in primary care and short enough (24 interventions) for the consensus exercise:

- avocado-soybean unsaponifiables, chondroitin, diacerein and glucosamine combined as 'symptomatic slow acting drugs for OA'
- arthroplasty, arthroscopy and osteotomy combined as surgical referral (the intervention in primary care);
- NSAIDs listed separately as (a) selective NSAIDs and (b) non-selective NSAIDs
- education, information and social support listed as (a) written information and (b) group education.

Thirty-five delegates (predominantly GPs) to the PCR Society conference completed the consensus exercise. Fourteen interventions failed to obtain a 66% consensus after round 1 and were discussed during the workshops. The results of the round 2 allocations are shown in Table 3. Seven interventions were assigned to a different step than in the round 1 results. After round 2, 16 of the 24 interventions were assigned on the basis of a simple majority (>50% of delegates allocating it to a step). Of the eight that were assigned by cumulative percentage, four (capsaicin, appliances, acupuncture and cognitive behaviour therapy) were assigned to the step nominated by the highest number of delegates, and four were assigned to either the step below (walking aids), the step above (group education and transcutaneous electrical nerve stimulation) or two steps above

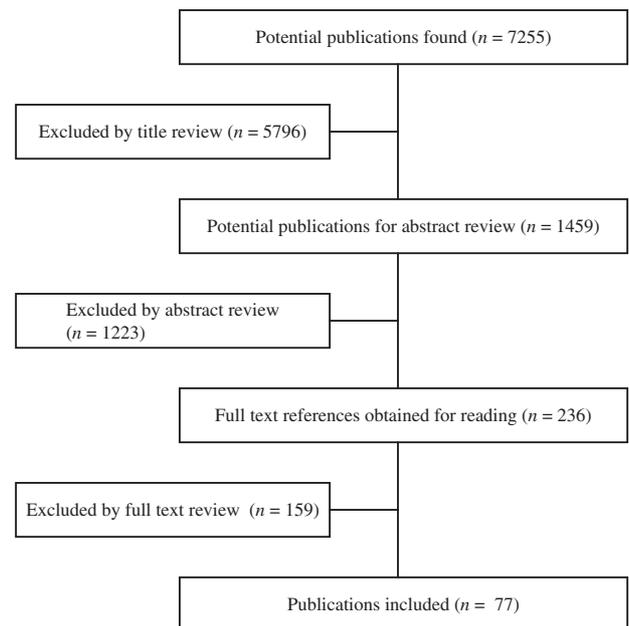


FIG. 1. Flow chart of process for identifying publications for inclusion in synthesis of recommended interventions for knee OA or knee pain.

(topical NSAIDs) the step with the highest allocation. The final consensus model of care for the treatment of knee pain in older adults is shown in Fig. 2.

Discussion

Principal findings

By combining a systematic search and synthesis of the literature with a consensus exercise, we have developed a practical evidence-based model of care for the treatment of knee pain in older adults in primary care. The interventions in step 1 are all accessible without the need to seek professional help, and so can be seen as forming the 'self-care step'. Some oral NSAIDs (step 2) and topical NSAIDs (step 3) can be purchased without prescription from the pharmacist and could also be described as self-care. Participants in the consensus exercise concluded that all interventions in step 1 should be considered, whereas steps 2 and 3 were seen by participants as providing a number of options for people with persisting pain or disability. Which of the interventions in these steps were used would depend on the preferences or characteristics of the patient (preference for non-pharmacological over pharmacological treatments, contra-indications due to comorbidity), characteristics of the knee pain (for example, wedges insoles for medial knee pain, appliances for knee instability), expertise of the practitioner (intra-articular injections) or local availability (group education or cognitive behavioural therapy). This refinement of the stepped model of care would allow the model of care to be tailored to the needs of the individual, an approach recommended in published guidance [6, 80].

Limitations of the study

As the systematic search was limited to papers published in English in the last 10 yrs and no search of the grey literature was performed, relevant papers may have been overlooked. However,

TABLE 1. Publications included in synthesis of recommended interventions

| Lead author/publisher | Year | Country of lead author/publisher | SR ^a or CG ^b | Interventions recommended | Interventions not recommended or inconclusive/no recommendation |
|---|------|----------------------------------|------------------------------------|--|--|
| Aggarwal A | 2004 | Canada | SR | i.a. hyaluronan | |
| Akai M | 2002 | Japan | SR | | |
| Altman R | 2000 | USA | CG | Weight loss, education, exercise, walking aids, appliances, wedged insoles, physiotherapy, occupational therapy (OT), paracetamol, capsaicin, non-steroidal anti-inflammatory drugs (NSAIDs) (non-selective), i.a. hyaluronan, i.a. steroids, opioid analgesics, osteotomy, total knee replacement (TKR) | Electromagnetic field stimulation NSAIDs (topical), tidal irrigation, arthroscopy, glucosamine, chondroitin, pulsed electromagnetic field therapy, acupuncture, arthroscopy |
| American Academy of Orthopaedic Surgeons | 2003 | USA | SR | Education, exercise, weight loss, appliances, paracetamol, NSAIDs (selective and non-selective), opioid analgesics, i.a. hyaluronan, i.a. steroids, glucosamine, chondroitin, osteotomy, TKR, bicompartmental / unicompartmental knee replacement (BKR / UKR), arthroscopy, acupuncture | NSAIDs (topical), pulsed electromagnetic field therapy |
| American Geriatric Society Panel on Chronic Pain in Older Persons | 1998 | USA | CG | NSAIDs, paracetamol, opioid analgesics, education, cognitive behavioural therapy (CBT), exercise, thermotherapy, OT, physiotherapy | Antidepressants, acupuncture, transcutaneous electrical nerve stimulation (TENS) |
| American Geriatric Society Panel on Exercise and Osteoarthritis | 2001 | USA | CG | Exercise | |
| Arroll B | 2004 | NZ | SR | i.a. steroids | |
| Bandolier | 2002 | UK | SR | | Arthroscopy |
| Bandolier | 2002 | UK | SR | Paracetamol | |
| Bandolier | 2001 | UK | SR | Glucosamine | |
| Barclay T | 1998 | USA | SR | | Glucosamine |
| Belgrade M | 2000 | USA | SR | Acupuncture | |
| Bjordal J | 2003 | Norway | SR | Low-level laser therapy | |
| Brosseau L | 2002 | Canada | SR | Balneotherapy (bathing in thermal and mineral waters) | |
| Brosseau L | 2004 | Canada | SR | | Low level laser therapy |
| Brosseau L | 2004 | Canada | SR | Exercise | |
| Brosseau L | 2004 | Canada | SR | Thermotherapy (heat and ice treatment) | |
| Callahan C | 1994 | USA | SR | TKR | |
| Callahan C | 1995 | USA | SR | | UKR / BKR |
| Dawson J | 2002 | UK | SR | Education, NSAIDs, (selective and non-selective), paracetamol, osteotomy, TKR, self-management, walking aids, shoe insoles, appliances, methylsalicylate, i.a. steroids, arthroscopy, UKR, OT, physiotherapy, weight loss, opioid analgesia, i.a. hyaluronan, tidal irrigation | NSAIDs (topical), capsaicin, exercise, TENS, acupuncture, |
| de Brie R | 1998 | Netherlands | SR | | Low level laser therapy |
| Deeks J | 2002 | UK | SR | | Celecoxib (selective NSAID) |
| Delafuente J | 2004 | USA | SR | Paracetamol, NSAIDs (selective and non-selective) | |
| Eccles M | 1998 | UK | SR | Paracetamol, NSAIDs (non-selective), opioid analgesics | NSAIDs (topical) |
| Ernst E | 1997 | UK | SR | | Acupuncture |
| Ernst E | 2003 | UK | SR | Avocado-soybean unsaponifiables (ASU) | |
| Espallargues M | 2003 | Spain | SR | i.a. hyaluronan | |
| Ezzo J | 2001 | USA | SR | Acupuncture | |
| Fransen M | 2001 | Australia | SR | Exercise | |
| Fransen M | 2002 | Australia | SR | Exercise | |
| Gam A | 1995 | Denmark | SR | | Therapeutic ultrasound |
| Godwin M | 2004 | Canada | SR | i.a. steroids | |
| Gotzsche P | 2004 | Denmark | SR | NSAIDs (topical), | NSAIDs (selective and non-selective) |

Evidence-based model of care for knee pain

^aSystematic review.

^bClinical guideline.

TABLE 1. Continued

| Lead author/publisher | Year | Country of lead author/publisher | SR ^a or CG ^b | Interventions recommended | Interventions not recommended or inconclusive/no recommendation | |
|--|------|----------------------------------|------------------------------------|---|--|---|
| Holbrook M | 2000 | Canada | SR | Exercise, education, social support, paracetamol, NSAIDS (selective and non-selective), opioid analgesics, i.a. steroids, i.a. hyaluronan, capsaicin, TKR, OT, physiotherapy, walking aids | Weight loss, TENS, acupuncture, low-level laser treatment, therapeutic ultrasound, appliances, glucosamine, NSAIDs (topical) | |
| Hulme J | 2001 | Canada | SR | Education, exercise, insoles, appliances, weight loss, social support, paracetamol, NSAIDs (selective, non-selective and topical), opioid analgesics, glucosamine, chondroitin, diacerein, ASU, capsaicin, i.a. steroids, i.a. hyaluronan, UKR, TKR, walking aids | Electromagnetic field therapy | |
| Jordan K | 2003 | UK | CG | | Low-level laser treatment, spa treatment, pulsed electromagnetic field treatment, therapeutic ultrasound, TENS, acupuncture, psychotropics, sex hormones (hormone replacement therapy), tidal irrigation, arthroscopy, osteotomy | |
| Kane R | 2003 | USA | SR | TKR | Exercise Acupuncture | |
| Kirwan J | 1997 | UK | SR | i.a. steroids, i.a. hyaluronan | | |
| La Mantia K | 1995 | Canada | SR | Education, weight loss, thermotherapy, paracetamol, NSAIDS (selective and non-selective), glucosamine, chondroitin, opioid analgesics, capsaicin, TENS, CBT, sleep advice, exercise, appliances, i.a. steroids, i.a. hyaluronan, walking aids, physiotherapy, OT | | |
| Lee J | 2003 | USA | CG | | | |
| Leeb B | 2000 | Austria | SR | Chondroitin | Short-wave diathermy Low-level laser treatment Therapeutic ultrasound Electrical muscle stimulation | |
| Lo G | 2003 | USA | SR | i.a. hyaluronan | | |
| Markow M | 2003 | USA | SR | Acupuncture | | |
| Marks R | 1999 | Canada | SR | Self-efficacy Laterally wedged foot orthotics (wedged insoles) Glucosamine, chondroitin Exercise Topical NSAIDs CBT and behavioural therapy Selective NSAIDs | | |
| Marks R | 1999 | Canada | SR | | | |
| Marks R | 2001 | Canada | SR | | | |
| Marks R | 2000 | Canada | SR | | | |
| Marks R | 2001 | USA | SR | | | |
| Marks R | 2004 | USA | SR | | | |
| Mc Alindon T | 2001 | USA | SR | | | |
| Mc Carthy C | 1999 | UK | SR | | | |
| Moore R | 1998 | UK | SR | | | |
| Morley S | 1999 | UK | SR | | | |
| National Institute for Clinical Excellence | 2001 | UK | CG | | | |
| Osiri M | 2000 | Thailand | SR | | | TENS |
| Petrella R | 2001 | Canada | SR | | | Exercise |
| Philadelphia Panel | 2001 | USA | CG | | Exercise, TENS | Thermotherapy, therapeutic ultrasound, electrical stimulation |

| | | | | | |
|--|------|-------------|----|--|--|
| Puett D | 1994 | USA | SR | Exercise | Diathermy, capsaicin, low-level laser therapy, acupuncture, TENS, pulsed electromagnetic field therapy, therapeutic ultrasound |
| Richy F | 2003 | Belgium | SR | Glucosamine, chondroitin | |
| Robertson V | 2001 | Australia | SR | | Therapeutic ultrasound |
| Robinson V | 2001 | Canada | SR | | Therapeutic ultrasound |
| Ruane R | 2002 | UK | SR | Glucosamine | |
| Scott | 2002 | UK | SR | TKA, UKA, NSAIDs (non-selective and topical), paracetamol, capsaicin, exercise, i.a. steroids, i.a. hyaluronan, osteotomy, appliances, exercise | Education, glucosamine, chondroitin, insoles |
| Simon L | 2002 | USA | CG | Education, CBT, exercise, paracetamol, NSAIDs (selective and non-selective), i.a. steroids, i.a. hyaluronan, opioid analgesics, glucosamine, weight loss | |
| Superio-Cabuslay E | 1996 | USA | SR | Education | |
| Tannenbaum | 1996 | Canada | SR | Paracetamol, NSAIDs (selective and non-selective) | |
| The Chartered Society of Physiotherapy | 2004 | UK | CG | i.a. steroids | |
| Todd C | 2002 | USA | SR | Physiotherapy, OT, weight loss, education, exercise, walking aids, appliances, insoles, paracetamol, NSAIDs (selective and non-selective), opioid analgesics, i.a. steroids, capsaicin | Glucosamine, chondroitin, i.a. hyaluronan |
| Towheed T | 1997 | USA | SR | NSAIDs (selective and non-selective), paracetamol, capsaicin, i.a. hyaluronan, i.a. steroids | |
| Towheed T | 1999 | Canada | SR | Glucosamine | |
| Towheed T | 2002 | Canada | SR | Paracetamol | |
| van Baar M | 1999 | Netherlands | SR | Exercise | |
| Walker-Bone K | 2000 | UK | CG | Education, physiotherapy, appliances, diathermy, therapeutic ultrasound, TENS, acupuncture, OT, paracetamol, opioid analgesics, NSAIDs (topical, selective and non-selective), i.a. hyaluronan, capsaicin, i.a. steroids, glucosamine, chondroitin, exercise | Tidal irrigation |
| Wang C | 2004 | Taiwan | SR | i.a. hyaluronan | |
| Watson M | 1996 | UK | SR | NSAIDs (selective and non-selective) | |
| Wegman A | 2002 | Netherlands | SR | Paracetamol, NSAIDs | |
| Zhang W | 1993 | UK | SR | Capsaicin | |

TABLE 2. Interventions included, or not included, in model of care and strength of recommendation in included guidelines and reviews

| Intervention | Total number of guidelines or reviews discussing intervention | Number with strong or moderate recommendation | Equivocal /no recommendation | Not recommended |
|---|---|---|------------------------------|-----------------|
| Interventions included in model | | | | |
| Acupuncture | 13 | 6 | 6 | 1 |
| Appliances | 8 | 8 | 0 | 0 |
| Arthroplasty (uni/bi/total) | 9 | 8 | 1 | 0 |
| Arthroscopy | 5 | 2 | 2 | 1 |
| Avocado-soybean unsaponifiables | 2 | 2 | 0 | 0 |
| Capsaicin cream | 11 | 9 | 2 | 0 |
| Chondroitin | 10 | 7 | 3 | 0 |
| CBT ^a or self efficacy training | 6 | 6 | 0 | 0 |
| Compound and opioid analgesia | 11 | 11 | 0 | 0 |
| Diacerein | 1 | 1 | 0 | 0 |
| Education and social support | 11 | 10 | 1 | 0 |
| Exercise | 21 | 19 | 2 | 0 |
| Glucosamine | 15 | 10 | 4 | 1 |
| Intra-articular corticosteroid | 15 | 15 | 0 | 0 |
| Intra-articular hyaluronan | 16 | 15 | 1 | 0 |
| NSAIDs ^b (selective & non-selective) | 20 | 18 | 2 | 0 |
| Occupational therapy | 7 | 7 | 0 | 0 |
| Osteotomy | 5 | 4 | 1 | 0 |
| Paracetamol | 18 | 18 | 0 | 0 |
| Physiotherapy | 7 | 7 | 0 | 0 |
| Sleep advice | 1 | 1 | 0 | 0 |
| TENS ^c | 9 | 4 | 5 | 0 |
| Thermotherapy (heat & ice treatment) | 4 | 3 | 1 | 0 |
| Topical NSAIDs ^b | 10 | 5 | 4 | 1 |
| Walking aids | 6 | 6 | 0 | 0 |
| Wedged insoles | 6 | 5 | 1 | 0 |
| Weight loss | 8 | 7 | 1 | 0 |
| Interventions not included in model | | | | |
| Electrical muscle stimulation | 2 | 0 | 2 | 0 |
| Low level laser treatment | 7 | 1 | 6 | 0 |
| Psychotropic medication | 2 | 0 | 2 | 0 |
| Pulsed electromagnetic field therapy and short wave diathermy | 7 | 0 | 7 | 0 |
| Sex hormones | 1 | 0 | 1 | 0 |
| Spa treatment (balneotherapy) | 2 | 1 | 1 | 0 |
| Therapeutic ultrasound | 9 | 1 | 5 | 3 |
| Tidal irrigation/lavage | 4 | 1 | 3 | 0 |

^aCognitive behavioural therapy.

^bNon-steroidal anti-inflammatory drug.

^cTranscutaneous electrical nerve stimulation.

the rationale was to synthesize recommendations from guidelines and reviews that might be consulted by a primary care practitioner working in the UK. We did not evaluate the level of evidence behind the recommendations, which in the clinical guidelines varied from expert opinion to evidence from meta-analysis of randomized controlled trials. Our interest was the current perceived best treatment of knee pain in older adults, as represented by the recommendations of recent clinical guidelines and systematic reviews, not restricted to interventions with a strong evidence base of clinical trials to support or refute their use. Some of the interventions were included only with limited recommendations (for example, sleep advice) and may be removed in future from the model of care if further research and future guidelines suggest they are not effective after all.

We considered the members of the PCR Society an appropriate group of experts for the consensus exercise. A different group, such as GPs with less overt interest in musculoskeletal problems, may have produced a different model. Consensus was not easy to achieve. One-third of the interventions were assigned to a step in the model of care based on a 50% cumulative consensus rather than by a simple majority. Two factors accounted for this: (i) allocations for acupuncture, appliances, capsaicin, group education, transcutaneous electrical nerve stimulation and walking aids were equally distributed between two steps,

(ii) about a third of the delegates were 'unsure about' or 'would not use' cognitive behavioural therapy and topical NSAIDs. Although some of these interventions were assigned to the step most frequently designated for them, some were not. This was particularly an issue for topical NSAIDs, which were assigned to step 3 when the most frequent designation (by 27% of participants) was step 1.

Some complementary therapies will have been overlooked because of the exclusion criteria applied, and a more extensive review of the potential role of these treatments in the primary care management of joint pain in older people is needed and may result in additions to the model of care.

Comparison to previous guidelines

Guidelines [6, 80–85], which cover both pharmacological and non-pharmacological treatments, all stress the need to use interventions from both groups but do not, bar one [81], adopt a stepped care model. Suggestions are given as to the order of use of some interventions: education being described as 'integral' to management [6, 80], paracetamol the first line analgesic with NSAIDs and compound opioid analgesia for non-responsive pain [6, 80–85], topical treatments (NSAIDs and capsaicin) when systemic therapy

TABLE 3. Allocations of recommended interventions to steps of the model of care and final assignment in the model

| Intervention | Percentage or cumulative percentage ^a of round 2 replies (n = 35) allocating intervention to: | | | | |
|--|--|--------|--------|--------|----------------------------|
| | Step 1 | Step 2 | Step 3 | Step 4 | Assigned step ^b |
| Weight loss | 97.1 | | | | 1 |
| Paracetamol | 97.1 | | | | 1 |
| Exercise | 91.2 | | | | 1 |
| Written information | 88.6 | | | | 1 |
| Restorative sleep advice | 70.6 | | | | 1 |
| Thermotherapy | 57.1 | | | | 1 |
| SYSADOA ^d | 51.4 | | | | 1 |
| Non-selective NSAIDs ^e | | 82.9 | | | 2 |
| Compound opioid analgesics | | 82.4 | | | 2 |
| Physiotherapy | | 79.4 | | | 2 |
| Wedged insoles | | 62.9 | | | 2 |
| Selective NSAIDs ^e | | 60.0 | | | 2 |
| Group education ^c | (42.9) | 71.5 | | | 2 |
| Capsaicin ^c | (14.7) | 55.9 | | | 2 |
| Acupuncture ^c | (5.9) | 53.0 | | | 2 |
| Appliances ^c | (8.6) | 51.5 | | | 2 |
| Walking aids ^c | (20.0) | 51.4 | | | 2 |
| i.a. hyaluronan | | | 62.9 | | 3 |
| i.a. corticosteroid | | | 62.9 | | 3 |
| Occupational therapy | | | 55.9 | | 3 |
| TENS ^{c,f} | | (48.6) | 88.6 | | 3 |
| Topical NSAIDs ^{c,e} | (26.5) | (17.6) | 64.7 | | 3 |
| Cognitive behavioural therapy ^c | (5.9) | (8.8) | 50.0 | | 3 |
| Surgical referral | | | | 82.9 | 4 |

Numbers in brackets are percentage allocations for lower steps when intervention assigned by cumulative percentage.

^aIf no step allocated by 50% or more delegates, scores for lower steps were added to higher steps until a cumulative percentage of 50% or greater was reached.

^bInterventions assigned to step if percentage, or cumulative percentage, allocation 50% or greater.

^cAssigned to step by cumulative percentage.

^dSymptomatic slow-acting drugs for osteoarthritis.

^eNon-steroidal anti-inflammatory drug.

^fTranscutaneous electrical nerve stimulation.

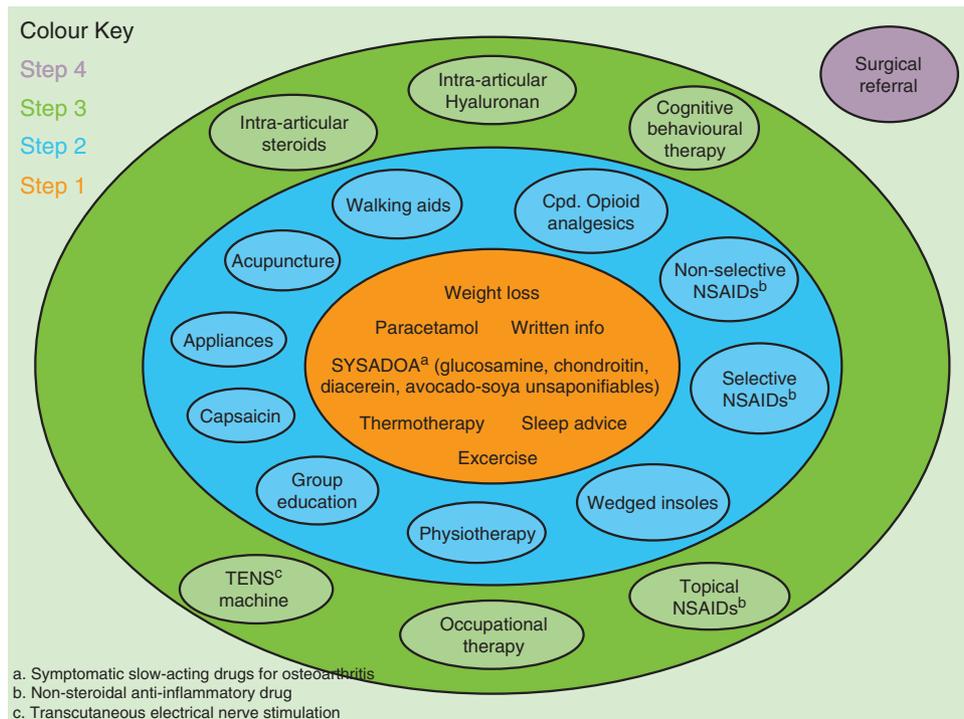


FIG. 2. Stepped model of care for the treatment of knee pain in adults aged ≥50. Step 1—interventions to be offered to all knee pain sufferers (aged ≥50 yrs) Step 2/3/4—interventions to be considered if there is persisting pain or disability despite use of interventions from lower steps.

is not effective or tolerated [80]. Alternative models exist to a stepped-care model, and one used in knee OA previously is that of tailoring treatment to the individual, [6, 80] albeit with an ordered approach to the use of some treatments. This approach mirrors the refinement to our stepped-care model aforesaid.

Implications for research

We plan now to compare the model of care with current practice in a survey of interventions used by 200 older adults with self-reported knee pain. Further refinements to the model of care are likely to come from examination of the evidence behind recommended interventions, particularly those with low-level recommendation, and from consensus work with other professional groups. The methodology used in this study could be used in the development of models of care for other common problems seen in primary care such as hip or shoulder pain.

Conclusion

The combination, of a systematic search and synthesis of current literature and a consensus exercise, has enabled an evidence-based and practical model of care for knee pain in older adults to be developed. Further research will compare the model with current practice and could usefully assess its utility in practice.

Ethical approval

North Staffordshire Local Research Ethics Committee approved the study. LREC reference number: 04/Q2604/27 and participants' written consent was obtained according to the Declaration of Helsinki.

| | |
|---------------------|---|
| <i>Rheumatology</i> | Key message |
| | <ul style="list-style-type: none"> We have developed an evidence-based model of care for the treatment of knee pain in older adults in primary care: based on published recommendations and involving primary care practitioners in its development. |

Acknowledgements

Participants and staff from the two general practices, staff of the Primary Care Musculoskeletal Research Centre, and the secretariat and members of the PCR Society.

The authors have declared no conflicts of interest.

References

- Dawson J, Linsell L, Zondervan K *et al.* Epidemiology of hip and knee pain and its impact on overall health status in older adults. *Rheumatol* 2004;43:497–504.
- Jinks C, Jordan K, Ong BN, Croft P. A brief screening tool for knee pain in primary care (KNEST). 2. Results from a survey in the general population aged 50 and over. *Rheumatol* 2004;43:55–61.
- Peat G, McCarney R, Croft P. Knee pain and osteoarthritis in older adults: a review of community burden and current use of primary health care. *Ann Rheum Dis* 2001;60:91–7.
- Duncan RC, Hay EM, Saklatvala J, Croft PR. Prevalence of radiographic osteoarthritis—it all depends on your point of view. *Rheumatol* 2006;45:757–60.

- Hadler N. Knee pain is the malady—not osteoarthritis. *Ann Intern Med* 1992;116:598–9.
- Jordan KM, Arden NK, Doherty M *et al.* EULAR Recommendations 2003: an evidence based approach to the management of knee osteoarthritis: Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). *Ann Rheum Dis* 2003;62:1145–55.
- Knee Osteoarthritis Management Options. The Primary Care Rheumatology Society. 1998. [cited 9-3-2005]; Available from: <http://www.pcrsociety.com/guidelines/knee-osteoarthritis.html>.
- British Guideline on the Management of Asthma. The British Thoracic Society and Scottish Intercollegiate Guidelines Network. 2004. [cited 9-3-2005]; Available from: <http://www.enterpriseportal2.co.uk/filestore/bts/asthmafull.pdf>.
- Williams B, Poulter NR, Brown MJ *et al.* Guidelines for the management of hypertension: report of the fourth working party of the British Hypertension, 2004 - BHS IV. British Hypertension Society. 2004. [cited 8-6-2005]; Available from: http://www.bhsoc.org/pdfs/BHS_IV_Guidelines.pdf.
- Von Korff M. Pain management in primary care: an individualized stepped-care approach. In: Gatchel RJ, Turk DC, eds. *Psychological factors in pain: evolution and relevations*. New York: Guilford Press, 1999;360–73.
- Clinical practice guidelines: directions for a new program. Washington, DC: National Academy Press, 1990.
- Gallagher M, Hares T, Spencer J, Bradshaw C, Webb I. The nominal group technique: a research tool for general practice? *Fam Pract* 1993;10:76–81.
- Jones J, Hunter D. Qualitative research: consensus methods for medical and health services research. *Br Med J* 1995;311:376–80.
- Robinson V, Brosseau L, Peterson J, Shea B, Tugwell P, Wells G. Therapeutic ultrasound for osteoarthritis of the knee. The Cochrane Database of Systematic Reviews 2001, Issue 3. Art No.: CD 003132.
- Osiri M, Welch V, Brosseau L *et al.* Transcutaneous electrical nerve stimulation for knee osteoarthritis. The Cochrane Database of Systematic Reviews 2000, Issue 4. Art No.: CD 002823.
- Towheed TE, Anastassiades TP, Shea B, Houpt J, Welch V, Hochberg M. Glucosamine therapy for treating osteoarthritis (Cochrane Review). In: *The Cochrane Library*, Issue 2, 2004; Chichester: John Wiley & Sons, Ltd.
- Towheed TE, Judd MJ, Hochberg MC, Wells G. Acetaminophen for osteoarthritis (Cochrane Review). In: *The Cochrane Library*, Issue 2, 2004; Chichester: John Wiley & Sons, Ltd.
- Hulme J, Robinson V, de Bie RA, Judd MJ, Tugwell P. Electromagnetic fields for the treatment of osteoarthritis. The Cochrane Database of Systematic Reviews 2002, Issue 1. Art No.: CD 003523.
- Brosseau L, Yonge KA, Robinson V *et al.* Thermotherapy for treatment of osteoarthritis. The Cochrane Database of Systematic Reviews 2003, Issue 4. Art No.: CD 004522.
- Brosseau L, Welch V, Wells G *et al.* Low level laser therapy (classes I, II, and III) for treating osteoarthritis (Cochrane Review). In: *The Cochrane Library*, Issue 2, 2004. Chichester: John Wiley & Sons, Ltd.
- Watson MC, Brookes ST, Kirwan JR, Faulkner A. Non-aspirin, non-steroidal anti-inflammatory drugs for osteoarthritis of the knee (Cochrane Review). In: *The Cochrane Library*, Issue 2, 2004. Chichester: John Wiley & Sons Ltd.
- Fransen M, McConnell S, Bell M. Exercise for osteoarthritis of the hip or knee. The Cochrane Database of Systematic Reviews 2001, Issue 2. Art No.: CD 004376.
- Brosseau L, MacLeay L, Robinson V, Wells G, Tugwell P. Intensity of exercise for the treatment of osteoarthritis (Cochrane Review). The Cochrane Database of Systematic Reviews 2003, Issue 2. Art No.: CD 004259.
- Zhang WY, Wan Po A. The effectiveness of topically applied capsaicin. A meta-analysis. *Eur J Clin Pharmacol* 1994;46:517–22.

25. Wegman A, Van Der Windt D, Van Tulder M, Stalman W, De Vries T. Nonsteroidal antiinflammatory drugs or acetaminophen for osteoarthritis of the hip or knee? a systematic review of evidence and guidelines. *J Rheumatol* 2004;31:344–54.
26. Wang CT, Lin J, Chang CJ, Lin YT, Hou SM. Therapeutic effects of hyaluronic acid on osteoarthritis of the knee. A meta-analysis of randomized controlled trials. *J Bone Joint Surg* 2004;86:538–45.
27. van Baar ME, Assendelft WJ, Dekker J, Oostendorp RA, Bijlsma JW. Effectiveness of exercise therapy in patients with osteoarthritis of the hip or knee: a systematic review of randomized clinical trials. *Arthritis Rheum* 1999;42:1361–9.
28. Towheed TE, Hochberg MC. A systematic review of randomized controlled trials of pharmacological therapy in osteoarthritis of the knee, with an emphasis on trial methodology. *Semin Arthritis Rheum* 1997;26:755–70.
29. Todd C. Meeting the therapeutic challenge of the patient with osteoarthritis. *J Am Pharm Assoc* 2001;42:74–82.
30. Tannenbaum H, Davis P, Russell A *et al.* An evidence-based approach to prescribing NSAIDs in musculoskeletal disease: a Canadian consensus. *J Can Med Assoc* 1996;155:77–88.
31. Superio-Cabuslay E, Ward M, Lorig K. Patient education interventions in osteoarthritis and rheumatoid arthritis: a meta-analytic comparison with nonsteroidal anti-inflammatory drug treatment. *Arthritis Care Res* 1996;9:292–301.
32. Scott D, Smith C, Lohmander S, Chard J. Osteoarthritis. *Clin Evid* 2004;1560–88.
33. Ruane R, Griffiths P. Glucosamine therapy compared to ibuprofen for joint pain. *Br J Community Nurs* 2002;7:148–52.
34. Robertson VJ, Baker KG. A review of therapeutic ultrasound: effectiveness studies. *Phys Ther* 2001;81:1339–50.
35. Richey F, Bruyere O, Ethgen O, Cucherat M, Henrotin Y, Reginster JY. Structural and symptomatic efficacy of glucosamine and chondroitin in knee osteoarthritis: a comprehensive meta-analysis. *Arch Intern Med* 2003;163:1514–22.
36. Puett DW, Griffin MR. Published trials of nonmedicinal and noninvasive therapies for hip and knee osteoarthritis. *Ann Intern Med* 1994;121:133–40.
37. Petrella RJ. Is exercise effective treatment for osteoarthritis of the knee? *West J Med* 2001;174:191–6.
38. Morley S, Eccleston C, Williams A. Systematic review and meta-analysis of randomised controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. *Pain* 1999;80:1–13.
39. Moore RA, Tramter MR, Carroll D, Wiffen PJ, McQuay HJ. Quantitative systematic review of topically applied non-steroidal anti-inflammatory drugs. *Br Med J* 1998;316:333–8.
40. McCarthy C, Oldham A. The effectiveness of exercise in the treatment of osteoarthritic knees: a critical review. *Phys Ther Rev* 1999;4:241–50.
41. McAlindon TE, LaValley MP, Gulin JP, Felson DT. Glucosamine and chondroitin for treatment of osteoarthritis: a systematic quality assessment and meta-analysis. *J Am Med Assoc* 2000;283:1469–75.
42. Marks R, de Palma F. Clinical efficacy of low power laser therapy in osteoarthritis. *Physiother Res Int* 1999;4:141–57.
43. Marks R, Ghassemi M, Duarte R, Van Nguyen JP. A review of the literature on shortwave diathermy as applied to osteo-arthritis of the knee. *Physiotherapy* 1999;85:304–16.
44. Marks R, Ungar M, Ghassemi M. Electrical muscle stimulation for osteoarthritis of the knee: biological basis and systematic review. *N Z J Physiother* 2000;28:6–20.
45. Marks R, Ghanagaraja S, Ghassemi M. Ultrasound for osteo-arthritis of the knee: a systematic review. *Physiotherapy* 2000;86:452–63.
46. Marks R. Efficacy theory and its utility in arthritis rehabilitation: review and recommendations. *Disabil Rehabil* 2001;23:271–80.
47. Marks R, Penton L. Are foot orthotics efficacious for treating painful medial compartment knee osteoarthritis? A review of the literature. *Int J Clin Pract* 2004;58:49–57.
48. Markow MJ, Secor ER. Acupuncture for the pain management of osteoarthritis of the knee. *Tech Orthop* 2003;18:33–6.
49. Lo GH, LaValley M, McAlindon T, Felson DT. Intra-articular hyaluronic acid in treatment of knee osteoarthritis: a meta-analysis. *J Am Med Assoc* 2003;290:3115–21.
50. Leeb B, Schweitzer H, Montag K, Smolen JS. Metaanalysis of chondroitin sulphate in the treatment of osteoarthritis. *J Rheumatol* 2000;27:205–11.
51. La Mantia K, Marks R. The efficacy of aerobic exercises for treating osteoarthritis of the knee. *N Z J Physiother* 1995;23:23–30.
52. Kirwan JR, Rankin E. Intra-articular therapy in osteoarthritis. *Balliere's Clinical Rheumatology*, vol. 11: Balliere Tindal, 1997; 769–94.
53. Kane RL, Saleh KJ, Wilt TJ *et al.* Total knee replacement. Agency for Healthcare Research and Quality, 2003.
54. Gotzsche P. Non-steroidal anti-inflammatory drugs. *Clin Evid* 2004;1551–9.
55. Godwin M, Dawes M. Intra-articular steroid injections for painful knees. Systematic review with meta-analysis. *Can Fam Physician* 2004;50:241–8.
56. Gam A, Johannsen F. Ultrasound therapy in musculoskeletal disorders: a meta-analysis. *Pain* 1995;63:85–91.
57. Franssen M, McConnell S, Bell M. Therapeutic exercise for people with osteoarthritis of the hip or knee. A systematic review. *J Rheumatol* 2002;29:1737–45.
58. Ezzo J, Hadhazy V, Birch S *et al.* Acupuncture for osteoarthritis of the knee: a systematic review. *Arthritis Rheum* 2001;44:819–25.
59. Espallargues M, Pons JMV. Efficacy and safety of viscosupplementation with Hylan G-F 20 for the treatment of knee osteoarthritis: a systematic review. *Int J Technol Assess Health Care* 2003;19:41–56.
60. Ernst E. Avocado-soybean unsaponifiables (ASU) for osteoarthritis—a systematic review. *Clin Rheumatol* 2003;22:285–8.
61. Ernst E. Acupuncture as a symptomatic treatment of osteoarthritis. *Scand J Rheumatol* 1997;26:444–7.
62. Eccles M, Freemantle N, Mason J. North of England evidence based guideline development project: summary guideline for non-steroidal anti-inflammatory drugs versus basic analgesia in treating the pain of degenerative arthritis. The North of England Non-Steroidal Anti-Inflammatory Drug Guideline Development Group. *Br Med J* 1998;317:526–30.
63. Delafuente JC. Emerging controversies in the treatment of osteoarthritis in older individuals. *Consult Pharm* 2004;19:135–42.
64. Deeks J, Smith L, Bradley M. Efficacy, tolerability, and upper gastrointestinal safety of celecoxib for the treatment of osteoarthritis and rheumatoid arthritis: systematic review of randomised controlled trials. *Br Med J* 2002;325:619–27.
65. de Bie RA, Verhagen AP, Lenssen AF *et al.* Efficacy of 904 nm laser therapy in the management of musculoskeletal disorders: a systematic review. *Phys Ther Rev* 1998;3:59–72.
66. Callahan CM, Drake BG, Heck DA, Dittus RS. Patient outcomes following tricompartmental total knee replacement. A meta-analysis. *J Am Med Assoc* 1994;271:1349–57.
67. Callahan CM, Drake BG, Heck DA, Dittus RS. Patient outcomes following unicompartmental or bicompartamental knee arthroplasty. A meta-analysis. *J Arthroplasty* 1995;10:141–50.
68. Brosseau L, MacLeay L, Robinson V *et al.* Efficacy of balneotherapy for osteoarthritis of the knee: a systematic review. *Phys Ther Rev* 2002;7:209–22.
69. Bjordal JM, Couppe RC, Chow RT, Tuner J, Ljunggren EA. A systematic review of low level laser therapy with location-specific doses for pain from chronic joint disorders. *Aus J Physiother* 2003;49:107–16.
70. Belgrade M, Weiss D, Weiss P, Wilson P. Acupuncture for chronic osteoarthritis pain, headache and low back pain. Institute for Clinical Systems Improvement. 2000.
71. Barclay TS, Tsourounis C, McCart GM. Glucosamine. *Ann Pharmacother* 1998;32:574–9.

72. Arroll B, Goodyear-Smith F. Corticosteroid injections for osteoarthritis of the knee: meta-analysis. *Br Med J* 2004;328:869.
73. American Academy of Orthopaedic Surgeons. Improving musculoskeletal care in America. Information on the impact and treatment of musculoskeletal conditions. Osteoarthritis of the knee. American Academy of Orthopaedic Surgeons. 2003. [cited 2-6-2004]; Available from: http://www3.aaos.org/research/imca/oa_knee_overview_final.htr.
74. Akai M, Hayashi K. Effects of electrical stimulation on musculoskeletal systems: meta-analysis of controlled clinical trials. *Bioelectromagnetics* 2002;23:132–43.
75. Aggarwal A, Sempowski IP. Hyaluronic acid injections for knee osteoarthritis. Systematic review of the literature. *Can Fam Physician* 2004;50:249–56.
76. Glucosamine and arthritis update. Bandolier. 2001. [cited 27-5-2004]; Available from: <http://www.jr2.ox.ac.uk/band85/b85-2.htm>.
77. Paracetamol (acetaminophen) for osteoarthritis. Bandolier. 2002. [cited 27-5-2004]; Available from: <http://www.jr2.ox.ac.uk/bandolier/booth/Arthritis/paraoa.htm>
78. Surgery for arthritic knee: roundup. Bandolier. 2002. [cited 27-5-2004]; Available from: <http://www.jr2.ox.ac.uk/bandolier/booth/Arthritis/arthrokn.htm>.
79. Dawson J, Fitzpatrick Ray, Fletcher J, Wilson R. Health care needs assessment. Osteoarthritis affecting the hip and knee. Oxford University. 2002. [cited 2-6-2004]; Available from: <http://hcna.radcliffe-oxford.com/osteoarthritisframe.htm>.
80. Altman RD, Hochberg MC, Moskowitz RW, Schnitzer TJ. Recommendations for the medical management of osteoarthritis of the hip and knee: 2000 update. *Arthritis Rheum* 2000;43:1905–15.
81. Walker-Bone K, Javaid K, Arden N, Cooper C. Regular review: medical management of osteoarthritis. *Br Med J* 2000;321:936–40.
82. Simon LS, Lipman AG, Jacox AK *et al.* Pain in osteoarthritis, rheumatoid arthritis, and juvenile chronic arthritis. American Pain Society [2nd]. 2002. Available from: http://www.ngc.gov/summary/summary.aspx?doc_id=3691&nbr=2917&string=pain+AND+osteoarthritis.
83. Lee JA. Adult degenerative joint disease of the knee. Maximizing function and promoting joint health. Institute for Clinical Systems Integration. *Postgrad Med* 1999;105:183–6, 189–90.
84. Holbrook AM. Ontario Treatment Guidelines for Osteoarthritis, Rheumatoid Arthritis, and Acute Musculoskeletal Injury. Toronto: Queen's Printer of Ontario, 2000.
85. Anonymous. The management of chronic pain in older persons. *Geriatrics* 1998;53:S8–25.
86. Guidance on the use of cyclo-oxygenase (Cox) II selective inhibitors, celecoxib, rofecoxib, meloxicam, etodolac for osteoarthritis and rheumatoid arthritis. 2001. London, National Institute for Clinical Excellence. Technology Appraisal Guidance.
87. Philadelphia Panel evidence-based clinical practice guidelines on selected rehabilitation interventions for knee pain. *Phys Ther* 2001;81:1675–94.
88. Exercise prescription for older adults with osteoarthritis pain: consensus practice recommendations. A supplement to the AGS Clinical Practice Guidelines on the management of chronic pain in older adults. *J Am Geriatr Soc* 2001;49:808–23.
89. A clinical guideline for the use of injection therapy by physiotherapists. 2004. London, The Chartered Society of Physiotherapy.