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# Guidance on the management of pain in older people

## Table of Contents



## Executive summary

This guidance document reviews the epidemiology and management of pain in older people via a literature review of published research. The aim of this document is to inform health professionals in any care setting who work with older adults on best practice for the management of pain and to identify where there are gaps in the evidence that require further research.

The assessment of pain in older people has not been covered within this guidance and can be found in a separate document (http://www.britishpainsociety.org/pub_professional.htm#assessmentpop).

Substantial differences in the population, methods and definitions used in published research makes it difficult to compare across studies and impossible to determine the definitive prevalence of pain in older people. There are inconsistencies within the literature as to whether or not pain increases or decreases in this age group, and whether this is influenced by gender. There is, however, some evidence that the prevalence of pain is higher within residential care settings.

The three most common sites of pain in older people are the back; leg/knee or hip and 'other' joints. In common with the working-age population, the attitudes

and beliefs of older people influence all aspects of their pain experience. Stoicism is particularly evident within this cohort of people.

Evidence from the literature search suggests that paracetamol should be considered as first-line treatment for the management of both acute and persistent pain, particularly that which is of musculoskeletal origin, due to its demonstrated efficacy and good safety profile. There are few absolute contraindications and relative cautions to prescribing paracetamol. It is, however, important that the maximum daily dose (4 g/24 h) is not exceeded.

Non-selective non-steroidal anti-inflammatory drugs (NSAIDs) should be used with caution in older people after other safer treatments have not provided sufficient pain relief. The lowest dose should be provided, for the shortest duration. For older adults, an NSAID or cyclooxygenase-2 (COX-2) selective inhibitor should be co-prescribed with a proton pump inhibitor (PPI), and the one with the lowest acquisition cost should be chosen. All older people taking NSAIDs should be routinely monitored for gastrointestinal, renal and cardiovascular side effects, and drug–drug and drug–disease interactions.

Opioid therapy may be considered for patients with moderate or severe pain, particularly if the pain is causing functional impairment or is reducing their quality of life. However, this must be individualised and carefully monitored. Opioid side effects including nausea and vomiting should be anticipated and suitable prophylaxis considered. Appropriate laxative therapy, such as the combination of a stool softener and a stimulant laxative, should be prescribed throughout treatment for all older people who are prescribed opioid therapy.

Tricyclic antidepressants and anti-epileptic drugs have demonstrated efficacy in several types of neuropathic pain. But, tolerability and adverse effects limit their use in an older population.

Intra-articular corticosteroid injections in osteoarthritis of the knee are effective in relieving pain in the short term, with little risk of complications and/or joint damage. Intra-articular hyaluronic acid is effective and free of systemic adverse effects. It should be considered in patients who are intolerant to systemic therapy. Intra-articular hyaluronic acid appears to have a slower onset of action than intra-articular steroids, but the effects seem to last longer.

The current evidence for the use of epidural steroid injections in the management of sciatica is conflicting and, until further larger studies become available, no firm recommendations can be made. There is, however, a limited body of evidence to support the use of epidural injections in spinal stenosis.

The literature review suggests that assistive devices are widely used and that the ownership of devices increases with age. Such devices enable older people with chronic pain to live in the community. However, they do not necessarily reduce pain and can increase pain if used incorrectly. Increasing activity by way of exercise should be considered. This should involve strengthening, flexibility, endurance and balance, along with a programme of education. Patient preference should be given serious consideration.

A number of complementary therapies have been found to have some efficacy among the older population, including acupuncture, transcutaneous electrical nerve stimulation (TENS) and massage. Such approaches can affect pain and anxiety and are worth further investigation.

Some psychological approaches have been found to be useful for the older population, including guided imagery, biofeedback training and relaxation. There is also some evidence supporting the use of cognitive behavioural therapy (CBT) among nursing home populations, but of course these approaches require training and time.

There are many areas that require further research, including pharmacological management where approaches are often tested in younger populations and then translated across. Prevalence studies need consistency in terms of age, diagnosis and terminology, and further work needs to be done on evaluating non-pharmacological approaches.

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## Foreword

Population ageing is a 'game changer' for our health services. Life expectancy at birth in England is now 82 for women and 77 for men. Nearly a quarter of our population is over 65 and the fastest growing group is the over 80 s—whose numbers have doubled over the past two decades. This represents a success for society and wider determinants of health, but also for healthcare—both preventative and interventional. And most older people report high levels of happiness and of satisfaction with their own health, wellbeing and independence.

For all this good news, if people live long enough, they are more likely to develop multiple long-term conditions, a degree of disability or frailty, dementia or cognitive impairment and worsening mobility. They are also at risk of chronic and life-limiting pain from a variety of causes, of acute pain associated with injury or illness and of pain towards the end of life. Poor control of pain has consistently been identified as an issue for older people and their carers in hospital settings and as a life-limiting factor which can trigger a spiral of dependence and depression.

As people over 65 account for 65% of admissions to hospital, 40% of primary care spend and the overwhelming majority of long-term care residents and users of community health services, clinicians need to adjust to this reality and to ensure they have the right skills, knowledge and evidence-base to deliver effective care. This evidence base needs to take into account the similarities in effective assessment and management of pain between older and younger people, but also the differences in approach sometimes required to take into account poor reserve, altered pharmacokinetics and dynamics, drug–drug and drug–disease interactions, adherence and the difficulty in assessing pain in those with atypical presentations or impaired cognition or communication. We have substantive evidence to show that pain in our older patients is not recognised or managed as well as it would be in younger adults.

These comprehensive guidelines, developed by a multidisciplinary team, provide a superb, user-friendly resource for clinicians treating pain in older patients in all settings and I have certainly learned a lot by reading them that will inform my own clinical practice. They deserve a wide audience.

***Professor David Oliver*, National clinical director for older people department of health**

It is a privilege to provide a foreword for this landmark publication on the management of pain in older adults: a most important field of practice, and currently an area of significant unmet need in the community, secondary and social care settings. There is a need to improve awareness and implement assessment tools and appropriate treatments, to alleviate suffering and improve the quality of life.

This definitive work is the culmination of a colossal effort by a multi-disciplinary working group (comprising expertise in epidemiology, geriatric medicine, pain medicine, nursing, physiotherapy, occupational therapy, psychology, pharmacy and patient representation) to gather, digest and sift the evidence, to review the epidemiology of pain in older adults and underpin recommendations for best practice.

The important influences of attitudes and beliefs of older people in relation to pain and the presence of stoicism in this age group are discussed.

The biopsychosocial aspects of pain are further addressed by way of the document's comprehensive review of the evidence for or against a wide range of treatments specifically for the management of pain in older adults, including complementary therapies, the benefits of patient education and self-management techniques, psychological and physical as well as pharmacological options and interventional techniques.

The focus on the management of pain in older adults continues by examining the place of a variety of commonly employed procedures for pain, from simpler interventions such as intra-articular injections to sophisticated approaches such as spinal cord stimulation. These are usefully and appropriately reviewed together with some of the common and bothersome painful conditions affecting older people, such as back pain, post-herpetic neuralgia and trigeminal neuralgia.

Assistive devices, often overlooked in research and guidelines documents, are critically appraised and highlight the small amount of evidence available in this area, that suggests benefit in supporting community living and reduction in functional decline, care costs and pain intensity.

The British Pain Society is very pleased to endorse these authoritative evidence-based guidelines, which promise to tangibly improve the lives of the increasing number of older adults living with painful conditions.

***Richard Langford*, President of the British Pain Society**

I welcome this guidance. It offers advice and information valuable to a wide range of readers. This is important as although pain is common, it may be under-reported, and make itself apparent in a variety of ways to a variety of clinical and social care staff. So a broad perspective is needed, and the broad array of disciplines and experts has made this possible. I am delighted that British Geriatrics Society is included. The therapeutic advice is clear and accessible. The scholarly reviews show, however, that there is need for further research on nearly every aspect of the issue. For example, frail older people, such as care home residents or older people with cognitive impairment, are particularly likely to get a poor deal at present. We need to develop ways to enable their experience to be better noticed and understood, and then their needs better addressed. Interdisciplinary work is our best way forward.

***Professor Finbarr Martin*, President of the British Geriatrics Society**

## Methodology

A group was formed of key personnel from either care of older people, pain or both. The professional groups included epidemiology, geriatric medicine, pain medicine, nursing, physiotherapy, occupational therapy, psychology, pharmacy and service users. Each group member identified initial approaches to the management of pain in older adults that would enable searching. They then provided key terms to allow the information scientist to conduct the review. These key terms can be found in Appendix 1. Reference lists were given to each group member, who reviewed the lists and selected appropriate papers to include. Papers were rejected that did not meet the following inclusion criteria:

- *Studies in English language.*
- *Types of study:* randomised controlled trials (RCTs), cohort studies, non-experimental studies and descriptive studies.
- *Types of participants:* all adults over 65 years with chronic pain, living in the community.
- *Interventions and specific comparisons to be made:* all drug and non-drug intervention studies, including comparisons with placebo, standard care and waiting list control.

### Outcomes

The primary outcomes included measure of pain, for example, visual analogue scales or the McGill Pain Questionnaire (MPQ). Secondary outcomes included reductions in pain-related distress, disability, depression, quality of life and self-efficacy.

Following acceptance of papers, each author graded the papers according to the following system, as proposed by Harbour and Miller [1]:

| | |
|---|---|
| *1++* | High-quality meta-analyses, systematic reviews of RCTs or RCTs with a very low risk of bias. |
| *1+* | Well-conducted meta-analyses, systematic reviews of RCTs or RCTs with a low risk of bias. |
| *1−* | Meta-analyses, systematic reviews or RCTs or RCTs with a high risk of bias. |
| *2++* | High-quality systematic reviews of case–control or cohort studies or high-quality case control or cohort studies with a very low risk of confounding, bias or chance, and a high probability that the relationship is causal. |
| *2+* | Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal. |
| *2−* | Case–control or cohort studies with a high risk of confounding, bias or chance, and a significant risk that the relationship is not causal. |
| *3* | Non-analytic studies, e.g. case reports, case series. |
| *4* | Expert opinion. |

A score was assigned to each paper and the papers were then exchanged among the group and another reviewer independently assigned a score. Any disagreements between scoring would be mediated by another group member. There were no disagreements. All papers that were considered to be acceptable were incorporated into the matrices (Appendix 3) and were then included in the commentary which follows.

### Results

Approximately 5,000 records were found. The main PubMed search found 3,691 records and the CINAHL search found a further 837 records, giving a total of 4,528 returned by the core searches. Further non-PubMed and non-CINAHL results were found in PsycInfo and AMED, but exact numbers are not available. A separate search of Scopus, which found 7,472 records, was used only to refine the results of one of the search topics, and may have found items missed by the other databases.

### Databases searched

The two main databases searched were PubMed and CINAHL. AMED, PsycInfo and Scopus were also used to refine some of the searches.

### Inclusion/exclusion criteria

A publication date range of 1997–2009 was used. No other inclusion/exclusion criteria were used during the searching stage. Further inclusion and exclusion criteria were decided during the appraisal stages.

*Number of papers by themes*
Prevalence = 444
Barriers, attitudes and education = 0
Communication and self-management = 333
Pharmacology = 191
Intervention and invasive = 194
Psychiatry = 553
Physiotherapy and rehabilitation = 260
Complementary therapies = 171
Guidelines = 162
Specific pathologies = 0
Palliative care = 225

*Note that these totals include duplicates in those searches where more than one database was used. Similarly, each total includes references found in other topics' totals.*

### Search strategy

The search used in PubMed was (((older person*[TIAB]) OR (GERIATRIC*[TIAB]) OR (elderly[TIAB])) OR (SENIOR CITIZEN*[TIAB])) AND (PAIN[TIAB]).

The search used in CINAHL was elderly or older or geriatric* or 'senior citizen*'.

Separate, specific search strategies were used for each of the nine sub-topics for which searches were conducted.

## Background

Pain is described as an 'unpleasant sensory or emotional experience associated with actual or potential tissue damage or described in terms of such damage' [2]. Millions of people in the UK live with chronic pain. As we go into older age, it is suggested that many people have pain which is often 'expected as part of ageing' or something that they have to 'learn to live with'. One of the fundamental issues regarding pain management in any age group is the assessment of pain. With older adults this can be particularly challenging due to age-related changes in vision, hearing and cognition. The assessment of pain has been addressed elsewhere (http://www.britishpainsociety.org/pub_professional.htm#assessmentpop); this document focuses on the management of pain. The emphasis, however, is on chronic pain management.

These guidelines will be updated in 3 to 5 years.

## Prevalence of pain in older people

Until recently, our knowledge of the prevalence of pain in older people, particularly those in the oldest age group, was relatively poor. Pain tended to be considered to be part of the ageing process and was rarely investigated in its own right. There have, however, been an increasing number of studies into the prevalence of pain in older people in the last decade or so.

### Methodological challenges to measuring pain prevalence

There are several methodological challenges to measuring pain prevalence. Since pain is a subjective phenomenon, it is extremely difficult to measure. Reliance on self-reporting of the experience means there are no gold standard tools by which the experience can be verified. Wide variations in prevalence are often found due to differences between studies, including country and date of study; type of study; population studied; type of pain examined; pain definitions used; sites of pain examined; methods used and time period of prevalence examined.

### Studies included in the review

A total of 64 studies were included in the final review. The majority of studies had taken place in Europe (27 studies) and North America (17 studies). The remaining studies were from Asia (6 studies); Australia (4 studies); South America (3 studies); Africa (2 studies) and multiple countries (5 studies). The majority of studies had focused on a community population sample (40 studies), although studies of residential care populations (12 studies) and mixed residential and non-residential care studies (12 studies) had also been undertaken.

None of the studies reviewed had used exactly the same definition of pain. Types of pain studied included 'any pain', 'acute pain', 'chronic pain', 'severe pain', 'episodic pain', 'persistent pain', 'regional pain' and 'widespread pain'. The time period of prevalence examined also varied and included: current pain; pain in the last week, 2 weeks, 1 month, 3, 6 and 12 months and lifetime prevalence. In addition, some studies examined pain at only one site, whereas others examined pain at multiple sites, and the rest examined pain at any site. Overall, 16 different pain sites were examined across the studies in the review.

Such differences in published research make it difficult to compare studies and impossible to determine the definitive prevalence of pain in older people.

### Prevalence of pain shown in studies

The crude prevalence of any type of pain reported in the papers ranged from a low of 0% to a high of 93%, clearly illustrating how variations in the population, methods and definitions used can affect prevalence estimates.

Eight studies had examined the prevalence of current pain (i.e. studies examining current pain anywhere in the body, but excluding studies examining current pain at specific sites). The prevalence of current pain in older people living in the community ranged from 20 to 46% [3, 4]. The prevalence of current pain in older people living in residential care was higher and ranged from 28 to 73% [5–10].

Ten studies had examined the prevalence of chronic pain (i.e. studies examining pain which had persisted for 3 months anywhere in the body, but excluding studies examining chronic pain at specific sites or specific types of chronic pain such as chronic widespread pain). The prevalence of chronic pain in older people living in the community ranged from 25 to 76% [3, 11–16]. The prevalence of chronic pain in older people living in residential care was higher and ranged from 83 to 93% [6, 10, 17].

### Gender differences in pain prevalence in older people

Of the 41 studies that looked at the prevalence rates of pain in men and women separately, the vast majority of studies found that women had a higher prevalence than men [3–5, 8, 12–16, 18–45]. One study reported that men had a higher prevalence of pain than women [7] and three studies reported no difference between the genders [17, 46, 47].

### Age differences in pain prevalence in older people

A total of 39 studies had examined how the prevalence of pain varied with age in older people. Different age patterns were seen in men and women, and in different sites of

pain. The age differences could be broadly categorised into four groups:

(i) a continual increase in pain prevalence with age [7, 9, 13, 27, 28, 31, 33, 34, 37, 38, 41, 48, 49];
(ii) an increase in pain prevalence with age up to 75–85 years and then a decrease with age [22, 32, 45, 50, 51];
(iii) a decrease in pain prevalence with age [5, 12, 16, 29, 36, 40, 42, 45, 52, 53];
(iv) no difference in pain prevalence with age [9,14,17,24,46, 54].

### Sites of pain in older people

Of the 22 studies that examined pain at different sites, the three most common sites of pain in older people were the back; [3, 4, 6, 7,9–11,14–17,21,32,33,37,43,49] leg, knee or hip; [4–10,14,15,17,23,32,37,42,43, 55] and 'other' joints [8, 9, 11, 37, 55].

*Summary statements*

- Substantial differences in the population, methods and definitions used in published research make it difficult to compare across studies and impossible to determine the definitive prevalence of pain in older people.
- The prevalence of pain in older people living in residential care is consistently higher than the prevalence of pain in older people living in the community, regardless of the definition of pain used.
- Older women have higher prevalence rates of pain than older men.
- The reported effect of age on pain prevalence in older people is inconsistent, with some studies reporting an increase in prevalence with age and others reporting a decrease in prevalence with age. The effect also varies by gender and site of pain.
- The three most common sites of pain in older people are the back, leg/knee or hip and other joints.

## Attitudes and beliefs

A biopsychosocial model of pain and evidence for cognitive behavioural approaches to its management provide a rationale for examining the attitudes and beliefs of people with pain, their friends and relatives and professionals they come into contact with. There is evidence to support the hypothesis that attitudes and beliefs play an important role in mediating the way in which patients engage with treatment and the pain experience in general (pain intensity, psychological distress, functional impairment and coping strategies utilised) [56, 57].

Attitudes can be defined as affective responses to an object (thing, idea, person or activity). Beliefs can be conceptualised as ideas held by individuals about the world that also act as a framework for interpreting experiences and using coping strategies (cognitive or behavioural) to manage challenges to day-to-day living [58]. This review focuses on pain-related attitudes and beliefs, and uses the definitions set out above.

A limitation of the review and of existing research is that while study samples often include older people, there are few studies that focus specifically on older cohorts or conduct subgroup analyses by age.

### Review

Some attitudes and beliefs that are relevant to pain (but not pain-specific) operate at the level of the patients' 'world view', and research into such ontological beliefs is limited. Investigation into 'just world' beliefs (beliefs around the degree to which people 'get what they deserve') indicates that, in the sample reported, compared with working-age adults, older participants had stronger beliefs in a 'personal' and 'general' just world and experienced less pain, disability and psychological distress [59]. The influence of spiritual/religious beliefs (and coping) has been the subject of more investigation, but with mixed findings regarding positive outcomes for different elements of the pain experience, and the importance of cultural differences in degrees of religiosity have been highlighted [60–62].

Attitudes of stoicism have been implicated in the under-reporting of pain in older people [50], although pain-related stoicism has been subject to limited empirical investigation. There is some evidence from qualitative and quantitative research to support the existence of age-related differences in attitudes of stoicism in the face of pain, its role in influencing pain reporting and in mediating the chronic pain experience in general [63–66].

Research with mixed-age samples and older people has demonstrated the association of self-efficacy beliefs for managing pain (i.e. the degree to which people believe they can exercise control over their pain), with lower scores on measures of functional impairment and psychological distress [67]. Related to the construct of self-efficacy is the locus of control: the degree to which an individual believes events and experiences are under their own control, or the control of chance or others. Research with working and mixed-age populations has indicated that an internal locus of control is associated with lower scores on measures of pain intensity, psychological distress and functional impairment [68, 69]. Research specific to older people (in common with other research into pain attitudes and beliefs) is limited, although findings are consistent with work undertaken with mixed-age samples [70].

Research has highlighted the role of fear of movement and re-injury as predictive of avoidance of activity and psychological distress [71]. The fear-avoidance model of pain has been shown to be valid and relevant to a range of chronic pain conditions in older people [72, 73]. Fear-avoidance beliefs should not be assumed or viewed in isolation from other beliefs as, contrary to what might be expected, one study found lower levels of fear-avoidance and harm beliefs in older people relative to those aged 45–64; this may be due to higher levels of stoicism [74].

A biopsychosocial model of pain and a cognitive behavioural approach to its management highlights in particular the potentially important role of the attitudes and beliefs of informal caregivers and professionals in mediating the pain experience. There has been little research conducted into the attitudes and beliefs of these groups; although it would appear that key beliefs held by patients are also important in significant others and health professionals; that is to say, for example, that belief in the ability of the person to control pain and function despite pain are adaptive, while beliefs that hurt equals harm and function requires the absence of pain are maladaptive.

The evidence that does exist supports this, indicating that where spousal beliefs about pain are maladaptive, increased psychological distress in the person with pain may be evident [75, 76]. While investigation of health and social care professionals' attitudes has been more extensive, it has focused on attitudes and beliefs in relation to working-age populations and low back pain; has suffered from a lack of conceptual clarity; has not differentiated between cancer and non-cancer pain and is limited by the absence of well established, robust measures [77, 78]. The available studies point towards an adherence to biomedically orientated beliefs about pain and negative perceptions of chronic pain patients in general; in some clinicians, beliefs that activity may increase pain (indicating harm) result in practice contrary to established guidelines that emphasise remaining active [79–83].

Summary statements

- In common with the working-age population, older peoples' attitudes and beliefs influence all aspects of the pain experience.
- Stoicism appears to be more evident in current generations of older people and may contribute to the underreporting of pain. This may not be the case for future generations.
- Spouse beliefs can have a negative impact on the development of adaptive responses to chronic pain.
- Professionals may share or inculcate patients' maladaptive beliefs that hurt equals harm, and consequently recommend or reinforce behaviours such as activity avoidance.

## Communication

A total of 406 articles were identified by a search of relevant databases. However, many of these did not relate to communication and were, therefore, not included in the review. A total of five papers specifically related to communication met the inclusion criteria [84–88]. The same author had published three of these papers. There is thus a dearth of information on this important, yet hitherto neglected, area. The articles reviewed highlighted issues regarding conveying and communicating pain information in various settings. Studies were mainly non-randomised studies and a cross-sectional survey.

Pain in older adults is associated with a variety of conditions and is prevalent in both community-dwelling and nursing home residents. A number of barriers to the effective identification and management of chronic pain in older people have been identified in studies of the assessment and management of chronic pain in older people [84]. These barriers are related to both the older people themselves and the professionals caring for them. Often these barriers are in the form of communication, particularly with those who experience sensory or cognitive impairment [89], which has been shown to be a particular issue for nursing home residents [86].

There may also be professional misconceptions about the nature of pain in older people and educational deficits on the part of health professionals [85, 90]. Further, older people themselves may hold attitudes, beliefs and expectations about pain which may also affect their pain reporting or lack of it [84].

Although many studies report health professionals identifying issues of communication in pain assessment and management, there are few studies that specifically relate to communication of pain information in older adults with chronic pain. Deficiencies in pain communication between patients and health professionals are evident, yet there is a paucity of research in this area.

Reasons for inadequate pain communication may also be attributable to the way that practitioners speak with patients. Communication accommodation theory describes the motivations and behaviours of people as they adjust their communication in response to their own needs and the perceived behaviour of the person with whom they are communicating [91, 92]. US-based studies of communication between older adults and nurses [93] and physicians [94] have found a lack of accommodation towards their patients.

Communication content and techniques have been tested in only a few studies of pain. Therefore, pain communication strategies need to be identified and tested for older adults in a variety of settings.

- Assessment of pain information should be multidimensional and include eliciting pain treatment information as well as location and sensory aspects of pain information. There is a need to develop assessment tools that can specifically assess these aspects of communication (see assessment guidelines: http://www.britishpainsociety.org/pub_professional.htm#assessmentpop).
- More pain information is elicited by the use of open-ended rather than closed-ended questions, which is a consideration in any form of pain communication assessment and has implications for the assessment and the use of pain assessment instruments.
- Health professionals should not interrupt when patients are conveying pain information, as this disrupts the amount and nature of pain information conveyed.
- Information regarding prognosis is considered important by older adults with chronic musculoskeletal pain, but this

is reported to be provided in only about one-third of general practice consultations.

*Summary statements*

- There is a need to conduct further research into issues of communicating pain information as there is a paucity of research upon which to base any recommendations.
- The level of cognitive impairment should be considered in the assessment of pain as patients with severe cognitive impairment are unable to convey pain information by self-report methods of assessment.

## Pharmacology

### Results

Few studies investigating the effects of analgesic drugs have been performed specifically in older people (those over 65 years).

### Physiological changes in older people that affect drug handling

Older people represent a heterogeneous population. However, as adults grow older, changes occur in body composition and the ability to handle drugs. These effects are summarised in Table 1 below.

### General principles of pharmacological management of pain in older people [95]

- Physiological changes in older people increase the sensitivity to some analgesic drugs, resulting in them sometimes requiring lower doses. Analgesics should, however, always be titrated to response.
- Although the incidence of side effects with drug therapy is higher in older people, analgesics can still be safe and effective when comorbidities and other concomitantly prescribed medicines are carefully considered.
- Use the least invasive route of administration. As a general rule, the oral route is preferred due to its convenience.
- Timing of medication administration is important. Severe, episodic pain requires treatment with medicines with a rapid onset of action and short duration. However, if a patient is experiencing continuous pain, regular analgesia is the most effective, possibly using modified release formulations.
- Only one drug should be initiated at a time using a low dose, and this should be followed by slow dose titration.
- Allow sufficiently long intervals between introducing drugs to allow the assessment of effect.
- Combination therapy using drugs with complementary mechanisms of action may have synergistic effects to provide greater pain relief with fewer side effects than higher doses of a single drug.
- Consider the use of non-pharmacological strategies such as physiotherapy, cognitive behavioural approaches and acupuncture, in combination with medication.
- Treatment should be monitored regularly and adjusted if required to improve efficacy and limit adverse events.
- When choosing an analgesic for an individual, both co-morbidity and other medication must be considered to minimise the chance of drug–disease and drug–drug interactions.

### Paracetamol

The literature search did not identify any primary studies specifically relating to paracetamol use in older people. However, it is an effective analgesic for the symptoms of musculoskeletal pain, including osteoarthritis and low back pain, and is recommended as a first choice analgesic in

Table 1. Physiological changes in older people that affect drug handling

| Physiological | Change with normal ageing | Clinical consequence of change |
|---|---|---|
| Absorption and function of the gastrointestinal (GI) tract | Delayed gastric emptying and reduced peristalsis | Alteration of drug absorption has little clinical effect |
| | Reduced blood flow to the GI tract | Increased risk of GI-related side effects including opioid-related gut mobility disturbance |
| Distribution | Decreased body water | Reduced distribution of water soluble drugs |
| | Increased body fat that causes lipid soluble drugs to accumulate in reservoirs | Lipid soluble drugs have longer effective half-life |
| | Lower concentration of plasma proteins and increased free fraction of drugs that are highly bound to proteins | Increased potential for drug–drug interactions |
| Hepatic metabolism | Decreased hepatic blood flow | Reduced first pass metabolism |
| | Reduced liver mass and functioning liver cells | Oxidative reactions (phase I) may be reduced, resulting in prolonged half-life |
| | | Conjugation (phase II metabolism) usually preserved |
| | | Difficult to predict precise effects in an individual |
| Renal excretion | Reduced renal blood flow | Reduced excretion of drugs and metabolites eliminated by kidney leading to accumulation and prolonged effects |
| | Reduced glomerular filtration | |
| | Reduced tubular secretion | |
| Pharmacodynamic changes | Decreased receptor density | Increased sensitivity to the therapeutic and side effects |
| | Increased receptor affinity | |

consensus guidelines [95–98] and National Institute for Health and Clinical Excellence (NICE) clinical guidelines for low back pain [99] and osteoarthritis [100]. Regular administration of paracetamol may improve social engagement in patients with dementia [101].

Adverse effects are rare and paracetamol use is not associated with significant GI side effects, adverse effects on the renal and central nervous systems or cardiovascular toxicity. There is increasing concern regarding the hepatic effects of prolonged use of the maximum recommended doses of paracetamol. Transient increases in alanine aminotransaminase have been reported, but these do not translate into liver failure when maximum daily doses are avoided [95]. A case series published recently reports acute liver failure in malnourished patients (weight <50 kg) and recommends dose reduction (maximum 2 g/24 h) if paracetamol is used regularly in these patients [102].

Patients should be educated not to exceed the recommended maximum daily dose (4 g/24 h) of paracetamol, including that contained in combination products (e.g. co-codamol and co-dydramol) and over the counter preparations (such as cold and influenza remedies).

Paracetamol is an effective analgesic, particularly for musculoskeletal pain and is generally well tolerated with few side effects. It is important that the recommended maximum daily dose is not exceeded.

## Non-steroidal anti-inflammatory drugs

The literature search did not identify any primary studies relating to NSAIDs or COX-2 selective agents (selective COX-2 inhibitors or coxibs) use in older people.

NSAIDs are one of the most widely prescribed classes of drugs for pain and inflammation, particularly musculoskeletal pain. NSAIDs are more effective for persistent inflammatory pain than paracetamol [95]. For osteoarthritis, NICE recommends that oral NSAIDs/selective COX-2 inhibitors may be considered, where paracetamol or topical NSAIDs are ineffective for pain relief, or provide insufficient pain relief for people with osteoarthritis [100]. NSAIDs are suggested as a treatment option when paracetamol alone provides insufficient pain relief in the early management of low back pain [99], taking into account the individual risk of side effects and patient preference.

Despite good efficacy, NSAIDs must be used with caution in older people because of a high risk of potentially serious and life-threatening side effects, as prostaglandins have a pivotal role in the normal human physiological functions of the GI tract, and renal and cardiovascular systems, among others. NSAIDs have been implicated in up to a quarter (23.5%) of hospital admissions due to adverse drug reactions in older people [95].

### *Gastrointestinal effects*

GI toxicity, including bleeding and ulceration, increases in frequency and severity with increasing age [95], and may be dose related and time dependent. There is increased likelihood of adverse GI effects when an NSAID is co-administered with low-dose aspirin, which is often used for its anti-thrombotic effect in cardiovascular disease.

GI adverse effects may be reduced by prescribing either misoprostol, a prostaglandin analogue, or a PPI, such as omeprazole or lansoprazole, together with an NSAID [95]. Whilst both misoprostol and PPIs are effective intolerable side effects often prevent the optimal use of misoprostol.

### *Renal effects*

Renal vasoconstriction and increased tubular sodium reabsorption may cause fluid retention, oedema and worsening of congestive cardiac failure. Most NSAIDs can contribute to worsening of chronic renal failure, particularly in patients with co-existing renal damage or patients prescribed diuretics or angiotensin converting enzyme inhibitors [103].

### *Cardiovascular effects*

Administration of NSAIDs may produce an increase in a mean arterial blood pressure of 5 mmHg [104].

It was hoped that selective COX-2 inhibitors would have similar efficacy but fewer side effects than non-selective NSAIDs, but this has not been borne out in clinical practice. Selective COX-2 inhibitors are contraindicated in patients with established ischaemic heart disease and cerebrovascular disease, and should be used with caution in patients with risk factors for cardiovascular disease, such as hypertension, hyperlipidaemia, smoking and diabetes mellitus.

Medicines and Healthcare products Regulatory Agency (MHRA) guidance on NSAID use suggests that the lowest effective dose of NSAID or COX-2 selective inhibitor should be prescribed for the shortest time necessary. The need for long-term treatment should be reviewed periodically. More specifically, MHRA guidance recommends:

- Prescribing should be based on the safety profiles of individual NSAIDs or COX-2 selective inhibitors, and on individual patient risk profiles (e.g. GI and cardiovascular).
- Prescribers should not switch between NSAIDs without careful consideration of the overall safety profile of the products and the patient's individual risk factors as well as the patient's preferences.
- Concomitant aspirin (and possibly other antiplatelet drugs) greatly increases the GI risks of NSAIDs and severely reduces any GI safety advantages of COX-2 selective inhibitors. Aspirin should only be co-prescribed if absolutely necessary [105].

Although NSAIDs are effective analgesics, their side effect profile means that they must be used with great caution in older people. If NSAID therapy is considered essential, the lowest dose should be used for the shortest period and therapy should be reviewed on a regular basis.

As older people are at an increased risk of GI side effects, a PPI or misoprostol should be prescribed together with an NSAID.

## Opioids

The literature search found a small number of primary studies relating to opioid use in older people, although the numbers of patients enrolled were still extremely small. Some studies were undertaken in patients with cancer pain, while other studies were performed in non-cancer pain.

In carefully selected and monitored patients, opioids may provide effective pain relief as part of a comprehensive pain management strategy [106]. Use of strong opioids in the management of chronic, severe cancer and non-cancer pain in older people has been reviewed [107]. RCTs have demonstrated short-term efficacy in persistent musculoskeletal pain, including osteoarthritis and low back pain, and various neuropathic pains, such as post-herpetic neuralgia (PHN; a neuropathic condition most common in older people) and diabetic peripheral neuropathy. However, longer-term efficacy and safety data are lacking.

Although older people tend to require lower doses than younger individuals, opioid effects do not appear to vary with age [108] and careful dose titration based on individual response is required.

Using the Minimum Data Set, a longitudinal study in the USA of nursing home residents found that the use of modified-release opioids improved functional status and social engagement compared with short-acting opioids [109].

Having a similar mechanism of action, opioids share similar side effect profiles. Many side effects, such as sedation, nausea and vomiting, may be worse around opioid initiation or dose escalation, and may resolve after 2 or 3 days [110]. On the other hand, constipation does not readily improve and may be managed with laxative therapy [111] or a peripheral opioid antagonist (such as oral prolonged-release naloxone). Central side effects of opioids include drowsiness and dizziness. This may be associated with an increased incidence of falls and fractures [111]. Opioid therapy had no effect on mood or increased risk of respiratory depression [110]. Cognitive function is relatively unaffected in patients taking stable opioid doses, but it may be impaired for up to 7 days after a dose increase.

Fear of addiction can be a major barrier to long-term opioid therapy. However, epidemiological data suggest this to be unfounded. In a review of three studies including over 25,000 patients taking long-term opioids without a history of drug dependence, only seven cases of iatrogenic addiction were identified [110].

Opioid use in older people may be associated with less risk than that of NSAIDs, particularly in those older people who are at particular risk of NSAID-related events [95]. As there is marked inter-patient variability in efficacy and tolerability of individual opioids, if there is no analgesic response or significant adverse events with one opioid, switching or rotation may be considered. It is important to have a good knowledge of the pharmacological properties and relative analgesic potencies of the opioids used.

### *Weak opioids*

The literature search did not identify any primary studies relating to the use of weak opioids in older people.

Weak opiods, such as codeine and dihydrocodeine, are recommended for use in moderate pain in the World Health Organization's (WHO) pain ladder. Use is limited by adverse effects, particularly constipation or as prescribed in combination with non-opioids as in co-codamol preventing adequate titration of the individual components. As an alternative, a low dose of a more potent opioid such as morphine may be better tolerated [112].

*Tramadol*. The literature search did not identify any primary studies relating to the use of tramadol in older people.

Tramadol is a centrally acting analgesic with two mechanisms of action: weak opioid agonist activity and inhibition of monoamine uptake. It may have less effect on respiratory and GI function than other opioids; however, confusion may be a problem for older people. Tramadol may reduce the seizure threshold and is contraindicated in patients with a history of seizures and should be used with caution in patients taking other serotonergic drugs [113].

A prospective, age-controlled study suggests older people require 20% less tramadol than younger adults, although the pharmacokinetics remained unaffected by age [112].

### *Strong opioids*

*Morphine*. No studies relating to the use of morphine have been undertaken specifically in older people.

Morphine has been used to treat cancer pain for many years and has been the subject of a large number of trials, generally involving small numbers of patients. Similar efficacy to newer opioids, such as oxycodone, fentanyl and methadone has been demonstrated. Morphine has been used for the management of persistent non-cancer pain too, often as a comparator to newer opioids where similar efficacy has been demonstrated.

Morphine undergoes substantial hepatic metabolism. Morphine-6-glucuronide (M6G) contributes to the overall analgesic effect and morphine-3-glucuronide (M3G) may cause neuroexcitatory effects. Enterohepatic recirculation of M3G and M6G results in these metabolites being excreted in bile and then faeces and urine for several days after the last dose is administered. Renal impairment produces accumulation of the metabolites that may cause side effects requiring dose adjustment or switching to an alternative opioid.

A combination of morphine and gabapentin produces better analgesia than the individual drugs or placebo in the

management of post-herpetic neuralgia and peripheral diabetic neuropathy, but side effects are common.

*Oxycodone*. Several randomised double-blind trials comparing oxycodone and morphine or different oxycodone formulations have demonstrated that oxycodone has similar efficacy to morphine and is well tolerated in the management of cancer pain. Studies of short duration have demonstrated the efficacy of oxycodone in low back pain, osteoarthritis, PHN and peripheral diabetic neuropathy. Like morphine, no studies have been undertaken specifically in older people.

It has been estimated that in patients aged over 65 years, oral oxycodone was associated with seven times more constipation than transdermal fentanyl [114].

*Fentanyl*. One randomised, double-blind, placebo-controlled trial studied transdermal fentanyl in cancer pain, in which it was found to provide effective analgesia and be well tolerated, with low incidences of constipation, nausea and drowsiness. Similar results have been found in several other open label studies. Transdermal fentanyl has also been used for persistent musculoskeletal and neuropathic pains.

Clinical experience suggests that the use of transdermal fentanyl, as measured by the need for dose adjustments and use of oral morphine for breakthrough pain, is similar in older people with cancer compared with an adult population [115]. Patient global assessment of transdermal fentanyl therapy was greater in older people (aged over 65) than younger adults [116].

Transdermal fentanyl may be associated with less constipation than oral oxycodone in older people [114]. The convenience of a transdermal preparation that requires changing every 72 h reduces administration time and staffing requirements in residential and nursing homes [113]. However, because of the high potency of transdermal fentanyl, it must not be used for opioid initiation and should only be used in the context of opioid rotation or switching.

*Buprenorphine*. Buprenorphine is available in several formulations for sublingual, parenteral and, more recently, transdermal administration. In several double-blind, placebo-controlled studies, patients with either cancer or non-cancer pain were randomised to receive buprenorphine or placebo patches. Pain relief, pain intensity and duration of pain-free sleep all improved from baseline. Limited data relating specifically to older people exist, although a post-marketing surveillance of transdermal buprenorphine in over 13,000 patients (mean and median age 68 years) demonstrated efficacy and sustained and dose-dependent analgesia.

The pharmacokinetics of buprenorphine are not altered in patients with renal failure [117]. In a small number of patients, transdermal buprenorphine has similar analgesic efficacy for moderate to severe pain in older people (aged over 65 years) compared with two groups of younger people (patients aged ≤50 years and patients aged been 51 and 64 years) [118]. The reduction in pain intensity was similar in all age groups and there was an increase in the duration of sleep. Incidence and severity of side effects was similar in all groups; dizziness and nausea being most commonly reported.

The convenience of a transdermal preparation that requires changing every 7 days reduces administration time and staffing requirements in residential and nursing homes [113].

*Hydromorphone*. Hydromorphone has been used in both cancer and non-cancer pain, although has not been specifically studied in older people.

*Methadone*. Methadone has been available for many years and evidence exists for efficacy in both cancer and persistent non-cancer pains. Owing to its multiple mechanisms of action and unusual pharmacokinetics, prescribing should be restricted to those with experience of its use.

Opioids have short-term efficacy in non-cancer pains such as musculoskeletal pain and neuropathic pain, as well as cancer pain, and may be considered as a treatment option for older people with moderate to severe pain. Evidence for long-term efficacy is more limited and hence patients prescribed opioids should have regular review, both for efficacy and tolerability. The formulation chosen should reflect the time course of each person's pain. Side effects, particularly constipation, should be anticipated and prophylactic treatments prescribed.

## Adjuvant drugs

The term 'adjuvant drug' was originally used in the cancer pain literature, although the term is now used regardless of pain aetiology, and describes drugs that were developed for other indications and then found to have analgesic effects. Some adjuvant drugs are particularly beneficial for neuropathic pain, such as the tricyclic antidepressants and some anti-epileptic medicines.

### *Antidepressants*

The literature search did not identify any primary studies relating to antidepressants for pain in older people.

The tricyclic antidepressants, such as amitriptyline and imipramine, were the first adjuvant drugs to be used in the management of PHN and painful peripheral diabetic neuropathy. However, the adverse effects, including urinary retention, postural hypotension and sedation (both increasing the risk of falls), glaucoma and cardiac arrhythmias, mean that these drugs should be prescribed with caution or are contraindicated in older people. One in five people discontinue treatment because of adverse effects [113].

Nortriptyline may produce less anticholinergic adverse effects [103].

Although the tolerability of serotonin reuptake inhibitors (SSRIs) is better than tricyclic antidepressants, the evidence for pain relief is controversial [103]. More recent advances, including the serotonin noradrenaline reuptake inhibitors (SNRIs) such as duloxetine, have demonstrated efficacy in some neuropathic pain conditions and may have better tolerability than tricyclic antidepressants.

The NICE clinical guideline for the pharmacological management of neuropathic pain in the non-specialist setting recommends duloxetine as an option for the initial management of diabetic peripheral neuropathy [119].

### *Anti-epileptic drugs*

The literature search did not identify any primary studies relating to anti-epileptic drugs for pain in older people. Historically, older anti-epileptic drugs, such carbamazepine, sodium valproate and phenytoin, were used in the management of neuropathic pain. Use of these drugs in older people was not without problems because of central adverse effects, the need for regular blood monitoring and potential for drug–drug and drug–disease interactions.

Newer anti-epileptic drugs, such as gabapentin and more recently pregabalin, have become more widely used in neuropathic pain states, as several studies have demonstrated analgesic efficacy and fewer adverse effects than older anti-epileptic drugs. Efficacy has been demonstrated in PHN, diabetic peripheral neuropathy and central pain syndromes [113]. Although the potential for drug–drug interactions is lower, elimination of gabapentin and pregabalin is dependent on renal function [112] and dose adjustment is required in renal impairment.

Dose titration is required during the initiation of gabapentin or pregabalin, although for PHN, initiation of therapy with gabapentin 200 mg administered three times daily had similar efficacy and side effects to lower doses studied [120].

Adjuvant analgesic drugs should be considered for older people with neuropathic pain. Although tricyclic antidepressants have good efficacy, anticholinergic side effects are often problematic for older people. Anti-epileptic drugs, such as gabapentin or pregabalin, are effective for neuropathic pain and are probably better tolerated if titrated appropriately. When indicated, treatment should start with the lowest possible dose and be increased very slowly based on response and side effects.

## Topical therapies

Topical administration may have improved tolerability than other routes of administration and may be preferable for older people.

### *Lidocaine*

Several studies have demonstrated the efficacy of topical lidocaine, especially the lidocaine 5% medicated plaster, predominantly in PHN, and less so in other types of neuropathic pain. Ease of use, the absence of toxicity and the lack of drug interactions have meant that it has been used for other indications too. One study has compared the lidocaine 5% medicated plaster and pregabalin in PHN and diabetic polyneuropathy [121]. More patients with PHN responded to lidocaine 5% medicated plaster. For patients with diabetic polyneuropathy, responses were comparable for both treatments. Fewer patients in the lidocaine 5% medicated plaster group experienced drug-related adverse events and discontinuations.

NICE guidelines recommend that lidocaine 5% medicated plasters should be considered as third-line treatment of localised neuropathic pain for people who are unable to take oral medication because of medical conditions and/or disability, while awaiting referral to an appropriate specialist [119].

### *NSAIDs*

Several NSAIDs have been formulated for topical administration. These preparations are effective in reducing pain [111] and may reduce (but not eliminate) the incidence of systemic adverse effects. Several studies have demonstrated the efficacy of topical NSAIDs in non-neuropathic persistent pain [95].

### *Capsaicin*

Topical capsaicin cream is available for the management of osteoarthritis and neuropathic pain, although a substantial proportion of patients are unable to tolerate the intense burning after application. A patch containing 8% capsaicin has recently been approved for use. A 1 hour application may provide pain relief for over 13 weeks for PHN [122].

Some analgesics have been formulated as topical treatments and may be beneficial for localised pain. Topical lidocaine and capsaicin have limited efficacy in the management of localised neuropathic pain, and topical NSAIDS may be suitable for older people with non-neuropathic pain.

*Summary statements*

- *Paracetamol* should be considered as first-line treatment for the management of both acute and persistent pain in older people, particularly of musculoskeletal origin, due to demonstrated efficacy and good safety profile.
  There are relatively few relative cautions and absolute contraindications to prescribing paracetamol.
  It is important that the maximum daily dose (4 g/24 h) is not exceeded.

- *Non-selective NSAIDs and selective COX-2 inhibitors* should be used with caution in older people after other safer treatments have not provided sufficient pain relief.
  The lowest dose should be used for the shortest duration.
  For older people, an NSAID or selective COX-2 inhibitor should be co-prescribed with a PPI, choosing the one with the lowest acquisition cost.
  All older people taking NSAIDs or COX-2 inhibitors should be routinely monitored for GI, renal and cardiovascular side effects, and drug–drug and drug–disease interactions.
- *Opioids* have demonstrated efficacy in the short term for both cancer and non-cancer pains, but long-term data are lacking.
  Patients with moderate and severe pain should be considered for opioid therapy, particularly if pain is causing functional impairment or reducing quality of life.
  Patients with continuous pain should be treated with modified release oral or transdermal opioid formulations aimed at providing relatively constant plasma concentrations.
  As there is marked variability in how individual patients respond to opioids. Treatment must be individualised and carefully monitored for efficacy and tolerability.
  Opioid side effects (including nausea and vomiting) should be anticipated and suitable prophylaxis considered.
  Appropriate laxative therapy, such as the combination of a stool softener and a stimulant laxative, should be prescribed throughout treatment for all older people prescribed opioid therapy.
  Regular patient review is required to assess the therapeutic benefit and to monitor adverse effects.
- *Tricyclic antidepressants* have demonstrated efficacy in several types of neuropathic pain.
  Adverse effects and contraindications limit the use of tricyclic antidepressants in older people.
  Duloxetine has been shown to be effective for the treatment of neuropathic pain and some studies suggest efficacy for non-neuropathic pain such as osteoarthritis and low back pain.
  Other antidepressants (e.g. SSRIs) have very limited evidence of analgesic efficacy and should not be used as analgesics.
  The lowest dose should be initiated and the dose increased slowly as tolerated.
  Regular patient review is required to assess therapeutic benefit and to monitor adverse effects.
- *Anti-epileptic* drugs have demonstrated efficacy in several types of neuropathic pain.
  Adverse effects and the need for blood monitoring limit the use of older anti-epileptic drugs in older people.
  Dose adjustment of gabapentin and pregabalin is required in renal impairment.
  Regular patient review is required to assess therapeutic benefit and to monitor adverse effects.
- *Topical treatments.* Topical NSAIDs may provide an alternative to oral NSAIDs, particularly if pain is localised.

## Interventional therapies in the management of chronic, non-malignant pain in older people

The most commonly employed modality for pain control in older people is pharmacotherapy. However, Ozyalcin suggests in his review that when weak opioids were ineffective, therapeutic nerve blocks or low-risk neuro-ablative pain procedures should be employed prior to strong opioids [123]. Furthermore, he considered that a combination of invasive procedures and systemic medications had the distinct advantage of reducing medication intake and its side effects. Freedman concurred that effective pain management in the older patient could be achieved through a multimodality approach, including invasive techniques [124].

Therapeutic interventional therapies in the management of chronic pain include a variety of neural blocks and minimally invasive procedures. 'Interventional pain therapies' can be defined as the discipline of medicine devoted to the diagnosis and treatment of pain and related disorders by the application of interventional techniques in managing chronic and intractable pain, independently or in conjunction with other modalities of treatment.

The controversy regarding the effectiveness of interventional pain therapies is well recognised. Although significant progress has been made over the last 20 years, the quality of medical literature on the efficacy of many interventional therapies in older people remains poor.

For the purpose of these guidelines, the authors opted to restrict the review to the following interventional therapies and specific indications:

- Epidural injections
- Epidural adhesiolysis
- Facet joint interventions
- Spinal cord stimulation
- Sympathetic nerve blocks
- Intrathecal (continuous neuraxial) infusions
- Vertebroplasty and kyphoplasty
- Peripheral intra-articular (IA) injections
- Post-herpetic neuralgia
- Radiofrequency denervation of Gasserian ganglion

### Epidural steroid injections in spinal stenosis and sciatica

Spinal stenosis in older people is most commonly caused by degenerative lumbar disease leading to a narrowing of the vertebral canal, which may result in spinal nerve compression. The condition commonly occurs in older adults with symptoms of neurogenic claudication and restriction of walking distance. Spinal stenosis may be managed conservatively with analgesia, surgically with spinal decompression and there is some evidence to support the use of spinal nerve blocks to reduce symptoms on a short-term basis [125].

A recent randomised single-blind controlled trial in patients with lumbar spinal stenosis found both epidural steroid and physical therapy to be effective in reducing pain and improving function for up to 6 months. The mean ages of the treatment groups were 60 years and the authors acknowledged the low numbers included in the study. Koc *et al.* [126] and Tadokoro *et al.* [127] treated 89 patients over 70 years of age with lumbar stenosis with inpatient conservative therapy, including epidural steroid injections, and reported improvement of symptoms and function. However, Shabat *et al.* [128] reported failure of conservative management including lumbar steroid injections for spinal stenosis in an uncontrolled study in patients over 65 years.

Epidural steroid via the fluoroscopcally guided transforaminal route was reported to be effective with a >50% reduction in pain scores in 75% of older patients (mean age 77 years) with unilateral radicular pain due to lumbar stenosis. The authors of this prospective cohort study acknowledged the small patient population and the need for a randomised double-blind trial [129].

Sciatica is a frequent and often debilitating event causing radicular pain from herniation of an intervertebral disc. The incidence is related to age and peaks in the fifth decade. Although most episodes of acute sciatic neuralgia respond to conservative management, some require surgery. In older people, surgery may be contraindicated or declined.

The injection of various agents into the epidural space to relieve pain has been employed since the 1990s, but the role of epidural steroid in the management of sciatica has generated much discussion and debate over the last 50 years. Despite the lack of consistent evidence, epidurals are widely undertaken for radicular pain.

Many of the earlier published studies have methodical flaws and overall evidence is variable. Our search found no data specific to older people, although most studies included all age groups. There are three ways to access the epidural space: caudal, interlaminar and transforaminal approaches; the latter two can be used at all levels of the spine. Some studies have identified the technique of 'blind' injections (epidurals undertaken without fluoroscopic guidance) to be associated with a high rate (9–70%) of false positive outcomes [130, 131].

Recent meta-analyses of pooled data from studies have produced favourable results [132, 133]. Using an endpoint of near or total pain relief, the odds ratio for short-term benefit up to 60 days was 2.61 (95% confidence intervals 1.9–3.77) and for long-term benefit, 1.87 (CI: 1.31–2.68) for epidural steroid compared with placebo. Using numbers needed to treat (NNT), short-term benefit for >75% pain relief was 7.3 and for short-term benefit for >50% pain relief, the NNT was 3. Studies looking at long-term benefit up to 1 year report an NNT for 50% pain relief of 13. However, in contrast, European guidelines for the management of chronic low back pain concluded that there was conflicting evidence for the effectiveness of epidural steroid injections for radicular pain [134].

Transforaminal epidural steroids have been found to decrease the rate of surgical interventions compared with interlaminar epidurals [135] and in a head-to-head controlled trial, they were found to be clinically superior to interlaminar epidurals [136]. Many pain clinicians currently consider transforaminal epidural steroids for radicular pain (or significant exacerbation) <1 year.

There is limited evidence to support epidural steroid injections for spinal stenosis in older patients, but the evidence is not strong for its use in radicular pain or sciatica.

## Epidural adhesiolysis

Percutaneous epidural adhesiolysis is a technique used to treat patients with refractory spinal pain considered the result of either epidural scarring following spinal surgery or spinal stenosis due to compression of intraspinal vascular and neural structures, with physical displacement of neural elements by injected fluids.

Manchikanti *et al.* [137] reported that the results of surgical decompression for lumbar stenosis were mixed and undertook a retrospective evaluation in a small sample of older people (mean age >65 years) undergoing epidural adhesiolysis with hypertonic saline neurolysis over a 3-year period. The results showed significant reduction in pain, improvement of physical and psychological health, and a decrease in narcotic intake. The authors concluded that this was a safe and probably effective modality of treatment in managing moderate to severe lumbar spinal stenosis. Similarly, Igarashi *et al.* [138] evaluated the technique of lysis of adhesions and epidural steroid during epiduraloscopy in a group of older patients with a mean age of 71 years. Low back pain was relieved up to 12 months after treatment, with relief of leg symptoms varying from 3 to 12 months, depending on the number of involved segmental spinal levels.

A 2010 assessment by NICE, concluded that 'current evidence on therapeutic endoscopic division of epidural adhesions is limited to some evidence of short-term efficacy, and there are significant safety concerns. This procedure therefore should only be used with special arrangements for consent and audit or research' [139].

There is limited evidence to support epidural adhesiolysis for spinal stenosis and radicular symptoms in the older adult. NICE recommends the use of special arrangements.

## Facet joint injections

Spinal pain is a common complaint in older people and is often associated with functional limitations. While facet arthrosis and osteoarthritis are common radiological findings, controlled studies of chronic low back pain have shown a prevalence of facet joint involvement in 15–45%. Manchikanti *et al.* [140] assessed 100 patients and found the prevalence of lumbar facet joint-mediated pain confirmed by diagnostic nerve blocks to be 52% in the elderly, compared with 30% in all adults. Conversely, in a later

retrospective analysis of 424 patients undergoing comparative nerve blocks, the author concluded that cervical pain of facet joint involvement was similar in all age groups [141].

Our search found no studies specifically conducted in older patients, although many included older patients in their populations. Facet joint-mediated pain may be managed with interventional therapy of IA injections, medial branch nerve blocks or medial branch nerve radiofrequency denervation, which inactivates the afferent nerve supply to the joint for a period of time. The efficacy of IA facet joint injections remains controversial and, at best, provides immediate-term relief in only a proportion of people with an inflammatory component [142].

The Cochrane review of injection therapy for subacute and chronic low back-pain included 18 RCTs of injections into the epidural space, facet joints and tender ligaments and muscles in a population from 18 to 70 years [143]. They concluded that there was no strong evidence for or against their use in subacute or chronic low back pain.

The evidence for radiofrequency denervation of the medial branch nerves, although mixed, is more supportive. The correct diagnosis of the condition is considered paramount, with rigorous pre-assessment of diagnostic facet nerve blocks. False positive rates have been reported from 25 to 40%. Dreyfus and Dreyer, Manchikanti *et al.* and Niemisto *et al.* concluded that there was limited evidence that radiofrequency denervation offered short-term relief for chronic neck pain and conflicting evidence for lumbar zygapophyseal joint pain [144–146]. Serious complications and side effects are rare.

Two RCTs demonstrated >50% pain relief after uncontrolled lumbar medial branch blocks were positive [147, 148]. van Eerd *et al.* reviewed the evidence for the treatment of cervical facet pain and concluded that radiofrequency treatment of the medial branch nerve could be considered for degenerative facet joint pain [149]. All authors highlight the need for further randomised controlled studies.

The evidence in all age groups for facet joint interventions is mixed, although more supportive for radiofrequency denervation of the medial branch nerves. Until further studies in the older population become available, no firm recommendations can be made in this age group.

## Spinal cord stimulation

Spinal cord stimulation (SCS) was first described by Shealy in 1967 [150]. The procedure involves the delivery of a pulsed electrical field to the dorsal columns of the spinal cord from an electrical generator, supplied by an implanted battery or external radiofrequency transmitter. The electrodes are implanted into the dorsal epidural space by laminectomy, or percutaneously. The mechanism of action remains poorly understood.

A consensus document published in 2009 (*Spinal cord stimulation for the management of pain: recommendations for best clinical practice*) prepared by the British Pain Society in consultation with the Society of British Neurological Surgeons [151], stated that SCS was more effective for radicular (limb) pain following spinal surgery than axial pain and that there was clinical evidence from RCTs to support its use in failed back surgical syndrome, complex regional pain and neuropathic and ischaemic pain.

Evidence exists to support SCS in the treatment of pain of ischaemic origin [152], although in 2008 NICE issued guidance in relation to SCS for neuropathic and ischaemic pain that recommended it as a treatment for chronic neuropathic pain not of ischaemic origin [153].

A placebo-controlled RCT by Eddicks *et al.* found SCS improved functional status and angina symptoms in patients with refractory angina [154]. The Cochrane review on spinal cord stimulation for chronic pain [155] considered SCS in a variety of chronic pain conditions, but found only two RCTs of this intervention; one in failed back surgery syndrome [156] and the other in complex regional pain syndrome type I [157]. The authors excluded angina and peripheral vascular disease. The North *et al.* trial [156] did not report age and the Kemla *et al.* trial [157] included participants up to the age of 65 years.

No studies of SCS specifically targeting the older population exist, but evidence from RCTs in mixed-age groups, including over 65s, support its use in failed back surgical syndrome, complex regional pain and neuropathic and ischaemic pain.

## Sympathectomy for neuropathic pain

Neuropathic pain is pain initiated or caused by a primary lesion or dysfunction in the nervous system. Examples include phantom limb pain, post-stroke pain and complex regional pain syndromes; the former two having prevalence among the older population. Treatment options are multimodal. The concept that many neuropathic pain syndromes include 'sympathetically mediated' pain has historically led to treatments directed at the sympathetic nervous system with local anaesthesia, chemical agents and surgical ablation.

Our searches failed to find studies specifically undertaken in the older population. However, a Cochrane review by Mailis-Gagnon and Furlan in 2009 [158] included studies with older patients and concluded that the evidence for the effectiveness of sympathectomy for neuropathic pain was weak and that complications of the procedure may be significant.

There is weak evidence to support consideration of sympathectomy for neuropathic pain in the older population.

## Continuous neuraxial infusions

The technique of delivering medications centrally followed the discovery of central opioid receptors in the 1970s. Since then, neuraxial infusions have been used in the treatment of both malignant and non-malignant pain. We found no studies undertaken specifically in the elderly population.

Erdine and de Andres [159] reviewed contemporary studies and concluded that intrathecal drug delivery (IDD) was an effective treatment alternative in carefully selected patients with chronic pain that cannot be controlled by a well-tailored drug regime and/or spinal cord stimulation. They considered that many studies with follow-up periods of up to 5 years achieved good to excellent pain relief. The evidence to support IDD systems for non-malignant pain is less robust than the evidence for cancer pain. Thimineur *et al.* [160], Anderson and Burchiel [161, 162], Kumar *et al.* [162] and Raphael *et al.* [163] support the notion of IDD as an effective treatment of refractory non-malignant pain.

Recommendations for best practice on IDD systems published in 2008 by the British Pain Society in consultation with the Association of Palliative Medicine and Society of British Neurological Surgeons noted that there was no RCT evidence, but supportive prospective open studies for chronic non-malignant pain [164].

There is no RCT evidence for the use of continuous neuraxial infusions in older people, but supportive prospective open studies in all age groups. The authors consider continuous neuraxial infusions may be useful in appropriately selected older people.

### Vertebroplasty and balloon kyphoplasty

Osteoporotic vertebral fractures are a common cause of acute pain in older people that may persist for weeks or months, even after the fracture has healed.

Two procedures, namely vertebroplasty (VP) and kyphoplasty (KP), have been advocated as the preferred treatment for painful osteoporotic vertebral fractures [165]. Both VP and KP involve minimal invasive surgery. The procedures are done under imaging by a radiologist or orthopaedic surgeon. VP consists of percutaneous needle placement into the fractured vertebra under imaging and injection of bone cement. Kyphoplasty involves inflation of a percutaneously delivered balloon in the vertebral body followed by percutaneous injection of bone cement into the cavity created by the balloon. KP also offers the advantage of partial restoration of vertebral height and correction of angular deformity. Single or multiple level VP may be done in one session [166].

These two treatments have gained wide acceptance based on many case series, and open non-randomised and randomised studies reported over the last decade [166–175]. These studies, among others, have shown that VP resulted in substantial and immediate pain relief, and an improved functional status in patients with osteoporotic compression fractures. The majority of patients in the reported studies were women aged 60 years and over.

Not all patients are amenable to VP and the procedure may, rarely, be complicated by cement leakage, neurologic injury (root pain and radiculopathy) and pulmonary embolism. Nonetheless, the reported benefits have been consistent, increasing the attraction for the procedures. Significant pain relief is noted within 24 h after the procedure and patients are able to leave hospital on the same day or following an overnight stay; thereby reducing the length of hospital stay. Analgesic use is also reduced for 6 months [176] and up to 1 year, and quality of life notably improved [172, 177].

Similar results have been reported with KP. Three studies, one RCT [178] and two earlier small open studies [179, 180], showed that KP was associated with greater improvement in back pain, physical function, mobility and quality of life than conventional medical treatment for at least 6–12 months. However, the differences between the KP and medical treatment groups diminished after 12 months [178].

In a recent systematic review of the available literature on VP and KP for osteoporotic vertebral fractures [181], the authors concluded that, compared with conventional medical management, VP resulted in superior pain control within the first 2 weeks of intervention (level I evidence) with less use of analgesics, less disability and greater improvement in general health within the first 3 months (level II–III evidence). The study also reported that evidence for VP and KP for better pain relief in tumour-associated vertebral fractures was poor.

More recently, two high-quality trials have challenged this widely accepted increasing practice. Both were blinded RCTs with sham surgery as the control comparator, rather than conventional medical treatment [182, 183]. Rapid improvement in pain in both VP (active) and control 'sham-treated' groups was noted in both studies, but no significant benefit of VP was found at 1 week; and 1, 3 and 6 months after intervention, compared with the control group. The control group in both trials underwent infiltration of the periosteum with a local anaesthetic, raising the possibility that either the placebo effect of injection and/or local anaesthetic on its own is as effective. It is important to note that the magnitude of improvement in pain in the VP-treated groups was similar in these two trials and consistent with the benefits reported in previous uncontrolled and controlled trials [184]. The results of the two trials have raised serious concerns about the effectiveness of the procedure.

The current evidence in favour of VP and KP is, therefore, conflicting. Compared with conventional medical therapy, VP and KP are both beneficial and significantly reduce pain and improve the quality of life in acute painful vertebral fractures in the short term and up to one year. However, these benefits are equally produced through a sham procedure [182, 183].

The current evidence in favour of VP and KP is conflicting. Until further larger studies become available, no firm recommendations could be made regarding VP and KP in the treatment of painful vertebral fractures.

### Intra-articular peripheral joint injections

Osteoarthritis (OA) is commonly the result of 'wear and tear' that accompanies ageing. Any joint may be affected. The knee is the site most affected and is a common cause

of pain in older people. Knee pain is associated with considerable reduction in functional ability, which in turn strongly predicts future disability and dependency [184].

In contrast to the knee, the literature evidence for IA injection of other joints (e.g. hip, sacro-iliac, shoulder) in older people is sparse. Therefore, the following recommendations will be limited to the knee.

### Corticosteroids

Although IA corticosteroid injections have been used in OA for over 50 years [185], concern regarding the deleterious effect it may have on the underlying disease process has been raised over the years and the effectiveness of local injections repeatedly questioned. More recently, several RCTs have demonstrated its effectiveness, and the role of IA steroid injection for short-term pain relief in OA of the knee is now well established. In a small systematic review, the authors concluded that there is a significant reduction in pain within the first week following the injection, and lasting for a period of 3 to 4 weeks [186]. Side effects were minimal. A larger meta-analysis, which included 10 trials [187], confirmed the short-term benefits (evidence level 1) and suggested that there may also be a significant long-term response noted at 16–24 weeks, although higher doses of corticosteroids (equivalent to 50 mg prednisolone) may be needed to obtain a long-term response.

A comprehensive Cochrane review and meta-analysis [188] looked at 26 RCTs comparing IA corticosteroids against placebo, IA hyaluronic acid (HA) preparations and joint lavage. The majority of patients in these trials were older patients with the mean age of 50–71 years. Of these, 13 trials compared IA corticosteroids with placebo, of which eight studies reported on pain relief. The analysis concluded that steroids were more effective than placebo in reducing pain in week one (NNT = 3–4). The effect continued for 3 weeks but thereafter the evidence for its effect on pain was poor. Interestingly, comparisons between IA corticosteroid and joint lavage showed no differences in efficacy.

The type of corticosteroid preparation used varied among the trials included in the meta-analyses. In a comparative study between triamcinolone hexacetonide (THA) and methylprednisolone acetate (MPA), it was noted that both gave significant pain relief at Week 3 ($P < 0.01$), but only MPA showed an effect at Week 8 compared with baseline ($P < 0.05$). THA was more effective than MPA in reducing pain at Week 3 ($P < 0.01$), but this difference was lost at Week 8. The mean age of the patients in this study was 62.5 years [189].

IA corticosteroid injections in OA of the knee are effective in relieving pain in the short term, with little risk of complications and/or joint damage.

### Viscosupplementation (intra-articular hyaluronic acid injection)

The use of IA HA preparations for pain relief has gained wide acceptance in patients with knee pain from OA. The practice is supported by several systematic reviews [190–194] and guidelines [96,98,195], and is refuted by only one review [196].

Many HA formulations exist. These preparations vary in molecular weight, pharmacodynamics, treatment schedule and time–effect response. The Cochrane review provides a comprehensive by-product and by-class analysis [193]. Compared with lower molecular weight HA, the highest molecular weight HA may be more efficacious [197].

The evidence shows that, compared with placebo, viscosupplementation is efficacious in providing pain relief with beneficial effects on pain, function and patient global assessment. The Cochrane review also concluded that the effect of IA HA is not only statistically significant, but also clinically important. The benefits are achieved with very low incidence of systemic adverse effects. Minor local reactions have been reported, most common of which are pain and swelling at the site of injection. However, HA acid may be slow to produce an effect and may not be seen in the first 3 to 4 weeks, but is significant by Week 5–11 and Week 8–12, depending on the formulation used [197].

Viscosupplements are comparable in efficacy to systemic forms of active intervention. In an effectiveness trial, HA lessened pain and reduced costs for other therapy and devices at 1 year [198].

IA HA is effective and relatively free of systemic adverse effects. It should be considered in patients intolerant to systemic therapy.

In comparison trials between corticosteroids and HA products, the Cochrane review concluded that no statistically significant differences were in general detected at 1–4 weeks post-injection. Between 5 and 13 weeks post-injection, HA products were more effective than corticosteroids. In general, the onset of effect was similar, but HA products had more prolonged effects than IA corticosteroids [191].

IA HA appears to have a slower onset of action than IA steroids, but the effects seem to last longer.

### Post-herpetic neuralgia

Acute herpes zoster and PHN are common in older people. It is estimated that, at the median age of 70 years, between two-thirds to 50% of patients develop PHN following an attack of herpes zoster, defined as pain persisting for >3 months, [199] or for >1 month [200], respectively.

Case series [201, 202] and controlled trials [203, 204] have demonstrated the benefits of nerve block for pain in both acute herpes zoster and PHN.

The use of intrathecal methylprednisolone as a treatment for long-standing intractable PHN was investigated in a randomised controlled study [205]. The study enrolled 277 patients randomly assigned to receive either intrathecal methylprednisolone and lignocaine, lignocaine alone or no treatment, once weekly for up to 4 weeks. Patients were followed up for 2 years. In the methylprednisolone–lidocaine group, the intensity and area of pain decreased and the use

of the NSAID declined by >70% 4 weeks after the end of treatment. Approximately 90% of patients in the methylprednisolone–lidocaine group had good or excellent global pain relief at all the follow-up evaluations, which was significantly better than in the control group ($P < 0.001$). Evaluation of treatment effect showed that one out of two patients will benefit from intrathecal steroid and local anaesthetic combination (NNT = 2). In contrast, there was minimal change in the degree of pain in the lignocaine only and control groups during and after the treatment period. No complications related to intrathecal methylprednisolone were observed. The results of this trial indicate that the intrathecal methylprednisolone—local anaesthetic is an effective treatment for PHN.

The effectiveness of epidural injection in the acute phase has been evaluated in two large RCTs [204, 205]. The first study [204] enrolled 600 patients over 55 years of age with a herpetic rash of <7 days duration, and severe pain. Patients were randomised to receive either intravenous acyclovir for 9 days and prednisolone for 21 days (group A), or bupivacaine 6–12 hourly and methylprednisolone every 3 to 4 days through an epidural catheter for a period ranging from 7 to 21 days (group B). Efficacy was evaluated at 1, 3, 6 and 12 months. The results showed epidural administration of local anaesthetic and methylprednisolone to be significantly more effective in preventing PHN throughout the 12 months of the study ($P < 0.0001$). The incidence of pain after 1 year was 22.2% (51 patients of 230) in group A and 1.6% (four patients of 255) in group B.

The second study employed a more simplified approach, comprising single epidural injection of steroid and local anaesthetic. There were 598 patients with acute herpes zoster randomly assigned to receive either standard therapy (oral antivirals and analgesics) or standard therapy with one additional epidural injection of methylprednisolone and bupivacaine. At 1 month, 137 (48%) patients in the epidural group reported pain, compared with 164 (58%) in the control group ($P = 0.02$). The NNT was 10. However, there was no difference in pain control between the two groups at 3 and 6 months. The mean age of patients was 66 (58–75) years [206]. The two trials confirm the effectiveness of epidural injection of steroids and local anaesthetics in reducing pain the acute phase.

An earlier systematic review to evaluate the evidence [207] has shown that nerve blocks using lignocaine alone, or lignocaine and corticosteroids, in controlling pain during the acute phase or for PHN is effective in 80% (grade A). Reduction of pain in PHN has been reported in 60% of trials included in the review when the block is administered within 2 months of acute zoster infection. The evidence is in favour of combined local anaesthetic and corticosteroid injection, rather than either given alone.

Evidence for the use of pulsed radiofrequency is sparse. An early trial suggests that it may be useful in refractory cases, [208] but further studies are needed.

The effectiveness of botulinum toxin type A in PHN in doses not exceeding 300 IU has been demonstrated in two pilot studies, the first involving seven patients [209] and the second which recruited 11 patients [210] (level 4 evidence). More recently, a double-blind, randomised placebo-controlled trial was reported involving 29 patients with chronic neuropathic pain (PHN, post-traumatic and post-operative) [211] using a once-only intradermal injection of botulinum toxin A, at multiple sites corresponding to the area of pain and followed up for 24 weeks. Significant sustained improvement in pain was noted (NNT for 50% pain relief tree at 12 weeks) (level 1 evidence). No systemic adverse effects were noted. However, it should be noted that of the 29 patients in the study, only four patients had underlying PHN. The initial pilot studies did not report the age of the patients, but the study by Ranoux *et al.* recruited patients between the ages of 27 and 78 years, five of who were >70 years [211].

In older people, nerve blocks using a combination of local anaesthetic and corticosteroid are effective in acute herpes zoster and PHN.

There is also some evidence for the use of botulinum toxin in these patients.

### Radiofrequency denervation of Gosserian ganglion to treat trigeminal neuralgia

Trigeminal neuralgia (TGN) is a debilitating condition characterised by intermittent bouts of moderate to severe stabbing pain in the distribution of one or more branches of the fifth cranial nerve, with an annual incidence of four to five in 1,000,000. The condition is usually incurable and many patients are older. The peak age of the onset of classical TGN is 60 years [212]. Medical management is considered the first-line treatment and there is a lack of evidence as to when this should be abandoned and interventional treatment considered.

Interventional treatments may be directed at three levels: peripheral nerve branches, Gasserian ganglion and posterior fossa with microvascular decompression and stereotactic radiosurgery (gamma knife). Peters and Turo [213] reviewed the literature on interventional treatments directed at the first two levels with peripheral nerve procedures of peripheral neurectomy, cryotherapy, alcohol block, radiofrequency thermocoagulation and other injections, and with Gasserian ganglion procedures of radiofrequency thermocoagulation, balloon compression and glycerol gangliolysis. They found that many studies looking at treatments to the Gasserian ganglion were retrospective, with more information on radiofrequency thermocoagulation techniques. Unfortunately, age was not reported, although many of the studies included follow-up periods of several years. They considered that long-term success rates for ganglion level procedures were broadly similar with initial pain relief of >95% in most studies, and one report of a recurrence rate of 25% at 14 years. It was noted that all could cause sensory loss to varying degrees, with balloon compression least likely to impair corneal sensation or to cause anaesthesia dolorosa. The reports on interventional treatments of peripheral nerves tended to involve a small series with the shorter-term follow-up.

Recurrence levels within 2 years were high (70%), but complications were minor. The authors concluded that peripheral procedures should be reserved for emergency use or in patients with significant medical problems restricting other procedures. Gronsth *et al.* [212] reached similar conclusions in their review, noting that for patients with TGN refractory to medical therapy, percutaneous procedures to the Gasserian ganglion, gamma knife and microvascular decompression could be considered.

Tronnier *et al.* [214] retrospectively analysed information obtained from patients undergoing 316 radiofrequency lesion procedures and 378 microvascular decompressions, although only 62% of patients were included due to the loss to follow-up or inability to complete questionnaire. They noted that age corresponded to literature data and found a 50% recurrence rate at 2 years for the first group and reported that 64% of patients undergoing surgery remained pain free for up to 20 years. They considered that microvascular decompression was the treatment of choice for TGN in healthy people because it was curative and non-destructive, and that percutaneous procedures were indicated for older patients with high comorbidity or multiple sclerosis.

In a study evaluating the effectiveness of percutaneous radiofrequency of the Gasserian ganglion in 1,600 patients with a follow-up time of 1 to 25 years and a mean age of 57 years, Kanolat *et al.* [215] reported immediate pain relief in 98% of patients continuing for 5 years in 58% of those. They noted that there was no single, standard method of treatment of TGN. They considered that selection of suitability of each patient was important and concluded radiofrequency denervation of the Gasserian ganglion to be minimally invasive, effective and especially indicated in older patients.

A review of the clinical efficacy and safety of stereotactic radiosurgery (gamma knife) for the treatment of TGN reported that the current evidence appeared adequate to support the procedure, although noted a paucity of directly comparable data [216]. Between 33 and 90% of patients achieved initial complete pain relief, with a recurrence rate of 14% at 18 months. Operative mortality and major morbidity was low and it was considered suitable for older patients with concurrent medical illnesses or comorbidity.

The evidence suggests that microvascular decompression is the treatment of choice for TGN in healthy patients and percutaneous procedures are indicated for older patients with high comorbidity. There is evidence to support stereotatic radiosurgery.

*Summary statements*

- There is limited evidence to support epidural steroid injections for spinal stenosis in older patients but the evidence is not strong for its use in radicular pain or sciatica.
- There is limited evidence to support consideration of epidural adhesiolysis for spinal stenosis and radicular symptoms in the older adult.
- The evidence in all age groups for facet joint interventions is mixed, although there is some evidence to support radiofrequency lesioning in appropriately selected patients. Until further studies in the older population become available, no firm recommendations can be made.
- No studies of SCS specifically targeting the older population exist, but evidence from RCTs in mixed-aged groups, including over 65s, support its use in failed back surgical syndrome, complex regional pain and neuropathic and ischaemic pain.
- There is weak evidence to support consideration of sympathectomy for neuropathic pain in the older population.
- There is no RCT evidence for the use of continuous neuraxial infusions in older people, but supportive prospective open studies in all age groups. The authors consider continuous neuraxial infusions may be useful in appropriately selected older people.
- The current evidence in favour of VP and KP is conflicting. Until further larger studies become available, no firm recommendations can be made regarding VP and KP in the treatment of painful vertebral fractures.
- IA corticosteroid injections in OA of the knee are effective in relieving pain in the short term with little risk of complications and/or joint damage. IA HA is effective and relatively free of systemic adverse effects. It should be considered in patients intolerant to systemic therapy. IA HA appears to have a slower onset of action than IA steroids, but the effects seem to last longer.
- In older people, nerve block using a combination of local anaesthetic and corticosteroid is effective in acute herpes zoster and PHN. There is also evidence for the use of botulinum toxin in these patients.
- The evidence suggests that microvascular decompression is the treatment of choice for TGN in healthy patients and percutaneous procedures are indicated for elderly patients with high comorbidity. There is some evidence to support stereotatic radiosurgery.

## Psychological interventions

Pain is not just a physical sensation. The biopsychosocial model reinforces how psychological factors may influence the way in which people interpret, respond to and cope with pain. Although pharmacological therapy can be helpful in managing pain, it may not be completely effective [216] and older people may be particularly susceptible to side effects and drug interactions [217]. In addition, psychological techniques may be helpful, not just when pharmacological therapy is ineffective, but as an adjunct to medication or as a first-line therapy if the patient prefers.

Depression is common in older people and, although its treatment is beyond the scope of this review, it is important to acknowledge the close association between chronic pain and clinical depression. Depression in patients with chronic diseases is not well understood; it may be an emotional

response to the diagnosis of illness or to the limitation of activities of daily living, mobility and consequent social isolation. For example, it has been found that treatment of depression in older people with osteoarthritis may have a significant impact on function and pain [218].

### Cognitive behavioural therapy

Cognitive and behavioural therapies use a broad range of psychological techniques to alter dysfunctional ways of thinking, modify beliefs and attitudes and increase a person's control over pain and how they interpret and manage this [219].

Residents in long-term care facilities commonly experience pain. Cipher *et al.* [220] used a pre-treatment to post-treatment design to examine the effect of standardised Multi-modal Cognitive Behavioural Therapy. This intervention consists of a comprehensive initial evaluation of a range of domains, including level of dementia, emotional distress and pain. The therapist worked collaboratively with the residents, their families and others involved in their care. They established motivating themes and values which were congruent with the resident's background, for example, 'being independent' or 'being well-groomed', and used structured and individualised treatment plans incorporating these to encourage behavioural change. The 44 participants (mean age 82 years) received an average of 7.9 sessions each and showed a significant decrease in pain as measured on the Geriatric Multidimensional Pain and Illness Inventory.

Cook *et al.* [221] used a group approach to deliver 10 weekly sessions of a cognitive behavioural pain management programme to elderly nursing home residents (mean age 77.2 years) who had chronic pain. The study had a randomised pre-/post-comparison group design, with follow-up until 4 months. CBT was compared with an attention/support control treatment. Of those patients who received CBT, 80% showed an improvement, compared with 34% in the control group. These effects remained at 4 months, with 86% of the CBT group maintaining the improvement in pain, compared with 33% in the control group; indicating that the benefits of CBT for pain management are not purely mediated through increased attention and support.

These two CBT treatment studies took place in nursing homes; we do not know the effect of such interventions on community-dwelling older people. Study methodologies were not particularly rigorous and sample sizes in both were small. In contrast to randomised double-blind placebo controlled drug trials, researchers evaluating outcomes of these studies may not have been blind to treatment group allocation.

There is some evidence that psychological interventions such as CBT or behavioural therapy may be effective in decreasing chronic pain in adults and improving disability and mood [222]. However, few studies or trials have focused on older adults.

### Mindfulness and meditation

One qualitative study examined the effects of mindfulness meditation on older adults (27 participants; mean age 74 years) with chronic back pain and concluded that they experienced 'numerous benefits' including less pain, better sleep and improved quality of life [223].

### Guided imagery and biofeedback

Guided imagery is an approach whereby the attention is focused on sights, sounds, music and words to create feelings of empowerment and relaxation [224].

Relaxation and guided imagery may be effective strategies for pain management [224, 225], although most studies have not included control groups. Positive outcomes have been demonstrated for pain relief and decreased length of stay [226] in a small study of older adults following joint replacement surgery.

Biofeedback training may be used as part of multidisciplinary pain management programmes and generally includes relaxation training [227]. Studies comparing older versus younger adults using biofeedback appear to show comparable results in both groups [228, 229].

Older adults appear to readily acquire the physiological self-regulation skills taught in biofeedback-assisted relaxation training, and achieve comparable decreases in pain [230]. There has been little research on specific groups of older adults, such as the oldest, frail, cognitively impaired and those living in long-term care facilities and whether guided imagery and biofeedback are effective in these populations.

*Summary statements*

- Elderly nursing home residents with chronic pain may benefit from CBT pain management interventions.
- There is limited/weak evidence that mindfulness, meditation and enhancing emotion regulation have an impact on chronic pain in older people.
- Guided imagery may useful for patients following joint replacement surgery.
- There is limited evidence that biofeedback training and relaxation can be a useful approach for some groups of older adults with chronic pain.

## Assistive devices

Assistive devices are prescribed to prevent further impairment, compensate for a range of motion restrictions, promote safety and manage pain during self-care and other activities of daily living [231]. For the purposes of this guideline, devices designed to assist in 'personal activities of daily living' (daily activities associated with personal hygiene, dressing and eating) are included, as is technology

for 'instrumental activities of daily living' (cooking, shopping, leisure etc). Equipment directly related to function (bath and toilet rails and frames) is included in this review; mobility aids (wheelchairs, walking frames, sticks and crutches) and sensory aids (hearing, speech and vision) are not. Devices used or operated by others in the process of assisting an individual (hoists and other technology for assisting in transfers) are also excluded.

The outcomes for assistive device use may be related to the specific design of the device (of which there are many makes and models); therefore, this guideline focuses on outcomes in general and does not recommend any specific piece of equipment. Design build and quality, user preference and cost will influence the selection and use of a particular device.

### Review

Most research into assistive devices is descriptive in nature and very few consider pain reduction or functional outcomes in older people identified as having chronic pain. There is some evidence that assistive devices support maintaining independence, that use of devices increases with age, and that levels of satisfaction with devices are high [232, 233]. Only two systematic reviews and one piece of primary research of relevance to this guideline were identified.

A systematic review of occupational therapy for older people living in the community found strong evidence for the efficacy of advising assistive devices as part of a home hazard assessment on functional ability. A Cochrane review of occupational therapy for rheumatoid arthritis found insufficient data to determine the effectiveness of advice/instruction of assistive devices [234].

Mann *et al.* conducted an RCT in the USA of an assistive devices/environmental adaptations service designed to maintain independence and reduce care costs for the frail older adult over an 18-month period [235]. The service, led by an occupational therapist (assisted by a nurse and technician), provided a comprehensive functional assessment, provision of devices and home modifications as required, training in their use and continued follow-up and additional assessment and provision as required. The functional status, as measured by the functional independence measure (FIM) identified a significant decrease in function for the intervention group, but there was significantly more decline for the control group. Pain, as measured by the functional status instrument, increased significantly more for the control group.

There is some evidence that assistive devices may:

- support community living,
- reduce functional decline,
- reduce care costs and
- reduce pain intensity relative to older people not provided with devices.

## Exercise and physical activity

Increasing and maintaining physical activity is important in the management of persistent pain in older people. Physical inactivity is common in this population and it can endanger their independence and quality of life, with reduced levels of fitness and function leading to increased levels of disability.

Studies exclusively focused on people over 65 with chronic pain are scarce and the available evidence base lacks high-quality RCT findings. Consistent with recommendations by American guidelines on persistent pain management, [236] evidence from reviews of RCTs on populations of people with chronic pain that include, but are not exclusive to, people over 65 [237, 238] support the use of programmes that comprise strengthening, flexibility and endurance activities to increase physical activity. There is also RCT evidence of improvement in function and pain with exercise for older people over 65 with chronic pain [239–241].

Persistent pain is also a strong risk factor for falls in older people [242]. Balance exercises can be incorporated successfully into a programme with strength and flexibility exercises for people over 65 years [241].

There are many different forms of exercise and which to select can pose a dilemma. A guideline on the management of persistent low back pain for adults (not older adults) recommended that the specific type of exercises should be determined by the patient together with the therapist [243]. Given that there is, as yet, no compelling evidence in any age group, and certainly within people over 65, that one type of exercise is better than another for people with chronic pain, the preference of the patient should be a key factor. Another consideration is the level of function of the person. The aims and method of delivery of the exercise/activity programme should also be related to the level of function of the person. For some, professional-led rehabilitation of basic function will be required, whereas for others, maintenance of exercise and/or activity will be important. The American guidelines offer some recommendations on this [236].

There is a large range of options that can be discussed with the person, such as progressive resistance exercise and aerobic exercise, including walking and water-based exercise/hydrotherapy. Based on studies of populations with older people with persistent pain, Tai-Chi [244–246] and yoga [247], appropriately delivered, may be considered as options: research to investigate their specific use for older people with pain is certainly indicated, and advances in gaming technology such as Wii and Kinect are opening up new possibilities.

Motivation is an essential factor to consider [248]. Likewise, barriers to exercise need to be taken into consideration [249]. In other age populations, it is recommended that a cognitive behavioural approach be used in exercise therapy to address such issues [243]. Again, until shown to

be otherwise, that should be considered in older people with chronic pain.

Supervision is important in younger populations [250] and is highlighted by the American Geriatrics Society (AGS) guidelines [236]. Until otherwise demonstrated, it should also be considered to be important in exercise for older people with chronic pain. Technology offers the potential for relatively low-cost supervision during self-management periods.

- Increasing activity by way of exercise should be considered.
- Exercise should involve strengthening, flexibility, endurance and balance.
- The preference of the person for the type of exercise should be given serious consideration.
- Motivation and barriers to exercise and activity should be discussed and planned for.
- Exercise should be customised to the individual capacity and needs of the person.
- Maintenance of productive activity and/or exercise should be facilitated.

## Self-management of pain

Self-management covers a wide range of techniques, including relaxation, coping strategies, exercise, adaptations to activities and education about pain and its effects [251, 252]. By definition, the person with pain takes the lead role in carrying out the intervention, independently or with varying levels of support from health professionals. Older people with persistent pain can be open to the idea of self-management [251, 252]. Barriers to older people's self-management include: conflicting demands of dealing with comorbidities; inadequate access to information and resources; time; cost; lack of confidence in ability; motivation and unhelpful attitudes of others [249, 253]. It is important to identify these and overcome them if possible.

Bespoke self-management practices present a challenge to investigation because of their variability and individuality. Structured group-based programmes are available to facilitate self-management. Those with a strong focus on improving self-efficacy, such as the Arthritis Self Management Programme, the Chronic Disease Self-Management Programme and their close derivatives such as the Expert Patient Programme in England and Wales, have been investigated. Reviews have challenged bold claims of effectiveness for pain and function in adults: they report, at best, small, short-term changes of clinically questionable benefit [254–257]. Two good quality RCTs, with samples of people exclusively or almost exclusively over 65 years, showed no statistically significant effects at 6-month follow-up [258, 259]. An adaptation of this approach specifically for older housebound adults has been shown to be feasible and there was a clinically small though statistically significant, improvement in self-reported function 2 weeks after the intervention had ended: there were no effects on pain [260].

A statistically significant effect on pain at 6-month follow-up was demonstrated in a good-quality RCT, in which participants were mostly over 65, which investigated an intervention with different features to those described above. It combined aspects of self-management training with a programme of supervised exercise sessions and, rather than ending after the programme, it incorporated a degree of follow-up support [261]. The effect on pain at 12 months was no longer statistically significant and there were no statistically significant effects on function [261].

Other approaches, such as those used by Pain Association Scotland, include components that allow for integrated working with other services and provide more long-term support and maintenance of skills: these are as yet untested.

*Summary statements*

- A range of self-management techniques and practices should be considered as an option to be carried out in conjunction with other methods of pain management.
- Arthritis self-management/chronic disease self-management programmes and close derivatives, such as the Expert Patient Programme, delivered in isolation, without on-going support, cannot yet be recommended to decrease pain and increase function.
- Self-management programmes with mechanisms for longer-term support/maintenance may have a benefit.
- Increasing activity by way of exercise should be considered.
- Exercise should involve strengthening, flexibility, endurance and balance.
- The preference of the person for the type of exercise should be given serious consideration.
- Motivation and barriers to exercise and activity should be discussed and planned for.
- Exercise should be customised to the individual capacity and needs of the person.
- Maintenance of productive activity and/or exercise should be facilitated.
- There is some evidence that assistive devices may:
  - support community living,
  - reduce functional decline,
  - reduce care costs and
  - reduce pain intensity relative to older people not provided with devices.

## Complementary therapies

There is evidence of some types of complementary therapy use among older adults for the management of painful conditions. However, many of the studies are related to specific therapies or specific pain types.

The House of Lords select committee [262] has organised complementary therapies into four main categories, as follows:

The first group embraces what may be called the principal disciplines, two of which are already regulated in their professional activity and education by Acts of Parliament (osteopathy and chiropractic). The others are acupuncture,

herbal medicine and homeopathy. These therapies claim to have a diagnostic approach.

The second group contains therapies which are most often used to complement conventional medicine and do not purport to embrace diagnostic skills. It includes aromatherapy; the Alexander Technique; body work therapies, including massage; counselling; stress therapy; hypnotherapy; reflexology and probably shiatsu; meditation and healing.

The third group purport to offer diagnostic information as well as treatment, in general favour a philosophical approach and are indifferent to the scientific principles of conventional medicine, and through which various and disparate frameworks of disease causation and its management are proposed. These therapies can be split into two subgroups:

Group 3a includes long-established and traditional systems of healthcare such as Ayurvedic medicine and Traditional Chinese medicine.

Group 3b covers other alternative disciplines which lack any credible evidence base, such as crystal therapy, iridology, radionics, dowsing and kinesiology.

Therapies reviewed for these guidelines tend to fall into the first group as they are the approaches with the most evidence underpinning their use, as highlighted by the House of Lords report mentioned above.

### Acupuncture

There are a number of RCTs which suggest the positive benefits associated with the use of acupuncture [263–269]. However, there appear to be methodological weaknesses within many of these studies. Acupuncture does seem to provide improvement in function and pain relief as an adjuvant therapy for osteoarthritis of the knee, when compared with credible sham acupuncture and education control groups [270, 271], but the duration of effect is short term [272] and uncertain beyond 26 weeks. When compared with TENS, acupuncture shows a small but significant improvement in pain above that of TENS which lasted beyond the treatment period [273].

Pain intensity and quality of life appears to improve greater with deep needling to trigger points than standard acupuncture or superficial needling in older patients with chronic low back pain [274]. However, while the results are not statistically significant, they suggest that deep needling is a safe procedure to be used with older adults [275].

Combining acupuncture with other modalities, such as TENS, does seem to also have an effect [236, 276, 277]. Therefore, combining acupuncture and TENS does provide a reduction in pain intensity along with an improvement in quality of life, over and above the improvement in pain and function normally seen with TENS and acupuncture applied singularly [278].

### TENS/PENS (transcutaneous/percutaneous electrical nerve stimulation)

There has been some suggestion that age-related changes can limit the use of TENS among the older population [279]. Furthermore, the AGS [236] recommend that the use of TENS alone, or in combination with other pharmacological strategies, can be an effective approach. Age does not have a significant impact on pain or TENS comfort. Conventional and burst TENS do not differ in their ability to decrease pain [278]. PENS combines systematically placed acupuncture needles with the delivery of an electrical current. Combined with physiotherapy, PENS can reduce pain intensity and self-reported disability in community-dwelling older adults with low back pain. This is maintained at 3-month follow-up, after 6 weeks of intervention (twice weekly) [278].

### Massage

Massage therapy has a long history of demonstrating positive effects on musculoskeletal pain [279–281] and chronic pain in general [282]. It is proposed that massage can increase serotonin and dopamine levels, and enhance the local blood flow while ‘closing the pain gate’. Ten minutes of slow stroke back massage has been shown to reduce shoulder pain and anxiety in older adults with a stroke, and this effect continues for 3 days after the massage. Older adults found this helped them to relax and sleep better. An alternative form of massage known as ‘Tender Touch’ (gentle massage) does improve pain and anxiety among older adults with chronic pain living in a long-term care facility. Furthermore, this approach is said to improve communication among staff and residents [282].

The addition of aromatherapy does have limited evidence, although it has been proposed that use of ginger oil does relieve pain and stiffness among older adults with knee pain. This improvement was maintained for 1 week following treatment, but the improved pain and enhanced physical function was not maintained at 4 weeks following six massage sessions over a period of 3 weeks [283].

### Reflexology

Foot reflexology is a form of foot massage which is designed to ‘harmonise’ bodily functions, producing a healing and relaxing effect [284]. The principles behind reflexology suggest that areas of the feet correspond to all of the glands, organs and parts of the body [285]. Reflexology is said to promote relaxation and relieve stress and tension [286].

Thirty minutes use of foot reflexology to both feet can reduce anxiety and descriptive words in the short-form MPQ [287].

There were no studies found supporting the use of homeopathy.

*Summary statement*

There is limited evidence to support the use of complementary therapies with older adults. What evidence does exist is generally weak and based upon small-scale studies without proper use of controls or randomisation procedures.

## Guidelines

The intention of this section is not to compare the guidelines. It is aimed to be more of a summary of available evidence that has been graded by other authors.

The AGS provided the first clinical practice guideline on the management of chronic pain in older people in 1998, [288] later updated in 2002 [236]. The two versions concentrated on the assessment of pain and pharmacological management. Many of the surgical interventions were not explored in this document, although non-pharmacological strategies, including physical and behavioural therapies, were discussed. More recently, in 2009, the AGS revised their earlier recommendation on pharmacological management of persistent pain to include advice on the use of newer pharmacologic approaches [95]. In their guideline, the panel highlighted the paucity of rigorous, well-controlled studies involving only older people; a problem that became only too obvious to us when searching the pain literature. Like the AGS, we also had little choice but to extrapolate, where appropriate, some of the evidence from studies on younger adults.

In 2010, the American Society of Anesthesiologists Task Force on Chronic Pain Management and the American Society of Regional Anesthesia and Pain Medicine released practice guidelines on the management of chronic pain excluding cancer, degenerative major joint disease, headache and other facial pain syndromes. The guideline graded the evidence and included interventional therapies as well as pharmacological management, physical therapy and psychological treatment. This guideline was not specifically designed for older people, although it may be argued that the recommendations could be on occasions, extrapolated to this population [289].

The American guidelines made recommendations for people with different degrees of problems. They recommended that health professionals should consider an initial period of appropriate professional-led rehabilitation, again focusing on improving strength, flexibility and stamina, for people who had severe physical problems. For people who were not yet capable of more strenuous exercise, they recommended routine consideration of moderate exercise over a period of 8–12 weeks, under the supervision of a professional with knowledge of the needs of older people. They recommended exercise classes for people who were considered otherwise healthy but unfit. Finally, maintenance of moderate levels of productive and/or leisure activity should be advised. We did not find any specific evidence that classified people over 65 years with chronic pain based on levels of disability to add to these recommendations.

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## References

1. Harbour R, Miller J. A New System for Grading Evidence Based Guidelines. Br Med J 2001; 323: 334–6.
2. Merskey H, Bogduk N. Taxonomy of Pain Terms & Definitions. Seattle: IASP Press, 1994.
3. Bergh I, Steen G, Waern M, Johansson B, Oden A, Sjostrom B, Steen B. Pain and its relation to cognitive function and depressive symptoms: a Swedish population study of 70-year-old men and women. J Pain Symptom Manage 2003; 26: 903–12.
4. Lichtenstein M, Dhanda R, Cornell J, Escalante A, Hazuda H. Disaggregating pain and its effects on physical functional limitations. J Gerontol Med Sci 1998; 53A: M361–71.
5. Asghari A, Ghaderi N, Ashory A. The prevalence of pain among residents of nursing homes and the impact of pain on their mood and quality of life. Arch Iranian Med 2006; 9: 368–73.
6. Boerlage AA, van Dijk M, Stronks DL, de Wit R, van der Rijt CCD. Pain prevalence and characteristics in three Dutch residential homes. Eur J Pain 2008; 12: 910–6.
7. Dos Reis LA, de Vasconcelos Torres G, Dos Reis LA. Pain characterization in institutionalized elderly patients. Arq Neuropsiquiatr 2008; 66: 331–5.
8. McClean WJ, Higginbotham NH. Prevalence of pain among nursing home residents in rural New South Wales. Med J Aust 2002; 177: 17–20.
9. Tsai YF, Tsai HH, Lai YH, Chu TL. Pain prevalence, experiences and management strategies among the elderly in Taiwanese nursing homes. J Pain Symptom Manage 2004; 28: 579–84.
10. Weiner DK, Peterson B, Ladd K, McConnell E, Keefe FJ. Pain in nursing home residents: an exploration of prevalence, staff perspectives, and practical aspects of management. Clin J Pain 1999; 15: 92–101.
11. Blay SL, Andreoli SB, Gasta FL. Chronic painful physical conditions, disturbed sleep and psychiatric morbidity: results

from an elderly survey. Ann Clin Psychiatry 2007; 19: 169–74.
12. Blyth FM, March LM, Brnabic AJ, Jorm LR, Williamson M, Cousins MJ. Chronic pain in Australia: a prevalence study. Pain 2001; 89: 127–34.
13. Elliott AM, Smith BH, Penny KI, Smith CW, Chambers WA. The epidemiology of chronic pain in the community. Lancet 1999; 354: 1248–52.
14. McCarthy LH, Bigal ME, Katz M, Derby C, Lipton RB. Chronic pain and obesity in elderly people: results from the Einstein aging study. J Am Geriatr Soc 2009; 57: 115–9.
15. Sa KN, Baptista AOF, Matos MA, Lessa I. Chronic pain and gender in Salvador population, Brazil. Pain 2008; 139: 498–506.
16. Yu HY, Tang FI, Kuo BI, Yu S. Prevalence, interference, and risk factors for chronic pain among Taiwanese community older people. Pain Manage Nurs 2006; 7: 2–11.
17. Zanocchi M, Maero B, Nicola E *et al*. Chronic pain in a sample of nursing home residents: prevalence, characteristics, influence on quality of life (QoL). Arch Gerontol Geriatr 2008; 47: 121–8.
18. Bergman S, Herrström P, Högström K, Petersson IF, Svensson B, Jacobsson LTH. Chronic musculoskeletal pain, prevalence rates, and sociodemographic associations in a Swedish population study. J Rheumatol 2001; 28: 1369–77.
19. Boardman HF, Thomas E, Croft PR, Millson DS. Epidemiology of headache in an English district. Cephalalgia 2003; 23: 129–37.
20. Bressler HB, Keyes WJ, Rochon PA, Badley E. The prevalence of low back pain in the elderly: a systematic review of the literature. Spine 1999; 24: 1813–9.
21. Brochet B, Michel P, Barberger-Gateau P, Dartigues JF. Population-based study of pain in elderly people: a descriptive survey. Age Ageing 1998; 27: 279–84.
22. Carmaciu C, Iliffe S, Kharicha K, Harari D, Swift C, Gillmann G, Stuck AE. Health risk appraisal in older people 3: prevalence, impact, and context of pain and their implications for GPs. Br J Gen Pract 2007; 57: 630–5.
23. Cavlak U, Yagci N, Aslan UB, Ekici G. A new tool measuring health-related quality of life (HRQOL): the effects of musculoskeletal pain in a group of older Turkish people. Arch Gerontol Geriatr 2009; 49: 298–303.
24. Christmas C, Crespo CJ, Franckowiak SC, Bathon JM, Bartlett SJ, Anderson RE. How common is hip pain among older adults? Results from the Third National Health and Nutrition Examination Survey. J Fam Pract 2002; 51: 345–8.
25. Clausen T, Romoren TI, Ferreira M, Kristensen P, Ingstad BHolmboe-Ottesen G. Chronic diseases and health inequalities in older persons in Botswana (Southern Africa): a national survey. J Nutr Health Aging 2005; 9: 455–61.
26. Dahaghin S, Bierma-Zeinstra SMA, Reijman M, Pols HAP, Hazes JMW, Koes BW. Prevalence and determinants of one month hand pain and hand related disability in the elderly (Rotterdam study). Ann Rheum Dis 2005; 64: 99–104.
27. Dawson J, Linsell L, Zondervan K *et al*. Epidemiology of hip and knee pain and its impact on overall health status on older adults. Rheumatology 2004; 43: 497–504.
28. Donald IP, Foy C. A longitudinal study of joint pain in older people. Rheumatology 2004; 43: 1256–60.
29. Edmond SL, Felson DT. Prevalence of back symptoms in elders. J Rheumatol 2000; 27: 220–5.
30. Franceschi M, Colombo B, Rossi P, Canal N. Headache in a Population-Based Elderly Cohort. An Ancillary Study to the Italian Longitudinal Study of Aging (ILSA). Headache 1997; 37: 79–82.
31. Frankel S, Eachus J, Pearson N *et al*. Population requirement for primary hip-replacement surgery: a cross-sectional study. Lancet 1999; 353: 1304–9.
32. Grimby C, Fastbom J, Forsell Y, Thorslund M, Claesson CBWinblad B. Musculoskeletal pain and analgesic therapy in a very old population. Arch Gerontol Geriatr 1999; 29: 29–43.
33. Jacobs JM, Hammerman-Rozenberg R, Cohen A, Stessman J. Chronic back pain among the elderly: prevalence, associations, and predictors. Spine 2006; 31: 203–7.
34. Jinks C, Jordan K, Croft P. Measuring the population impact of knee pain and disability with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Pain 2002; 100: 55–64.
35. Leveille SG, Zhang Y, McMullen W, Kelly-Hayes M, Felson T. Sex differences in musculoskeletal pain in older adults. Pain 2005; 116: 332–8.
36. Makela M, Heliovaara M, Sainio P, Knekt P, Impivaara O, Aromaa A. Shoulder joint impairment among Finns aged 30 years or over: prevalence, risk factors and co-morbidity. Rheumatology 1999; 38: 656–62.
37. Miro J, Paredes S, Rull M *et al*. Pain in older adults: a prevalence study in the Mediterranean region of Catalonia. Eur J Pain 2007; 11: 83–92.
38. Pope DP, Hunt IM, Birrell FN, Silman AJ, Macfarlane GJ. Hip pain onset in relation to cumulative workplace and leisure time mechanical load: a population based case-control study. Ann Rheum Dis 2003; 62: 322–6.
39. Sandler RS, Stewart WF, Liberman JN, Ricci JA, Zorich NL. Abdominal pain, bloating, and diarrhea in the United States: prevalence and impact. Dig Dis Sci 2000; 45: 1166–71.
40. Thomas E, Peat G, Harris L, Wilkie R, Croft PR. The prevalence of pain and pain interference in a general population of older adults: cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). Pain 2004; 110: 361–8.
41. Tsang A, Von Korff M, Lee S *et al*. Common chronic pain conditions in developed and developing countries: gender and age differences and co-morbidity with depression-anxiety disorders. J Pain 2008; 9: 883–91.
42. Urwin M, Symmons D, Allison T *et al*. Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. Ann Rheum Dis 1998; 57: 649–55.
43. Westerbotn M, Hilleras P, Fastbom J, Aguerro-Torres H. Pain reporting by very old Swedish community dwellers: the role of cognition and function. Aging Clin Exp Res 2008; 20: 40–6.
44. Won A, Lapane K, Gambassi G, Bernabei R, Mor V, Lipsitz LA. Correlates and management of nonmalignant pain in the nursing home. SAGE Study Group. Systematic Assessment of Geriatric drug use via Epidemiology. J Am Geriatr Soc 1999; 47: 936–42.
45. Won AB, Lapane KL, Vallow S, Schein J, Morris JN, Lipsitz LA. Persistent nonmalignant pain and analgesic prescribing patterns in elderly nursing home residents. J Am Geriatr Soc 2004; 52: 867–74.

**46.** Chaplin A, Curless R, Thomson R, Barton R. Prevalence of lower gastrointestinal symptoms and associated consultation behaviour in a British elderly population determined by face-to-face interview. Br J Gen Pract 2000; 50: 798–802.

**47.** Landi F, Onder G, Cesari M, Russo A, Barillaro C, Bernabei R on behalf of the SILVERNET-HC Study Group. Pain and its relation to depressive symptoms in frail older people living in the community: an observational study. J Pain Symptom Manage 2005; 29: 255–62.

**48.** Jakobsson U, Klevsgard R, Westergren A, Halberg IR. Old people in pain: a comparative study. J Pain Sympt Manage 2003; 26: 625–36.

**49.** Mantyselka P, Hartikainen S, Louhivuori-laako K, Sulkava R. Effects of dementia on perceived daily pain in home-dwelling elderly people: a population-based study. Age Ageing 2004; 33: 496–9.

**50.** Helme RD, Gibson SJ. The epidemiology of pain in elderly people. Clin Geriatr Med 2001; 17: 417–31.

**51.** Smalbrugge M, Jongenelis LK, Pot AM, Beekman ATF, Eefsting JA. Pain among nursing home patients in the Netherlands: prevalence, course, clinical correlates, recognition and analgesic treatment: an observational cohort study. BMC Geriatr 2007; 7: 3.

**52.** Dionne CE, Dunn KM, Croft PR. Does back pain prevalence really decrease with increasing age? A systematic review. Age Ageing 2006; 35: 229–34.

**53.** Macfarlane GJ, Pye SR, Finn JD *et al*. the EMAS Study Group. Investigating the determinants of international differences in the prevalence of chronic widespread pain: evidence from the European Male Ageing Study. Ann Rheum Dis 2009; 68: 690–5.

**54.** Vogt MT, Simonsick EM, Harris TB, *et al*. Neck and shoulder pain in 70- to 79-year-old men and women: findings from the Health, Aging and Body Composition Study. Spine J 2003; 3: 435–41.

**55.** Ross MM, Crook J. Elderly recipients of home nursing services: pain, disability and functional competence. J Adv Nurs 1998; 27: 1117–26.

**56.** Linton SJ. Understanding Pain for Better Clinical Practice: A Psychological Perspective. Edinburgh: Elsevier, 2005.

**57.** Main CJ, Keefe FJ, Rollman GB. Psychological assessment and treatment of the pain patient. In: Giamberardino MA, ed. Pain 2002—An Updated Review. Seattle: IASP Press; 2002. 281–301.

**58.** Degood DE, Tait RC. Assessment of pain beliefs and pain coping. In: Turk DC, Melzack R, eds. Handbook of Pain Assessment. 2nd edition. New York: Guilford Press, 2001; 320–9.

**59.** McParland JL, Knussen C. Just world beliefs moderate the relationship of pain intensity and disability with psychological distress in chronic pain support group members. Eur J Pain 2010; 14: 71–6.

**60.** Bush EG, Rye MS, Brant CR, Emery E, Pargament KI, Riessinger CA. Religious coping with chronic pain. Appl Psychophysiol Biofeedback 1999; 24: 249–60.

**61.** Glover-Graf N, Marini I, Baker J, Buck T. Religious and spiritual beliefs and practices of persons with chronic pain. Rehabil Couns Bull 2007; 51: 21–33.

**62.** Büssing A, Michalsen A, Balzat H *et al*. Are spirituality and religiosity resources for patients with chronic pain conditions? Pain Med 2009; 10: 327–39.

**63.** Cook AJ, Chastain DC. The classification of patients with chronic pain: age and sex differences. Pain Res Manag 2001; 6: 142–51.

**64.** Yong H, Bell R, Workman B, Gibson SJ. Psychometric properties of the pain attitudes questionnaire (revised) in adult patients with chronic pain. Pain 2003; 104: 673–81.

**65.** Spiers J. Expressing and responding to pain and stoicism in home-care nurse-patient interactions. Scand J Caring Sci 2006; 20: 293–301.

**66.** Yong H. Can attitudes of stoicism and cautiousness explain observed age-related variation in levels of self-rated pain, mood disturbance and functional interference in chronic pain patients? Eur J Pain 2006; 10: 399–407.

**67.** Turner JA, Ersek M, Kemp C. Self-efficacy for managing pain is associated with disability, depression, and pain coping among retirement community residents with chronic pain. J Pain 2005; 6: 471–9.

**68.** Crisson JE, Keefe FJ. The relationship of locus of control to pain coping strategies and psychological distress in chronic pain patients. Pain 1988; 35: 147–54.

**69.** Toomey TC, Mann JD, Abashian SW, Carnrike CL Jr, Hernandez JT. Pain locus of control scores in chronic pain patients and medical clinic patients with and without pain. Clin J Pain 1993; 9: 242–7.

**70.** Gibson SJ, Helme RD. Cognitive factors and the experience of pain and suffering in older persons. Pain 2000; 85: 375–83.

**71.** Lamé IE, Peters ML, Vlaeyen JWS, Kleef Mv, Patijn J. Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. Eur J Pain 2005; 9: 15–24.

**72.** Bishop KL, Ferraro FR, Borowiak DM. Pain management in older adults: role of fear and avoidance. Clin Gerontol 2001; 23: 33–42.

**73.** Basler H, Luckmann J, Wolf U, Quint S. Fear-avoidance beliefs, physical activity, and disability in elderly individuals with chronic low back pain and healthy controls. Clin J Pain 2008; 24: 604–10.

**74.** Cook AJ, Brawer PA, Vowles KE. The fear-avoidance model of chronic pain: validation and age analysis using structural equation modeling. Pain 2006; 121: 195–206.

**75.** Benjamin S, Mawer J, Lennon S. The knowledge and beliefs of family care givers about chronic pain patients. J Psychosom Res 1992; 36: 211–7.

**76.** Cano A, Miller LR, Loree A. Spouse beliefs about partner chronic pain. J Pain 2009; 10: 486–92.

**77.** Jones D, Ravey J, Steedman W. Developing a measure of beliefs and attitudes about chronic non-malignant pain: a pilot study of occupational therapists. Occup Ther Int 2000; 7: 232–45.

**78.** Bishop A, Thomas E, Foster NE. Health care practitioners' attitudes and beliefs about low back pain: a systematic search and critical review of available measurement tools. Pain 2007; 132: 91–101.

**79.** Linton SJ, Vlaeyen J, Ostelo R. The back pain beliefs of health care providers: are we fear-avoidant? J Occup Rehabil 2002; 12: 223–32.

**80.** Daykin AR, Richardson B. Physiotherapists' pain beliefs and their influence on the management of patients with chronic low back pain. Spine (Phila Pa 1976) 2004; 29: 783–95.

**81.** Ostelo RWJG, Vlaeyen JWS. Attitudes and beliefs of health care providers: extending the fear-avoidance model. Pain 2008; 135: 3–4.

82. Fullen BM, Baxter GD, O'Donovan B, Doody C, Daly LE, Hurley DA. Factors impacting on doctors' management of acute low back pain: a systematic review. Eur J Pain 2009; 13: 908–14.
83. Bowey-Morris J, Purcell-Jones G, Watson PJ. Test-retest reliability of the pain attitudes and beliefs scale and sensitivity to change in a general practitioner population. Clin J Pain 2010; 26: 144–52.
84. Allcock N, McGarry C. Management of pain in older people within the nursing home: a preliminary study. Health Soc Care Comm 2002; 10: 464–71.
85. Ferrell BA, Ferrell BR, Osterweil D. Pain in the nursing home. J Am Geriatr Soc 1990; 38: 409–14.
86. Kassalainen S, Crook J. An exploration of seniors' ability to report pain. Clin Nurs Res 2004; 13: 199–215.
87. McDonald DD, Fedo J. Older adults' pain communication: the effect of interruption. Pain Manag Nurs 2009; 10: 149–53.
88. Mallen CD, Peat G. Discussing prognosis with older people with musculoskeletal pain: a cross sectional study in general practice. BMC Fam Pract 2009; 10: 50–6.
89. Blomquist K, Hallberg L. Pain in older adults living in sheltered accommodation-agreement between assessments by older adults and staff. J Clin Nurs 1999; 8: 159–69.
90. Closs J. Pain in elderly residents: a neglected phenomenon? J Adv Nurs 1994; 19: 1072–81.
91. Fox S, Giles H. Accommodating intergenerational contact: a critique and theoretical model. J Aging Stud 1993; 7: 423–51.
92. McDonald DD. Older adults' pain descriptions. Pain Manag Nurs 2009; 10: 142–8. (Epub Ahead of Print Feb 28).
93. Ryan E, Hamilton J, See S. Patronizing the old: how do younger and older adults respond to baby talk in the nursing home? Intl J Aging Hum Dev 1994; 39: 21–32.
94. Coupland J, Coupland N. Old age doesn't come alone: discursive representations of health-in-ageing in geriatric medicine. Intl J Aging Hum Dev 1994; 39: 81–95.
95. American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons. Pharmacological management of persistent pain in older persons. J Am Geriatr Soc 2009; 57: 1331–46.
96. Zhang W, Moskowitz RW, Nuki G *et al*. OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. Osteoarthritis Cartilage 2008; 16: 137–62.
97. Zhang W, Doherty M, Arden N *et al*. EULAR evidence based recommendations for the management of hip osteoarthritis: report of a task force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT). Ann Rheum Dis 2005; 64: 669–81.
98. 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.
99. National Institute for Health and Clinical Excellence. *Clinical guideline for the early management of persistent low back pain. Clinical Guideline 88*. Available at http://guidance.nice.org.uk/CG88 (25 August 2012, last date accessed).
100. National Institute for Health and Clinical Excellence. *Clinical guideline for care and management of osteoarthritis in adults. Clinical Guideline 59*. Available at http://guidance.nice.org.uk/CG59 (25 August 2012, last date accessed).
101. Chibnall JT, Tait RC, Harman B, Luebbert RA. Effect of acetaminophen on behaviour, well-being, and psychotropic medication use in nursing home residents with moderate to severe dementia. J Am Geriat Soc 2005; 53: 1921–9.
102. Claridge LC, Eksteen B, Smith A, Shah T, Holt AP. Acute liver failure after administration of paracetamol at the maximum recommended daily dose in adults. Br Med J 2010; 341: c6764.
103. Nikolaus T, Zeyfang A. Pharmacological treatments for persistent non-malignant pain in older persons. Drugs Aging 2004; 21: 19–41.
104. Johnson AG, Nguyen TV, Day RO. Do nonsteroidal anti-inflammatory drugs affect blood pressure? A meta-analysis. Ann Int Med 1994; 121: 289–300.
105. Medicines and Healthcare products Regulatory Agency Safety of selective and non-selective NSAIDs. Available at http://www.mhra.gov.uk/home/groups/pl-p/documents/websiteresources/con2025036.pdf (6 September 2012, date last accessed).
106. British Pain Society. Opioids for persistent pain: Good Practice. London: The British Pain Society, 2010.
107. Pergolizzi J, Böger RH *et al*. Opioids and the management of chronic severe pain in the elderly: consensus statement of an International Expert Panel with focus on the six clinically most often used World Health Organization Step III opioids (buprenorphine, fentanyl, hydromorphone, methadone, morphine, oxycodone). Pain Pract 2008; 8: 287–313.
108. Mercadante S, Ferrera P, Villari P, Casuccio A. Opioid escalation in patients with cancer pain: the effect of age. J Pain Sympt Manage 2006; 32: 413–9.
109. Won A, Lapane KL, Vallow S, Schein J, Morris JN, Lipsitz LA. Long-term effects of analgesics in a population of elderly nursing home residents with persistent nonmalignant pain. J Gerontol Med Sci 2006; 61A: 165–9.
110. Podichetty VK, Mazanec DJ, Biscup RS. Chronic non-malignant musculoskeletal pain in older adults: clinical issues and opioid intervention. Postgrad Med J 2003; 79: 627–33.
111. Vestergaard P, d Rejnmark L, Mosekilde L *et al*. Fracture risk associated with the use of morphine and opiates. J Int Med 2006; 260: 76–83.
112. Mercadante S, Arcuri E. Pharmacological management of cancer pain in the elderly. Drugs Aging 2007; 24: 761–76.
113. Barber JB, Gibson SJ. Treatment of chronic non-malignant pain in the elderly: safety considerations. Drug Safety 2009; 32: 457–74.
114. Ackerman SJ, Knight T, Schein J, Carter C, Staats P. Risk of constipation in patients prescribed fentanyl transdermal system or oxycodone hydrochloride controlled-release in a California Medicaid population. Consult Pharm 2004; 19: 118–32.
115. Menten J, Desmedt M, Lossignol D, Mullie A. Longitudinal follow-up of TTS-fentanyl use in patients with cancer-related pain: results of a compassionate-use study with special focus on elderly patients. Curr Med Res Opin 2002; 18: 488–98.
116. Otis J, Rothman M. A Phase III study to assess the clinical utility of low-dose fentanyl transdermal system in patients with chronic non-malignant pain. Curr Med Res Opin 2006; 22: 1493–501.

**117.** Kress HG. Clinical update on the pharmacology, efficacy and safety of transdermal buprenorphine. Eur J Pain 2009; 13: 219–30.

**118.** Likar R, Vadlau EM, Breschan C, Kager I, Korak-Leiter M, Ziervogel G. Comparable analgesic efficacy of transdermal buprenorphine in patients over and under 65 years of age. Clin J Pain 2008; 24: 536–43.

**119.** National Institute for Health and Clinical Excellence. Clinical guideline for the pharmacological management of neuropathic pain in the non-specialist setting. Clinical Guideline 96. Available at <http://guidance.nice.org.uk/CG96> (25 August 2012, date last accessed).

**120.** Jean WH, Wu CC, Mok MS, Sun WZ. Starting dose of gabapentin for patients with post-herpetic neuralgia—a dose-response study. Acta Anaesthesiol Taiwan 2005; 43: 73–7.

**121.** Baron R, Mayoral V, Leijon G, Binder A, Steigerwald I, Serpell M. 5% lidocaine medicated plaster versus pregabalin in post-herpetic neuralgia and diabetic polyneuropathy: an open-label, non-inferiority two-stage RCT study. Curr Med Res Opin 2009; 25: 1663–76.

**122.** Backonja M, Wallace MS, Blonsky ER *et al*. NGX-4010, a high-concentration capsaicin patch, for the treatment of postherpetic neuralgia: a randomised, double-blind study. Lancet Neurol 2008; 7: 1106–12.

**123.** Ozyalcin NS. Minimal invasive treatment modalities for geriatric pain management. Agri 2004; 16: 26–36.

**124.** Freedman GM. Chronic pain. Clinical management of common causes of geriatric pain. Geriatrics 2002; 57: 36–41.

**125.** Snyder DL, Doggartt D, Turkelson C. Treatment of degenerative lumbar spinal stenosis. Am Fam Physician 2004; 70: 517–20.

**126.** Koc Z, Ozcakir O, Sivrioglu K, Gurbet A, Kucukoglu S. Effectiveness of physical therapy and epidural steroid injections in lumbar spinal stenosis. Spine 2009; 34: 985–9.

**127.** Tadokoro K, Miyamoto H, Sumi M, Shimomura T. The prognosis of conservative treatments for lumbar stenosis: analysis of patients over 70 years of age. Spine 2005; 30: 2458–63.

**128.** Shabat S, Folman Y, Leitner Y, Fredman B, Gepstein R. Failure of conservative treatment for lumbar stenosis in elderly patients. Arch Gerontol Geriatr 2007; 44: 235–41.

**129.** Botwin K, Gruber R, Bouchlas CG *et al*. Fluoroscopically guided lumbar transformational epidural steroid injections in degenerative lumbar stenosis. Am J Phys Med Rehabil. 2002; 81: 898–905.

**130.** Stojanovic MP, Vu T, Caneris O, Slezak J, Cohen SP, Sang CN. The role of fluoroscopy in cervical epidural steroid injections. Spine 2002; 27: 509–14.

**131.** White AH, Berby R, Wynne G. Epidural injections for the diagnosis and treatment of low back pain. Spine 1980; 5: 578–86.

**132.** Stafford MA, Peng P, Hill DA. Sciatica: a review of history, epidemiology, pathogenesis and the role of epidural steroid injection in management. BJA 2010; 99: 461–73.

**133.** Abdi S, Datta S, Trescottt A *et al*. Epidural steroids in the management of chronic spinal pain: a systematic review. Pain Physician 2007; 10: 185–212.

**134.** Airaksinen O, Bronx J, Cedraschi C *et al*. COST B13 Working Group on Guidelines for Chronic Low Back Pain. European Guidelines for the Management of Chronic nonspecific Low Back Pain. Eur Spine J 2006; 15(Suppl. 2): S192–S300.

**135.** Riew KD, Yuming Y, Gilula L *et al*. The effect of nerve root injections on the need for operative treatment of lumbar radicular pain. J Bone Joint Surgery Am 2000; 82: 1589–3.

**136.** Thomas E, Cytteval C, Abiad L, Picot MC, Taourel P, Blotman F. Efficacy of transforminal versus interspinous corticostgeriod injectionin discal radiculalgia. Clin Rheumatol 2003; 22: 299–304.

**137.** Manchikanti L, Pampati V, Fellows B *et al*. Effectiveness of percutaneous adhesiolysis with hypertonic saline neurolysis in refractory spinal stenosis. Pain Physician 2001; 4: 366–73.

**138.** Igarashi T, Hirabayashi Y, Seo N, Saitoh K, Fukuda H, Suzuki H. Lysis of adhesions and epidural injection of steroid/local anaesthetic during epiduroscopy potentially alleviate low back pain and leg pain in elderly patients with lumbar spinal stenosis. Brit J Anaesth 2004; 93: 181–7.

**139.** National Institute for Health and Clinical Excellence. Therapeutic Endoscopic Division of Epidural Adhesions. February 2010. Available at: http://www.nice.org.uk/nicemedia/live/11066/47515/47515.pdf (25 August 2012, date last accessed).

**140.** Manchikanti L, Pamapti V, Rivera J, Fellow B, Beyer C, Damron K. Role of facet joints in chronic back pain in the elderly: a controlled prevalence study. Pain Pract 2001; 1: 332–7.

**141.** Manchikanti L, Manchikanti KN, Cash KA, Singh V, Giordano J. Age-related prevalence of facet-joint involvement in chronic neck and low back pain. Pain Physician 2008; 11: 67–75.

**142.** Cohen SP, Raja SN. Pathogenesis, diagnosis and treatment of lumbar zygopophyseal (facet) joint pain. Anaesthesiology 2007; 106: 591–614.

**143.** Staal JB, de Bie R, de Vet HCW, Hildebrandt J, Nelemans P. The Cochrane Review of Injection Therapy for Subacute and Chronic Low back-Pain (Injection therapy for subacute and chronic low back-pain. The Cochrane Collaboration. Oxford: John Wiley & Sons Ltd, 2010.

**144.** Dreyfus P, Dreyer S. Lumbar Zygapophyseal joint (facet) injections. Spine J 2003; 3: 50S–9S.

**145.** Manchikanti L, Pampati V, Fellows B, Bakhit C. The diagnostic validity of and therapeutic value of lumbar facet joint nerve blocks with or without adjuvant agents. Curr Rev Pain 2000; 4: 337–44.

**146.** Niemisto L, Kalso E, Malmivaara A, Seitsalo S, Hurri H, Cochrane Collaboration Back Review Group. Radiofrequency denervation for neck and back pain: a systematic review within the framework of the Cochrane Collaboration Back Review Group. Spine 2003; 28: 1877–88.

**147.** Gallagher J, Petriccine DVP, Wedley J *et al*. Radiofrequency facet joint denervation in the treatment of low back pain. Pain Clinic 1994; 7: 193–8.

**148.** van Kleef M, Barende G, Kessles A, Voets H, Weber W, de Lange S. Randomised trial of radiofrequency lumbar facet denervation for chronic low back pain. Spine 1999; 24: 1937–42.

**149.** van Eerd M, Patijn J, Lataster A *et al*. Cervical facet pain. Pain Practice 2010; 10: 113–23.

**150.** Shealy CN, Mortimer JT, Reswick JB. Electrical inhibition of pain by stimulation of the dorsal columns: preliminary clinical report. Anaesth Analg 1967; 46: 489–91.

**151.** The British Pain Society. Spinal Cord Stimulation for the Management of Pain: Recommendations for Best Clinical Practice; A Consensus Document Prepared by the British Pain Society and in Consultation with the Society of British Neurological Surgeons. London: The British Pain Society, 2009.

**152.** Ubbink DT, Vermeulen H. Spinal cord stimulation for non-reconstructable chronic critical leg ischaemia. Cochrane Database Syst Rev 2005; 3: CD004001.

**153.** National Institute for Health and Clinical Excellence. Spinal cord stimulation for chronic pain of neuropathic or ischaemic origin. NICE technology appraisal guidance 159. Available at: http://www.nice.org.uk/nicemedia/pdf/TA159Guidance.pdf (25 August 2012, date last accessed).

**154.** Eddicks S, Maier-Haauff K, Schenk M, Muller A, Baumann GTheres H. Thoracic spinal cord stimulation improves functional status and relieves symptoms in patients with refractory angina pectoris. Heart 2007; 93: 585–90.

**155.** Mailis-Gagnon F, Furlan AD, Sandoval JA, Taylor RS. Spinal cord stimulation for chronic pain. Cochrane Database Syst Rev 2004; 3: CD003783.

**156.** North RB, Kidd DH, Piantadosi S. Spinal cord stimulation versus reoperation for failed back surgery syndrome. Acta Neurosuergery Suppl 1995; 64: 106–8.

**157.** Kemla MA, Barendse GA, van Kleef M *et al*. Spinal cord stimulation in patients with chronic reflex sympathetic dystrophy. N Engl J Med 2000; 343: 618–24.

**158.** Mailis-Gagnon A, Furlan A. The Cochrane Review of Sympathectomy for Neuropathic Pain. The Cochrane Collaboration. John Wiley & Sons Ltd, 2009.

**159.** Erdine S, de Andres J. Continuous neuraxial infusions. Drug delivery systems. Pain Pract 2006; 6: 51–7.

**160.** Thimineur MA, Kravitz E, Vodapally MS. Intrathecal opioid treatment for chronic non-malignant pain. Pain 2004; 109: 242–9.

**161.** Anderson VC, Burchiel KJ. A prospective study of long term intrathecal morphine in the management of non-malignant pain. Neurosurgery 1999; 44: 289–300.

**162.** Kumar K, Kelly M, Pirlot T. Continuous intrathecal morphine treatment for longterm benefits and efficacy. Surg Neurol 2001; 55: 79–86.

**163.** Raphael JH, Gnanadurai TV, Southall JL, Mutagi H, Kapur S. Placebo-controlled single blind study of short-term efficacy of spinal morphine in chronic non-malignant pain. Reg Anaes Pain Med 2006; 31: 47.

**164.** The British Pain Society. *Intrathecal Drug Delivery for the Management of Pain and Spasticity in Adults; Recommendations for Best Practice*. Prepared on behalf of the British Pain Society in consultation with the Association for Palliative Medicine and the Society of British Neurological Surgeons. London: The British Pain Society, 2008.

**165.** Jensen ME, McGraw JK, Cardella JF, Hirsch JA. Position statement on percutaneous vertebral augmentation: a consensus statement developed by the American Society of Interventional and Therapeutic Neuroradiology, Society of Interventional Radiology, American Association of Neurological Surgeons/Congress of Neurological Surgeons, and American Society of Spine Radiology. J NeuroInterv Surg 2009; 1: 181–5.

**166.** Yu SW, Yang SC, Kao YH, Yen CY, Tu YK, Chen LH. Clinical evaluation of vertebroplasty for multiple-level osteoporotic spinal compression fracture in the elderly. Arch Orthop Trauma Surg 2008; 128: 97–101.

**167.** Peh WCG, Gilula LA, Peck DD. Percutaneous vertebroplasty for severe osteoporotic vertebral body compression fractures. Radiology 2002; 223: 121–6.

**168.** Diamond TH, Champion B, Clark WA. Management of acute osteoporotic vertebral fractures: a nonrandomized trial comparing percutaneous vertebroplasty with conservative therapy. Am J Med 2003; 114: 257–65.

**169.** Do HM, Kim BS, Marcellus ML, Curtis L, Marks MP. Prospective analysis of clinical outcomes after percutaneous vertebroplasty for painful osteoporotic vertebral body fractures. AJNR Am J Neuroradiol 2005; 26: 1623–8.

**170.** Ãlvarez L, Alcaraz M, Pãrez-Higueras A, Granizo JJ, de Miguel I, Rossi RE, Quiãones D. Percutaneous vertebroplasty: functional improvement in patients with osteoporotic compression fractures. Spine 2006; 31: 1113–8.

**171.** Diamond TH, Bryant C, Browne L, Clark WA. Clinical outcomes after acute osteoporotic vertebral fractures: a 2-year non-randomised trial comparing percutaneous vertebroplasty with conservative therapy. Aust Med J 2006; 184: 113–7.

**172.** Ploeg W, Veldhuizen A, The B, Sietsma M. Percutaneous vertebroplasty as a treatment for osteoporotic vertebral compression fractures: a systematic review. Eur Spine J 2006; 15: 1749–58.

**173.** Gray L, Jarvik J, Heagerty P *et al*. Investigational vertebroplasty efficacy and safety trial (invest): a randomized controlled trial of percutaneous vertebroplasty. BMC Musculoskelet Disord 2007; 8: 126.

**174.** Layton KF, Thielen KR, Koch CA *et al*. Vertebroplasty, first 1000 levels of a single center: evaluation of the outcomes and complications. AJNR Am J Neuroradiol 2007; 28: 683–9.

**175.** Voormolen MHJ, Mali WPTM, Lohle PNM *et al*. Percutaneous vertebroplasty compared with optimal pain medication treatment: short-term clinical outcome of patients with subacute or chronic painful osteoporotic vertebral compression fractures. The vertos study. AJNR Am J Neuroradiol 2007; 28: 555–60.

**176.** Liliang PC, Su TM, Liang CL, Chen HJ, Tsai YD, Lu K. Percutaneous vertebroplasty improves pain and physical functioning in elderly osteoporotic vertebral compression fracture patients. Gerontology 2005; 51: 34–9.

**177.** Amar AP, Larsen DW, Esnaashari N, Albuquerque FC, Lavine SD, Teitelbaum GP. Percutaneous transpedicular polymethylmethacrylate vertebroplasty for the treatment of spinal compression fractures. Neurosurgery 2001; 49: 1105–15.

**178.** Wardlaw D, Cummings SR, Van Meirhaeghe J *et al*. Efficacy and safety of balloon kyphoplasty compared with non-surgical care for vertebral compression fracture (free): a randomised controlled trial. Lancet 2009; 373: 1016–24.

**179.** Komp M, Ruetten S, Godolias G. Minimally invasive therapy for functionally unstable osteoporotic vertebral fracture by means of kyphoplasty: prospective comparative study of 19 surgically and 17 conservatively treated ptients. J Miner Stoffwechs 2004; 11: 13–5.

**180.** Grafe I, Da Fonseca K, Hillmeier J *et al*. Reduction of pain and fracture incidence after kyphoplasty: 1-year outcomes of a prospective controlled trial of patients with primary osteoporosis. Osteoporosis Int 2005; 16: 2005–12.

**181.** Buchbinder R, Osborne RH, Ebeling PR *et al*. Randomized trial of vertebroplasty for painful osteoporotic vertebral fractures. N Eng J Med 2009; 361: 557–68.

**182.** Kallmes DF, Comstock BA, Heagerty PJ *et al*. A randomized trial of vertebroplasty for osteoporotic spinal fractures. N Eng J Med 2009; 361: 569–79.

**183.** Kallmes D, Buchbinder R, Jarvik J *et al*. Response to 'Randomized vertebroplasty trials: bad news or sham news?'. AJNR Am J Neuroradiol 2009; 30: 1809–10.

**184.** Jinks C, Jordan K, Croft P. Osteoarthritis as a public health problem: the impact of developing knee pain on physical function in adults living in the community: (knest 3). Rheumatology 2007; 46: 877–81.

**185.** Miller JH, White J, Norton TH. The value of intra-articular injections in osteoarthritis of the knee. J Bone Joint Surg Br 1958; 40: 636–43.

**186.** Godwin M, Dawes M. Intra-articular steroid injections for painful knees. Systematic review with meta-analysis. Can Fam Physician 2004; 50: 241–8.

**187.** Arroll B, Goodyear-Smith F. Corticosteroid injections for osteoarthritis of the knee: meta-analysis. BMJ 2004; 328: 869.

**188.** Bellamy N, Campbell J, Robinson V, Gee TL, Bourne R, Wells G. Intraarticular corticosteroid for treatment of osteoarthritis of the knee. Cochrane Database Syst Rev 2005; 2: CD005328.

**189.** Pyne D, Ioannou Y, Mootoo R, Bhanji A. Intra-articular steroids in knee osteoarthritis: a comparative study of triamcinolone hexacetonide and methylprednisolone acetate. Clin Rheumatol 2004; 23: 116–20.

**190.** Lo GH, LaValley M, McAlindon T, Felson DT. Intra-articular hyaluronic acid in treatment of knee osteoarthritis: a meta-analysis. JAMA 2003; 290: 3115–21.

**191.** Aggarwal A, Sempowski I. Hyaluronic acid injections for knee osteoarthritis. Systematic review of the literature. Can Fam Physician 2004; 50: 249–56.

**192.** Wang C-T, Lin J, Chang C-J, Lin Y-T, Hou S-M. Therapeutic effects of hyaluronic acid on osteoarthritis of the knee. A meta-analysis of randomized controlled trials. J Bone Joint Surg Am 2004; 86: 538–45.

**193.** Bellamy N, Campbell J, Welch V, Gee TL, Bourne R, Wells GA. Viscosupplementation for the treatment of osteoarthritis of the knee. Cochrane Database Syst Rev 2006; 2: CD005321.

**194.** Divine JG, Zazulak BT, Hewett TE. Viscosupplementation for knee osteoarthritis: a systematic review. Clin Orthop Relat Res 2007; 455: 113–22. .

**195.** van den Bekerom M, Lamme B, Sermon A, Mulier M. What is the evidence for viscosupplementation in the treatment of patients with hip osteoarthritis? Systematic review of the literature. Arch Orthop Trauma Surg 2008; 128: 815–23.

**196.** Arrich J, Piribauer F, Mad P, Schmid D, Klaushofer K, Mullner M. Intra-articular hyaluronic acid for the treatment of osteoarthritis of the knee: systematic review and meta-analysis. CMAJ 2005; 172: 1039–43.

**197.** Modawal A, Ferrer M, Choi HK, Castle JA. Hyaluronic acid injections relieve knee pain. J Fam Pract 2005; 54: 758–67.

**198.** Kahan A, Lleu P-L, Salin L. Prospective randomized study comparing the medicoeconomic benefits of hylan gf-20 vs. Conventional treatment in knee osteoarthritis. Joint Bone Spine 2003; 70: 276–81.

**199.** Bowsher D. The lifetime occurrence of herpes zoster and prevalence of post-herpetic neuralgia: a retrospective survey in an elderly population. Eur J Pain 1999; 3: 335–42.

**200.** Kost RG, Straus SE. Postherpetic neuralgia: pathogenesis, treatment, and prevention. N Eng J Med 1996; 335: 32–42.

**201.** Colding A. Treatment of pain: organization of a pain clinic: treatment of acute herpes zoster. Proc R Soc Med 1973; 66: 541–3.

**202.** Hardy D. Relief of pain in acute herpes zoster by nerve blocks and possible prevention of post-herpetic neuralgia. Can J Anesth 2005; 52: 186–90.

**203.** Tenicela R, Lovasik D, Eaglstein W. Treatment of herpes zoster with sympathetic blocks. Clin J Pain 1985; 1: 63–8.

**204.** Pasqualucci A, Pasqualucci V, Galla F *et al*. Prevention of post-herpetic neuralgia: acyclovir and prednisolone versus epidural local anesthetic and methylprednisolone. Acta Anaesthesiol Scand 2000; 44: 910–8.

**205.** Kotani N, Kushikata T, Hashimoto H *et al*. Intrathecal methylprednisolone for intractable postherpetic neuralgia. N Eng J Med 2000; 343: 1514–9.

**206.** van Wijck A, Opstelten W, Moons K *et al*. The pine study of epidural steroids and local anaesthetics to prevent postherpetic neuralgia: a randomised controlled trial. Lancet 2006; 367: 219–24.

**207.** Kumar V, Krone K, Mathieu A. Neuraxial and sympathetic blocks in herpes zoster and postherpetic neuralgia: an appraisal of current evidence. Reg Anesth Pain Med 2004; 29: 454–61.

**208.** Kim YH, Lee CJ, Lee SC *et al*. Effect of pulsed radiofrequency for postherpetic neuralgia. Acta Anaesthesiol Scand 2008; 52: 1140–3.

**209.** Freund B, Schwartz M. Subcutaneous btx-a in the treatment of neuropathic pain: A pilot study. Presented at the 38th Interagency Botulism Research Coordinating Committee Meeting, October 17–19 2001 Easton, MD.

**210.** Argoff CE. A focused review on the use of botulinum toxins for neuropathic pain. Clin J Pain 2002; 18: S177–81.

**211.** Ranoux D, Attal N, Morain F, Bouhassira D. Botulinum toxin type a induces direct analgesic effects in chronic neuropathic pain. Ann Neurol 2008; 64: 274–83.

**212.** Gronsth G, Cruccu G, Alksne J *et al*. Practice parameter: the diagnostic evaluation and treatment of trigeminal neuralgia (an evidence based review). Neurology 2008; 71: 1183–90.

**213.** Peters G, Turo N. Peripheral and Gasserian Ganglion-level procedures for the treatment of trigeminal neuralgia. Clin J Pain 2002; 18: 28–34.

**214.** Tronnier VM, Rashe D, Hamer J, Kienle A, Kunze S. Treatment of Idiopathic TGN: comparison of long-term outcome after radiofrquency rhizotomy and microvascular decompression. Neurosurgery 2001; 48: 1261–8.

**215.** Kanolat Y, Savas A, Bekar A, Berk C. Percutaneous controlled radiofrequency trigeminal rhizotomy for the treatment of idiopathic trigeminal neuralgis. Neurosurgery 2001; 48: 524–34.

**216.** Lim JN, Ayiku L. Systematic review of the clinical efficacy and safety of stereotactic radiosurgery (gamma knife) in the treatment of trigeminal neuralgia. University of Sheffield; review body for interventional procedures. Commissioned by the National Institute for Clinical Excellence, 2004.

**217.** Barry LC, Gill TM, Kerns RD, Reid MC. Identification of pain-reduction strategies used by community-dwelling older persons. J Gerontol A Biol Sci Med Sci 2005; 60: 1569–75.

**218.** Lin EB, Katon W, Von Korff M, Tang L *et al*. Effect of improving depression care on pain and functional outcomes among older adults with arthritis. A randomized controlled trial. JAMA 2003; 290: 2428–9.

**219.** Eccleston C, Williams AC, Morley S. Psychological therapies for the management of chronic pain (excluding headache) in adults. Cochrane Database Syst Rev 2009; CD007407.

**220.** Cipher DJ, Clifford A, Roper KD. The effectiveness of geropsychological treatment in improving pain, depression, behavioral disturbances, functional disability, and health care utilization in long term care. Clin Gerontol 2007; 30: 23–40.

**221.** Cook AJ. Cognitive-behavioral pain management for elderly nursing home residents. J Gerontol B Psychol Sci Soc Sci 1998; 53: 51–9.

**222.** Smith H, Bruckenthal P. Implications of opioid analgesia for medically complicated patients. Drugs Aging 2010; 27: 417–33.

**223.** Green SM, Hadjistavropoulos T, Sharpe D. Client personality characteristics predict satisfaction with cognitive behavior therapy. J Clin Psychol 2008; 64: 40–51.

**224.** Deisch P, Soukup SM, Adams P, Wild MC. Guided imagery: replication study using coronary artery bypass graft patients. Nursing Clinics of North America 2000; 35: 417–25.

**225.** Morone NE, Lynch CS, Greco CM, Tindle HA, Weiner DK. 'I felt like a new person'. The effects of mindfulness meditation on older adults with chronic pain: qualitative narrative analysis of diary entries. J Pain 2008; 9: 841–8.

**226.** Naparstek B. Staying Well with Imagery. NY: Warner Books.

**227.** Antall GF, Kresevic D. The use of guided imagery to manage pain in an elderly orthopeaic population. Orthop Nurs 2004; 23: 335–40.

**228.** Drahota A, Galloway E, Stores R, Ward D, Severs M, Dean T. Audiovisual distraction as an adjunct to pain and anxiety relief during minor surgery. Foot 2008; 18: 211–9.

**229.** Middaugh SJ, Woods SE, Kee WG, Harden RN, Peters JR. Biofeedback assisted relaxation training for chronic pain in the ageing. Biofeedback Self Reg 1991; 16: 361–77.

**230.** Middaugh SJ, Pawlick K. Biofeedback and behavioural treatment of persistent pain in the older adult: a review and a study. Appl Psychophysiol Biofeedback 2002; 27: 185–202.

**231.** Klinger L, Spaulding S. Chronic pain in the elderly: is silence really golden? Phys Occup Ther Geriatr 1998; 15: 1–17.

**232.** Mann WC, Hurren D, Tomita M. Assistive devices used by home-based elderly persons with arthritis. Am J Occup Ther 1995; 49: 810–20.

**233.** Steultjens E, Dekker J, Bouter L, Jellema S, Bakker E, Van den Ende CHM. Occupational therapy for community dwelling elderly people: a systematic review. Age Ageing 2004; 33: 453–60.

**234.** Steultjens EMJ, Dekker J, Bouter LM, Van Schaardenburg D, Van Kuyk MAH, Van den Ende CHM. Occupational Therapy for Rheumatoid Arthritis (Cochrane Review). Chichester, UK: John Wiley & Sons, 2004.

**235.** Mann WC, Ottenbacher KJ, Fraas L, Tomita M, Granger CV. Effectiveness of assistive technology and environmental interventions in maintaining independence and reducing home care costs for the frail elderly. Arc Fam Med 1999; 8: 210–7.

**236.** AGS Panel on Persistent Pain in Older Persons. The management of persistent pain in older persons. JAGS 2002; 50: S205–24.

**237.** Jamdvedt G, Dahm KT, Christie A *et al*. Physical therapy interventions for patients with osteoarthritis of the knee: an overview of systematic reviews: an overview of systematic reviews. Phys Ther 2008; 88: 123–36.

**238.** Walsh NE, Mitchell HL, Reeves BC, Hurley MV. Integrated exercise and self-management programmes in osteoarthritis of the hip and knee: a systematic review of effectiveness. Phys Ther Rev 2006; 11: 289–97.

**239.** Ferrell BA, Josephson KR, Pollan AM, Loy S, Ferrell BR. A randomized trial of walking versus physical methods for chronic pain management. Aging 1997; 9: 99–105.

**240.** Dias RC, Dias JMD, Ramos LR. Impact of an exercise and walking protocol on quality of life for elderly people with OA of the knee. Physiother Res Int 2003; 8: 121–30.

**241.** Hasegawa R, Islam MM, Nasu E *et al*. Effects of combined balance and resistance exercise on reducing knee pain in community-dwelling older adults. Phys Occup Ther Geriatr 2010; 28: 44–56.

**242.** Leveille SG, Jones RN, Kiely DK *et al*. Chronic musculoskeletal pain and the occurrence of falls in an older population. JAMA 2009; 302: 2214–21.

**243.** Airaksinen O, Brox JI, Cedraschic C *et al*. Chapter 4. European guidelines for the management of chronic nonspecific low back pain. Eur Spine J 2006; 15(Suppl. 2): S169–91.

**244.** Wolf SL, Barnhart HX, Kutner NG, McNeely E, Coogler CXu T. Reducing frailty and falls in older persons: an investigation of Tai Chi and computerized balance training. Atlanta FICSIT Group. Frailty and injuries: cooperative studies of intervention techniques. JAGS 1996; 44: 489–97.

**245.** Li F, Harmer P, Fisher KJ, McAuley E. Tai Chi: improving functional balance and predicting subsequent falls in older persons. Med Sci Sports Exerc 2004; 36: 2046–52.

**246.** Shen CL, James CR, Chyu MC *et al*. Effects of Tai Chi on gait kinematics, physical function, and pain in elderly with knee osteoarthritis: a pilot study. Am J Chin Med 2008; 36: 219–32.

**247.** Chen KM, Tseng WS, Ting LF, Huang GF. Development and evaluation of a yoga exercise programme for older adults. J Adv Nurs 2007; 57: 432–41.

**248.** Sabin KL. Older adults and motivation for therapy and exercise: issues, influences and interventions. Top Geriatr Rehabil 2005; 21: 215–20.

**249.** Austrian JS, Kerns RD, Reid MC. Perceived barriers to trying self-management approaches for chronic pain in older persons. JAGS 2005; 53: 856–61.

**250.** Liddle SD, Baxter GD, Gracey JH. Exercise and chronic low back pain: what works? Pain 2004; 107: 176–90.

**251.** Lansbury G. Chronic pain management: a qualitative study of elderly people's preferred coping strategies and barriers to management. Disabil Rehabil 2000; 22: 2–14.

**252.** Kemp CA, Ersek M, Turner JA. A descriptive study of older adults with persistent pain: use and perceived effectiveness of pain management strategies. BMC Geriatr 2005; 5: 12.

**253.** Bayliss EA, Steiner JF, Fernals DH, Crane LA, Main DS. Descriptions of barriers to self-care by persons with comorbid chronic diseases. Ann Fam Med 2003; 1: 15–21.

**254.** Chodosh J, Morton SC, Mojica W *et al*. Meta-analysis: chronic disease self-management programs for older adults. Ann Intern Med 2006; 143: 427–38.

**255.** Newbould J, Taylor D, Bury M. Lay-led self-management in chronic illness: a review of the evidence. Chronic Illn 2006; 2: 249–61.

**256.** Nunez D, Keller C, Ananian CD. A review of the efficacy of the self management model on health outcomes in community-residing older adults with arthritis. Worldviews Evid Based Nurs 2009; 6: 130–48.

**257.** Warsi A, LaValley MP, Wang PS, Avorn J, Solomon DH. Arthritis self-management education programs. Arthritis Rheum 2003; 48: 2207–13.

**258.** Ersek M, Turner JA, Cain KC, Kemp CA. Results of a randomised controlled trial to examine the efficacy of a chronic pain self-management group for older adults. Pain 2008; 138: 29–40.

**259.** Haas M, Groupp E, Muench J, Kraemer D *et al*. Chronic disease self-management program for low back pain in the elderly. J Manipulative Physiol Ther 2005; 28: 228–37.

**260.** Laforest S, Nour K, Gignac M, Gauvin L, Parisien M, Poirier M. Short-term effects of a self-management intervention on health status of housebound older adults with arthritis. J Appl Gerontol 2008; 27: 539–67.

**261.** Hughes SL, Seymour RB, Campbell RT *et al*. Long-term impact of Fit and Strong! on older adults with osteoarthritis. Gerontologist 2006; 46: 801–14.

**262.** House of Lords. Science and Technology—Sixth Report. http://www.publications.parliament.uk/pa/ld199900/ldselect/ldsctech/123/12301.htm (25 August 2012, last date accessed).

**263.** Wong TW, Fung KP. Acupuncture: from needle to laser. Fam Pract 1991; 8: 168–70.

**264.** Astin JA, Pelletier KR, Marie A, Haskell WL. Complementary and alternative medicine use among elderly persons: a one year analysis of Blue Shield Medicare Supplement. J Geront A Biol Med Sci 2000; 55: M4–9.

**265.** Ezzo J, Hadhazy V, Birch S, Lao L, Kaplan G. Hochberg M acupuncture for osteoarthritis of the knee: a systematic review. Arthritis Rheum 2001; 44: 815–25.

**266.** Gaw AC, Chang LW, Shaw LC. Efficacy of acupuncture on osteoarthritic pain. A controlled double blinded study. N Engl J Med 1975; 293: 375–8.

**267.** Takeda W, Wessel J. Acupuncture for the treatment of pain of osteoarthritic knees. Arthritis Care Res 1994; 7: 118–22.

**268.** Berman BM, Lao L, Greene M, Anderson RW, Wong RH, Langenberg P. efficacy of traditional Chinese acupuncture in the treatment of symptomatic knee osteoarthritis: a pilot study. Osteoarthritis Cartilage 1995; 3: 139–42.

**269.** Lao L, Bergman S, Langenberg P, Wong RH, Berman B. Efficacy of Chinese acupuncture on postoperative oral surgery pain. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995; 79: 423–8.

**270.** Berman BM, Singh BB, Lao L *et al*. A randomized trial of acupuncture as an adjunctive therapy in osteoarthritis of the knee. Rheumatology (Oxford) 1999; 38: 346–54.

**271.** Miller E, Maimon Y, Rosenblatt Y *et al*. Delayed effect of acupuncture treatment in OA of the knee: a blinded, randomized, controlled trial. Evid Based Complement Altern Med 2009 (epub ahead of print January 5, 2013).

**272.** Williamson L, Wyatt MR, Yein K, Melton JTK. Severe knee osteoarthritis: a randomised controlled trial of acupuncture, physiotherapy (supervised exercise) and standard management for patients awaiting knee replacement. Rheumatology 46: 1445–9.

**273.** Grant DJ, Bishop-Miller J, Winchester DM, Anderson M, Faulkner S. A randomized comparative trial of acupuncture versus transcutaneous electrical nerve stimulation for chronic back pain in the elderly. Pain 1999; 82: 9–13.

**274.** Itoh K, Katsumi Y, Kitakoji H. Trigger point acupuncture treatment of chronic low back pain in elderly patients—a blinded RCT. Acupunct Med 2004; 22: 170–7.

**275.** Meng CF, Wang D, Ngeow J *et al*. Acupuncture for chronic low back pain in older patients: a randomized, controlled trial. Rheumatology (Oxford) 2003; 42: 1508–17.

**276.** Itoh K, Hirota S, Katsumi Y, Ochi H, Kitakoji H, Itoh S. A pilot study on using acupuncture and transcutaneous electrical nerve stimulation to treat chronic no-specific low back pain. Complement Ther Clin Pract 2009; 15: 22–5.

**277.** Barr JO, Weissenbuehler SA, Cleary CK, Berman . Effectiveness and comfort of transcutaneous electrical nerve stimulation for older persons with chronic pain. J Geriatr Phys Ther 2004; 27: 93–9.

**278.** Weiner DK, Rudy TE, Glick RM *et al*. Efficacy of percutaneous electrical nerve stimulation for the treatment of chronic low back pain in older adults. J Am Geriatr Soc 2003; 51: 599–608.

**279.** Miller A, Hickman L, Lemasters G. A distraction technique for control of burn pain. J Burn Care Rehabil 1992; 13: 276–80.

**280.** Labyak D, Metzger B. The effects of effleurage backrub on the physiological components of relaxation: a meta analysis. Nurs Res 1997; 46: 59–62.

**281.** Mok E, Woo CP. The effects of slow-stroke back massage on anxiety and shoulder pain in elderly stroke patients. Complement Therap Nurs Midwifery 2004; 10: 209–16.

**282.** Sansome P, Schmitt L. Providing tender touch massage to elderly nursing home residents: a demonstration project. Geriatr Nurs 2000; 21: 303–8.

**283.** Yip YB, Tam ACY. An experimental study on the effectiveness of massage with aromatic ginger and orange essential oil for moderate to severe knee pain among the elderly in Hong Kong. Complement Ther Med 2007; 16: 131–8.

**284.** Tappan FM. Healing Massage Techniques. Reston, VA: Reston, 1978.

**285.** Byers DC. Better Health with Foot Reflexology. St Petersburg, FL: Ingram Publishing, 1983.

**286.** Meyer T, Cooper J, Raspe H. Disabling low back pain and depressive symptoms in the community-dwelling elderly: a prospective study. Spine 2007; 32: 2380–6.

**287.** Stevenson NLN, Weinrich SP, Tavakoli AS. The effects of foot reflexology on anxiety and pain in patients with breast and lung cancer. Oncol Nurs Forum 2000; 27: 67–72.

**288.** AGS Panel on Chronic Pain in Older Persons. The managment of chronic pain in older persons. J Am Geriatr Soc 1998; 46: 635–51.

**289.** American Society of Anesthesiologists Task Force on Chronic Pain Management and The American Society of Regional Anesthesia and Pain Medicine. Practice guidelines for chronic pain management. Anesthesiology 2010; 112: 810–33.

**290.** Chen J, Devine A, Dick IM, Dhaliwal SS, Prince RL. Prevalence of lower extremity pain and its association with functionality and quality of life in elderly women in Australia. J Rheumatol 2003; 30: 2689–93.

**291.** Chung JW, Kim JH, Kim HD, Kho HS, Kim YK, Chung SC. Chronic orofacial pain among Korean elders: prevalence, and impact using the graded chronic pain scale. Pain 2004; 12: 164–70.
**292.** Cox MO. The issues and challenges of orofacial pain in the elderly. Spec Care Dentist 2000; 20: 245–9.
**293.** Fox PL, Parminder R, Jadad AR. Prevalence and treatment of pain in older adults in nursing homes and other long-term care institutions: a systematic review. CMAJ 1999; 160: 329–3.
**294.** Leong IY, Nuo TH. Prevalence of pain in nursing home residents with different cognitive and communicative abilities. Clin J Pain 2007; 23: 119–27.
**295.** Linsell L, Dawson J, Zondervan K *et al*. Population survey comparing older adults with hip versus knee pain in primary care. Br J Gen Pract 2005; 55: 192–8.
**296.** Riley JL, Gilbert GH, Heft MW. Orofacial pain symptom prevalence: selective sex differences in the elderly. Pain 1998; 76: 97–104.
**297.** Sheffield RE. Migraine prevalence: a literature review. Headache 1998; 38: 595–601.
**298.** Weiner DK, Haggerty CL, Kritchevsky SB *et al*. How does low back pain impact physical function in independent, well-functioning older adults? Evidence from the Health ABC Cohort and implications for the future. Pain Med 2003; 4: 311–20.
**299.** Kaasalainen S, Crook J. An exploration of seniors' ability to report pain. Clin Nurs Res. 2004; 13: 199–215.
**300.** McDonald DD, Shea M, Rose L, Fedo J. The effect of pain question phrasing on older adult pain information. J Pain Symptom Manage. 2009; 37: 1050–60.
**301.** Zasqualucci A, Pasqualucci V, Galla F *et al*. Prevention of post-herpetic neuralgia: acyclovir and prednisolone versus epidural local anesthetic and methylprednisolone. Acta Anaesthesiol Scand 2000; 44: 910–8.

## Appendices

## Appendix 1: Specific search strategy for each section

### Summary of review process for prevalence

In addition to the standard terms used to identify older adults outlined previously, the keywords 'prevalence' and 'pain' were included in the search strategy.

Four hundred and forty-four papers were produced by the literature search focusing on pain, prevalence and the elderly between 1997 and 2009.

On first read-through, 77 titles/abstracts appeared relevant to the focus of the search. The following criteria were then used when re-reviewing the abstracts initially identified. Exclusion criteria applied:

- non-English;
- did not include >60 s;
- focused on chronic condition rather than pain, e.g. osteoarthritis, angina;
- focused on pain associated with conditions, e.g. prevalence of those with cancer who had pain;
- focused on specific subgroups, e.g. pain clinic attendees, veterans.

Of the 77 abstracts initially identified as potentially useful:

- Non-English—7
- Duplicates—3
- Focus on chronic condition, e.g. osteoarthritis, TMD—17
- Not general population—4
- Focus not on prevalence/elderly—2
- Total excluded—33
- Total included—44 full-papers sought.

A further nine papers were added which did not appear in the literature search, but were known to the reviewer (Bergman, Blyth, Boardman, Elliott, Frankel, Jinks, Macfarlane, Pope and Sandler). Most of these additional papers did not appear in the literature review because they do not focus on an elderly population, but do provide age-specific prevalences for the >60s as part of a larger general population survey.

In addition, a further 11 papers were included which came from second references from the reviewed papers.

The final review, therefore, contains 64 papers.

### Search: barriers, attitudes and education

Types of outcomes: impact of attitudes and beliefs on pain intensity, psychological distress, functional impairment and coping strategies; the impact of interventions designed to change attitudes and beliefs.
Search terms:

- Attitudes;
- Beliefs;
- elderly/frail elderly/old* people/aged/geriatric/senior*;
- health care professional.

This strategy returned few results specifically relating to older people and a large number of hits with age limits removed. As a result, the evidence reviewed has focused on key papers that incorporate older people in the sample under investigation. In addition, reference lists of studies selected as relevant were scanned to identify further papers.

### Search: communication

A total of 406 articles were identified by a search of relevant databases. However, many of these did not relate to communication and were, therefore, not included in the review. A total number of five papers specifically related to communication met the inclusion criteria. The same author had published three of these papers. There is thus a dearth of information on this important, yet hitherto neglected, area.

The articles reviewed highlighted issues regarding conveying and communicating pain information in various settings.

Studies were mainly non-randomised studies and a cross-sectional survey.

Communication + Older person/Geriatric/Elderly/Senior Citizen + Pain
Number of articles = 406
Exclude: cancer = 369
Psychometric = 350
Sleep = 327
Review = 226
Depression = 162
Non-English = 136
Not specifically communication = 4
Added papers: 1 from reference list
Final review: 5

## Search: pharmacology

Few studies investigating the effects of analgaesic drugs have been performed specifically in older people (age <65 years).

### Inclusion criteria

The following keywords were used in the title or abstract fields:

- Non-steroidal anti-inflammatory drugs or NSAID*, opioid*, antidepressant*, anti-depressant*, anti-epileptic*, local anaesthetic* or local anaesthetic*
- Paracetamol, nefopam, gabapentin, pregabalin, carbamazepine, lidocaine

The literature search undertaken identified 192 papers published between 1999 and 2009. The titles and abstracts of papers identified were read independently by two people (R.K. and N.A.) and then discussed to identify papers that were excluded.

### Exclusion criteria

| | Number of papers |
|---|---|
| Not written in English | 29 |
| Animal study | 1 |
| Case report | 5 |
| Other indication and not pain related | 20 |
| Not UK practice or unavailable in the UK | 4 |
| Not focused on older people | 44 |
| Not relevant to treatment of pain | 4 |
| Non-pharmacological interventions | 2 |
| Prescribing practice | 14 |
| Peri-operative pain management or anaesthesia | 37 |
| Review but not focused on pharmacological interventions | 12 |
| Total | 172 |

As the literature search was primarily undertaken according to age, some papers that may have been relevant to older people may not have been identified if categorised according to the condition being treated, due to limitations in indexing. Many of the included papers were reviews or expert opinion; however, the majority of these still extrapolated data from a younger population and did not cite studies undertaken in older people.

Reviews or consensus statements were included when specifically relating to older people, however many of the conclusions or references cited in these papers did not specifically relate to older people and were extrapolated from research including younger patient cohorts.

A further three papers were identified by personal knowledge of the reviewers.

## Search: psychiatry/psychology

(psychiat* or psycholog*).sh,ab,ti. (325,733)
2 (elderly or geriatric* or 'senior citizen*' or 'older').sh,ab,ti. (79,795)
3 pain.sh,ab,ti. (33,628)
4 1 and 3 and 2 (391)
5 limit 4 to yr='1997—Current' (308)
6 from 5 keep 1–10 (10)
7 from 5 keep 1–308 (308)
Search strategy:
Searched CINAHL (medline records excluded)
Psychiat* or psycholog*
Searched Psycinfo

Five hundred and fifty-three papers were initially identified for this section. However, 545 were rejected as not being appropriate and eight papers were included in the final review.

## Search: physiotherapy/ occupational therapy

Types of outcomes**:** increased, maintained or improved function in self-care or activities of daily living (including work and leisure) or reduction in pain intensity.
Search terms:

- assistive devices/assistive technology/equipment/aid*/ adaptation
- pain/chronic pain
- elderly/frail elderly/old* people/aged/geriatric/senior*

This strategy returned between 3 and 24 'hits'. In addition, reference lists of studies selected as relevant were scanned to identify further papers.

## Search: assistive devices

Types of outcomes: increased, maintained or improved function in self-care or activities of daily living (including work and leisure) or reduction in pain intensity.

### Search strategy

Searches conducted using MEDLINE, CINAHL, Cochrane, OT Seeker until December 2009 using the search terms:

- assistive devices/assistive technology/equipment/aid*/adaptation
- pain/chronic pain
- elderly/frail elderly/old* people/aged/geriatric/senior*

This strategy returned between 3 and 24 'hits'. In addition, reference lists of studies selected as relevant were scanned to identify further papers.

## Abstracts

Each section author reviewed the abstracts and selected papers according to their selection criteria. Papers were read and then graded, and read and graded by a second author to agree the scores. Hand searching was carried out by the authors by searching reference lists of all of the papers.

## Peer/consensus review

After development of the first full draft, a consensus panel was identified by the team who were considered to be representative of the stakeholders and experts in the field. The consensus panel consists of the following members:

Professor Peter Passmore—Professor of Geriatric Medicine
Dr Beverley Collett, Consultant in Pain Management, Leicester
Professor Peter Crome, Professor of Geriatric Medicine
Ms Kristine Pedersen-Clinical Standards Advisor CEEU UNIT RCP (London)
Dr Amanda Williams, Reader in Clinical Health Psychology
Dr Lucy Gagliese, Clinical Psychologist
Dr David Lussier, Assistant Professor
Dr Gisele Pickering, MD Clinical Pharmacology
Professor Lynn Turner-Stokes, Chair of Academic Rehabilitation
Ms Jo Cummings, Patient Liaison, British Pain Society

## Appendix 2: Level of evidence

(from Harbour and Miller [1])

| | |
|---|---|
| *1++* | High-quality meta-analyses, systematic reviews of RCTs or RCTs with a very low risk of bias |
| *1+* | Well-conducted meta-analyses, systematic reviews of RCTs or RCTs with a low risk of bias |
| *1* | Meta-analyses, systematic reviews or RCTs or RCTs with a high risk of bias |
| *2++* | High-quality systematic reviews of case–control or cohort studies or High-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal |
| *2+* | Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal |
| *2* | Case–control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal |
| *3* | Non-analytic studies, e.g. case reports, case series |
| *4* | Expert opinion |

## Appendix 3: Matrices

*Abbreviations used in Appendix 3:*

| | |
|---|---|
| qnr | questionnaire |
| NH | nursing home |
| COM | community |
| MED PRACT | medical practice |
| CMS | chronic musculoskeletal pain |
| CMS | chronic widespread pain |
| CRS | chronic regional pain |
| MS | musculoskeletal |
| CBP | chronic back pain |
| sig | Special interest group |
| LBP | lower back pain |
| FIM | Functional Independence Measure |
| PHN | post-herpetic neuralgia |
| OA | osteoarthritis |

## Prevalence

| Ref. no | First author | Year | Country | Study design | Methods | Population studied | Sample/response | Age group | Type of pain | Prevalence | Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [5] | Asghari | 2006 | Iran | Cross-sectional | Face-to-face interview using qnr | NH<br>All residents of two private nursing homes | 114/124 (92%) | Mean 69<br>Range 56–90 | Current pain, pain by site and chronic persistent pain | Current pain: 72.8<br>Legs/hips: 43, Abdomen: 9, Chest: 7, Head/neck: 6,<br>Arms/shoulder: 5, Back: 4<br>Severe pain: 29.0<br>Chronic persistent pain: 66.7 | 2+ |
| [3] | Bergh | 2003 | Sweden | Cross-sectional | Postal qnr, nurse administered qnr and neuropsych examination | COM<br>Random sample of 70 year olds from community in Gothenburg | 508/778 (65%) for full study<br>241 randomly drawn for pain study | 70 year olds | Current pain, pain in last 14 days, pain by site, chronic pain | Current pain: M-20, F-42<br>In last 14 days: M-53, F-79<br>Head: M-9.1, F-18<br>Face: M-0, F-0.9<br>Teeth: M-0.8, F-2.6: Neck: M-4.1, F-10 Shoulders: M-6.6, F-20 sig<br>Arms: M-2.5, F-11 sig<br>Hands: M-2.5, F-16 sig<br>Upper back: M-2.5, F-13 sig<br>Lower back: M-17, F-25: M-2.5, F-5.2 Abdomen: M-8.3, F-11<br>Legs: M-15, F-16<br>Knees: M-5.8, F-23 sig<br>Feet: M-6.6, F-11<br>Chronic pain: M-38, F- 68 | 2+ |
| [18] | Bergman | 2001 | Sweden | Cross-sectional | Postal qnr | COM<br>Representative random sample of general adult population of 2 municipalities of Sweden | 2,425/3,928 (61.7%) | 20–74 (age-specific rates for 60+) | CMS, CWP and CRP.<br>Chronic defined as pain for >3 of last 12 months | For 60–64 year olds—CMS: M-46, F-51; CWP: M-19.5, F-25.0; CRP: M-27.6, F-27.8<br>For 65–69 year olds – CMS: M-37, F-53; CWP: M-12.5, F-22.0; CRP: M-25.0, F-31.0<br>For 70–74 year olds—CMS: M-34, F-48; CWP: M-10.4, F-21.8; CRP: M-27.1, F-23.8<br>CMS increased with age up to 55–64 for M and 65–69 for F then declined. CWP increased with age up to 60–64 for M and F then declined. CRP less clear association with age. | 2++ |
| [11] | Blay | 2007 | Brazil | Cross-sectional | Face-to face survey/ interview assessed | COM<br>Representative probability sample of non-institutional population of Brazilian state | 6,963/7,000 (99%) | 60 years or older | 5 chronic pain sites: joint, back, chest, gastrointestinal(all in last 6 months), headaches in last month, | Prevalence of any chronic pain was 76.2 (74.2–78.2)<br>Joint: 43.1, Back: 43.0<br>Headaches: 32.3, Chest: 28.1<br>GI: 18.3. Joint pain was most prevalent among F (49.5%) and back pain was most prevalent among M (34.7%) | 2++ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| [12] | Blyth | 2001 | Australia | Cross-sectional | Telephone interviews | COM<br>Random sample of 17,000 residents of New South Wales | 17,543 (70.8%) | 16+<br>Mean 43<br>(age-specific rates for older ages given) | Chronic pain (pain experienced every day for 3 months in the 6 months prior to interview). | 20.0% of females and 17.1% of males had chronic pain.<br>60–64: M-23, F-28<br>65–69: M-27, F-29<br>70–74: M-21, F-27<br>75–79: M-22, F-26<br>80–84: M-19, F-31<br>For males, it was generally highest in 55–69 years. For females, it was consistently higher after the age of 50. | 2++ |
| [19] | Boardman | 2003 | England | Cross-sectional | Postal self-completion qnr | COM<br>Adults randomly selected from 5 representative practices | 2,662/4,757 (56%) | Median 52,<br>Range 18–98<br>(specific data for >65s reported) | Head pain (3 months and lifetime) | 3 month prevalence for >65s:<br>M: 40.6, F: 49.7<br>Lifetime prevalence for >65s:<br>M: 77.6, F: 83.3%<br>Headaches decreased with age | 2++ |
| [6] | Boerlage | 2008 | Holland | Cross-sectional | Face-to-face interviews by nurse using standard qnr | NH<br>All residents in three public nursing homes in Rotterdam not cognitively impaired | 157/202 (77.7%) | Median 88<br>IQR 83–92 | Current pain or pain in last week, pain by site, chronic pain, episodic/ persistent pain | Current pain: 69.4. Most common sites—legs: 32, lower back: 27, shoulders and arms: 13. Chronic pain: 93%, unstable continuous pain: 54, episodic pain: 27, stable continuous pain: 16 | 2+ |
| [20] | Bressler | 1999 | Various | Systematic review | 5 databases (Medline, Embase, Cinahl, Age-line, Mantis | MIXED<br>Adults 65 and over with back pain of any type and duration, localised to the lumbar spine | Of 534 titles, 152 reviewed and 12 included in review | 65+ | Back pain (various timelines) | 10 cross-sectional/ 2 cohorts<br>Community studies: 12.8 to 49% (9 studies)<br>Medical practice setting: 23.6 to 51% (2 studies)<br>Nursing home: 40% (1 study)<br>General trend of decreasing prevalence with age. Women higher prevalence than men, even among very old (>80) | 2++ |
| [21] | Brochet | 1998 | France | Cross-sectional | Face-to face interview by psychologist using closed qnr | COM<br>Random sample from electoral register of elderly. Third year follow-up of subgroup. Sample was representative of area | 741 | 65+<br>Mean 74.2 | Pain in last year (pain anywhere during the previous year)<br>Persistent pain (daily pain for >6 months) | 71.5% had pain in last year<br>M: 66.8, F: 74.7. Main sites: limb joints—44.5%, back—29.6%, non-joint leg—17.3%<br>32.9% had persistent pain<br>M: 23.7, F: 40.1. Main sites: limb joints—19.4%, back—12.0%, non-joint leg—10.4%.<br>65–74: M-19.7, F-33.3<br>75–84: M-25.4, F-42.8<br>85+: M-34.5, F-48.4 | 2+ |
| [22] | Carmaciu | 2007 | England | Secondary analysis of baseline data from RCT | Postal self-completion qnr | COM<br>3 large practices selected for interest in care for elderly. All adults living at home, non-disabled and without cognitive impairment | 2,620/4,075 (64%) gave consent for trial. Of 1,240 due to get qnr, 88% responded | 65+ | Pain in the last 4 weeks, pain every day, pain several times a week, pain that never goes away | 39.9% had pain in past 4 weeks. Prevalence significantly associated with female sex and advancing age up to 84 years<br>>85 years reported far less pain<br>Of those with pain 53.2% had it every day, 73.6% had it several times a week and 40.4% had pain that 'never goes away' | 2- |

*Continued*

*Continued*

| Ref. no | First author | Year | Country | Study design | Methods | Population studied | Sample/response | Age group | Type of pain | Prevalence | Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [23] | Cavlak | 2008 | Turkey | Cross-sectional | Face-to-face interview | MIXED<br>Elderly in retirement home (16%) or own residence (84%) | 900 | Mean 71, Range 65–94 | MS (current pain) | All MS:72.1 (M:61.8, F:85.5)<br>Neck: 17.0<br>Upper extremities: 24.9<br>Low back: 27.6<br>Lower extremities: 51.1<br>Severe: 61.7 (M:53.5, F:69.5) | 2- |
| [46] | Chaplin | 2000 | England | Cross-sectional | Semi-structured clinical face-to-face interview | COM<br>Random sample of elderly from community drawn from one large practice sent qnr and invited for follow-up | 596/842 (71%) agreed to interview | 65+ | Abdominal pain (in past year) | Abdominal pain in past year: 25.2 (21.8–28.9)<br>Abdominal pain 6+ times in past year: 19.5 (16.5–22.6)<br>No significant differences with age or sex. Of those with frequent pain, 24% rated it as severe or worse. Most abdominal pain was chronic, with only 16% developing frequent pain in the past year | 2+ |
| [290] | Chen | 2003 | Australia | Cross-sectional | Qnr and physical exam | COM<br>Population-based random sample of whole population of women 70+, derived from electoral roll | 1,486/24,800 (6.2%) | 70+<br>Mean 75.1<br>46% aged 70–74, 46% aged 75–79, 8% aged 80+ | Lower extremity pain (hip, knee and foot). Based on current pain | The prevalence of any pain at the hip, knee, and foot was 39, 52 and 34%, respectively. 72% had pain at one or more sites. 14% experienced pain at all sites and 28% had no pain at any of the sites | 2+ |
| [24] | Christmas | 2002 | USA | Cross-sectional | Face-to-face interviews in participants homes and clinical exam | COM<br>Part of NHANES III study. Nationally representative sample of civilian non-institutional US population | 6,596 elderly adults included | 60+ | Significant hip pain on most days over the preceding 6 weeks | 14.3% (13.1–15.5) reported hip pain. Less common in men than women (11.9% versus 16.2%). Similar prevalence in men aged 60–70, 70–80 and older than 80. Similar prevalence in women aged 70–80 and 80+, but women aged 60–70 reported less hip pain | 2++ |
| [291] | Chung | 2004 | Korea | Cross-sectional | Qnr data collected via telephone interview | COM<br>Selected randomly from the cohort of the Korean Oral Health Study. Sample stratified for age and sex | 1,032 elders | Median 66.2<br>Range 55–85 | Five orofacial pain symptoms during the last 6 months for 3 age groups: 55–64, 65–74, 75+ | 42% reported 1 or more of the 5 orofacial symptoms.<br>Joint pain: 13.2, 17.7, 17.9<br>Face pain: 8.9, 10.3, 8.3<br>Toothache: 29.3, 26.9, 18.6<br>Oral sores: 25.8, 27.7, 23.7<br>Burning mouth:13.6,15.2,14.1<br>Only toothache significant differences by age | 2+ |
| [25] | Clausen | 2005 | Botswana | Cross-sectional | Face-to-face interview and clinical exam | COM<br>Cluster sample nationally representative for main study. 50% random subsample used for paper | 393/543 (72%) | 60–109<br>Mean 73.2 | MS pain | 83% had MS pain in at least one location.<br>60–69: M-69, F-83<br>70–79: M-79, F-91<br>80+: M-85, F-100<br>The four most common sites were shoulders, neck, lower back and knees | 2+ |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [292] | Cox | 2000 | Various | Review article | Basic review (databases not listed) | MIXED<br>Orofacial pain in elderly adults (no specific criteria given) | 4 papers: Lipton last 6 m, Riley last 12 m, Lester/Locker last 4 w | Lipton 55–74 and 75 +, Riley 65+<br>Lester 60+<br>Locker 50+ | Five orofacial pain symptoms for Lipton and Riley, one measure of oral pain for Lester and Locker | Joint pain: 4.0 (55–74), 3.9 (75+), 7.7 (65+), Face pain: 1.0 (55–74), 1.6 (75 +), 6.9 (65+), Toothache: 6.8 (55–74), 3.4 (75+), 12.0 (65+), Oral sores: 6.8 (55–74), 6.2 (75+), 6.4 (65+), Burning mouth: 0.8 (55–74), 1.2 (75+), 1.7 (65+) Oral pain: 22.0 (60+) | 2- |
| [26] | Dahaghin | 2005 | Holland | Prospective cohort study | Face-to-face interviews | COM<br>Population-based sample of all inhabitants of a single are aged 55 and over | Full sample 7,983 (78%) | 55+<br>Mean 70.6 | Hand pain in the last month | 16.9 (M: 9.7, F: 21.6)<br>Prevalence not significantly higher in people aged 70+ compared with 55–69. The prevalence of hand disability was 13.6 (M: 7.2 F: 17.8). This was increased in people aged 70+ compared with those 55–69 (OR=6.4; 5.4–7.6) | 2+ |
| [27] | Dawson | 2004 | England | Cross-sectional | Postal self-completion qnr | COM<br>Random sample of community-dwelling elderly residents | 3,341/5,039 (66.3%) | 65+ | Hip and knee pain (during the past 12 months pain in the hips/knees on most days for one month or longer) | Hip pain<br>65–74: M—14.7, F – 23.1<br>75–84: M—18.0, F—20.7<br>85+: M—18.8, F – 21.0<br>Knee pain:<br>65–74: M—26.1, F –36.2<br>75–84: M—31.0, F—37.4<br>85+: M—32.3, F – 35.5 | 2++ |
| [52] | Dionne | 2006 | Various | Systematic review | Four databases (Web of Science, Medline, Embase, Cinahl) | MIXED<br>Papers on the prevalence of back pain, back ache or neck pain in elderly adults | Of 299 titles, 51 included in review | Had to include age of 65 or above | Back pain (various timelines) | Increase in back pain prevalence with age (five papers)<br>Decrease in back pain prevalence with age (seven papers)<br>Curvilinear relationship—an increase until about 55 years and then a decrease (nine papers)<br>No change in prevalence of back pain with age (13 papers)<br>Mild back pain prevalence increased with age up to a peak in the sixth decade and then declined, but severe back pain continues to increase with age | 2++ |
| [28] | Donald | 2004 | England | Cohort | Postal qnr at baseline and 1-year follow-up | MED PRACT<br>Subjects recruited as part of RCT and had accepted offer of health screening. Practices chosen based on over 75 screening expertise | 4,804 (77%) | Over 75s<br>Mean: 80.7 | Joint pain (current pain) | Any joint pain: 83%<br>Constant pain: 26%(higher in F & >85s) Pain increased with age<br>Episodic joint pain<br>75–79: M-24.1 , F-26.7<br>80–84: M-23.9 , F-27.6<br>85–89: M-19.6 , F-27.7<br>>89: M-36.6 , F-32.5<br>Constant joint pain<br>75–79: M-19.2 , F-26.5<br>80–84: M-21.7 , F-31.5<br>85–89: M-24.5 , F-36.8<br>>89: M-25.3 , F-28.0 | 2- |

*Continued*

*Continued*

| Ref. no | First author | Year | Country | Study design | Methods | Population studied | Sample/response | Age group | Type of pain | Prevalence | Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [7] | Dos Reis | 2008 | Brazil | Cross-sectional | Face-to-face interviews and qnr | NH<br>All institutionalised elderly patients in one Brazilian care unit. No serious cognitive impairments | 60 | 60–104<br>Mean 77.6 | Any pain (timeline not clear) | 73.3% reported pain. 65.7% of those 60–80 and 84% of those 80+. The prevalence was higher among men (38.3) than women (35%). The most common location was back pain (31%), followed by lower limbs (28.2%) and upper limbs (14.1%). 61.4% reported their pain as severe | 2+ |
| [29] | Edmond | 2000 | USA | Cross-sectional | Interview and exam | COM<br>Secondary analysis of data from the 22nd exam of the Framingham heart study (a population-based cohort study of heart disease) | 1,037/1,710 (61%) had data on back pain | 68–100<br>Mean 78 | Back pain (pain, aching or stiffness in their back excluding their neck on most days current and in last year) | Current pain: 22.3%<br>68–80: M-17.6, F-25.1<br>81–100: M-13.4, F-26.6<br>Pain in last year: 48.6%<br>68–80: M-42.9, F-53.4<br>81–100: M-38.1, F-51.5<br>F higher rates than M, but no significant difference by age Low back pain more prevalent than mid or upper in all sex/age groups<br>Review of 10 other papers on back pain in elderly reported. Prevalence ranged from 16–56 for women and 7–51 for men | 2+ |
| [13] | Elliott | 1999 | Scotland | Cross-sectional | Postal self-completion qnr | COM<br>Random sample of patients from 29 practice lists in Grampian region | 3,605/4,379 (82.3%) | Six stratified age groups 25–34<br>35–44<br>45–54<br>55–64<br>65–74<br>75+ | Chronic pain (pain or discomfort in any location lasting for 3 months or longer) | 50·4% had chronic pain. After standardisation equivalent to 46·5% of general population. No significant differences between men and women (48·9 versus 51·8%)<br>Proportion significantly increased with age: 31.7% (25–34) to 62.0% (75+).<br>55–64: M-53.9, F-60.2<br>65–74: M-56.6, F-57.9<br>75+: M-59.9, F-64.3 | 2++ |
| [293] | Fox | 1999 | Canada | Systematic review | Medline, Health, Cinahl, Ageline, Cochrane and secondary refs. All methods and languages included | NH<br>All papers providing data on prevalence of pain in residents of a nursing home or other long-term care institution | Of 91 titles, 14 included in review (only 6 provided direct measures of pain) | No age details given, although intro focuses on over 65s | Pain in nine studies. Chronic pain in five studies | The prevalence of pain as determined by direct measure (self-report or chart review—six studies) ranged from 49 to 83%. The 49% study asked only about arthritic pain | 2++ |
| [30] | Franceschi | 1997 | Italy | Cohort | Qnr, interview and physical exam | COM<br>Random sample stratified for age and gender | 312 | 65–84<br>Mean 73 | Head pain in the previous year | 6% reported headaches in the previous year (3.6% of men and 0.8% of women) | 2+ |
| [31] | Frankel | 1999 | USA | Cross-sectional | Postal self-completion qnr | COM<br>Stratified random sample from 40 practices | 22,978 (88.2%) for full sample. 6,818: 65 + | 35+<br>Specific data for:<br>65–74 = 4,052<br>75–84 = 2,274<br>85 += 492 | Hip pain (In past 12 months pain in hips on most days for 1 month or more) | 65–74: 17.8, M-13.2, F-21.4<br>75–84: 19.0, M-13.8, F-30.8<br>85+: 19.3, M-14.0, F-21.1 | 2++ |

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| [32] | Grimby | 1999 | Sweden | Cohort | Face-to-face interview, qnr and brief health examination | MIXED<br>Population based sample of all adults born before 1,912 living in one area—including home and institution residents | 1,810/2,368 (76%) | 75+ | MS pain (including back pain, joint pain, pain in shoulders and extremities) (timeline not clear) | 62% had MS pain. Most common in shoulders/extremities: 41.3, back: 35.3, joint: 30.4. Pain prevalence was higher in F than M in all locations. Women 90 + reported pain less often than younger women. The prevalence of joint pain decreased with age<br>All MS pain:<br>75–79: M-46.0 , F-66.8<br>80–84: M-48.3, F-69.8<br>85–89: M-42.9, F-67.1<br>90+: M-37.5, F-58.6<br>All ages: M-45.9, F-67.2 | 2++ |
| [50] | Helme | 2001 | Various | Review (not systematic) | No details on specific databases or keywords used. No inclusion or exclusion criteria reported | MIXED<br>Reviewed papers of community and nursing homes | 11 papers detailed | 55–64<br>65–74<br>75–84<br>85+ | Pain (various definitions, sites, durations) | Prevalence ranged from 20–88%. Pain peaks or plateaus by age 65 and declines in the old (75+). Joint pain doubles in over 65s, but declines in over 75s. Foot and leg pain increase into ninth decade. Head pain decreases after a peak at 45–50. Abdominal, facial and visceral pain decrease with age. Chest pain peaks during late middle age then declines. Back pain peaks in late middle age then declines | 2- |
| [33] | Jacobs | 2006 | Jerusalem | Cohort | Face-to-face interview, qnr and brief health exam | COM<br>Age homogenous community-dwelling elderly cohort of West Jerusalem residents born in 1920–21 identified through election register. | 461 in phase 1<br>309 (67%) of phase 1 in phase 2 | 70 at phase1<br>77 at phase2 | CBP (based on reporting back pain on a frequent basis) | The prevalence of CBP significantly increased from<br>44% at 70 to 58% at 77<br>For males: 34–43%<br>For females: 55–63%<br>Females had significantly higher CBP at both time points. Pain slightly decreased in frequency with age with daily/weekly pain in 68% of 70s versus 61% of 77s (NS). Pain slightly decreased in severity with age with moderate/severe pain in 87% of 70s versus 82% of 77s (NS). Low back pain was most common site, present in 69% of 70s versus 91% of 77s | 2+ |
| [48] | Jacobbson | 2003 | Sweden | Cross-sectional | Postal self-completion qnr | MIXED<br>Random stratified sample of community dwelling, serviced homes and nursing homes | 4,278/8,500 (50.3%) | 75–105<br>Mean 83.7 | Chronic pain<br>Pain (MS pain or other pain) for the last 3 months | 40.4% had pain. 29.4% had MS pain, 22.4% had other/unspecified pain and 34% reported both.<br>75–79: 34.1%<br>80–84: 34.5%<br>85–89: 41.5%<br>90+: 50.1% | 2+ |
| [34] | Jinks | 2002 | England | Cross-sectional | Postal self-completion qnr | COM<br>Population-based sample of all adults aged over 50 years registered with three general practices | 6,792/8,995 (77%) | Mean 65.4<br>Range 50–100 | Knee pain (12 month period prevalence) | 1-year period prevalence of 47% (M: 44%, F: 49%).<br>There were clear significant trends of rising severity with increasing age | 2- |

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| Ref. no | First author | Year | Country | Study design | Methods | Population studied | Sample/response | Age group | Type of pain | Prevalence | Grade |
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| [47] | Landi | 2005 | Italy | Cross-sectional | Face-to-face interviews by multi-disciplinary team | COM WITH HOME CARE<br>Population-based database on frail elderly patients living in the community, but receiving home care programmes | 5,372 | Mean 78.5 | Daily pain and Pain less than daily (pain in any part of the body in the preceding 7 days) | Daily pain: 40% (M:38, F:42)<br>Pain less than daily: 15% (M:15, F: 14) | 2- |
| [294] | Leong | 2007 | Singapore | Cross-sectional | Face-to-face interviews | NH<br>All residents 65 years or over in three nursing homes in Singapore of variable cognitive status | 305/382 | 65+ | Any pain, acute pain and chronic pain | The prevalence of any pain was 40% and did not differ between those with normal cognition (48.7%), mildly impaired cognition (46.5%) or severely impaired cognition (42.9%). However, the impaired groups reported more acute pain (M-14.1, S-7.9) than those with normal cognition (2.5%) but less chronic pain (M-32.3, S-34.9 versus 46.2). Those with impaired cognition reported constant pain more often, fewer total sites of pain, and had more frequent and more severe pain. Those with chronic pain were significantly older than those with no pain | 2+ |
| [35] | Leveille | 2005 | USA | Cross-sectional | Interview and exam | COM<br>Secondary analysis of data from the 22nd exam of the Framingham heart study (a population-based cohort study of heart disease) | 1,166 left in study from original 5,209, 104 had no pain data so $n = 1{,}062$ | 72–99 | MS joint pain (pain, aching or stiffness in any joints on most days) | There was a higher age-adjusted prevalence of MS pain in women (63.5%) compared with men (51.6%). There was a marked difference in the proportions with widespread pain (M: 5.0%, F: 15.2%). There were similar proportions reported regional pain (M:29.3%, F:28.6%) and multi-site pain that did not meet criteria for widespread<br>Pain (M: 17.1%, F: 19.9%) | 2+ |
| [4] | Lichtenstein | 1998 | USA | Cross-sectional | Face-to-face interview with validated qnrs | COM<br>Americans form the community-based San Antonio Longitudinal Study of Aging | 833 | 65–79 | Pain in the last week. | 46% reported pain in the last week. Women more likely to report pain than men (50 versus 40.5%). Most common sites of pain were knees (23.9), lower back (20.9), shoulders (17–19), upper back (18.2) and right leg (16.6). 32.7% reported pain rarely/some of the time, 34.3% a moderate amount of time, 33.0% most of the time | 2- |
| [295] | Linsell | 2005 | England | Cross-sectional | Postal qnr | COM<br>A random sample of community residents in Oxfordshire | 3,341/5,039 (66.3%) | 65+ | Hip and knee pain (during past 12 months pain in hips on most days for 1 month or longer). | 8.3% reported hip pain only 65–74 (63.7%), 75–84 (29.7%), 85+ (6.6%)—decrease with age<br>21.8% reported knee pain only 65–74 (55.7%), 75–84 (36.6%), 85+ (7.7%)—decrease with age<br>11.3% reported both hip and knee pain | 2+ |

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| [53] | Macfarlane | 2008 | Europe | Cross-sectional | Postal qnr | COM<br>Population based prospective study of 8 European countries. Analysis of baseline qnr | 3,963/8,416 (48.7%) | 40–79 | CWP (pain in the past month which has lasted for one day or more and has been present >3 months) | The overall prevalence of CWP was 8.3%, 95% CI 7.5–9.3%). Prevalence was broadly similar across the four decades of study increasing slightly from 40 to 49 years (7.4%) to 50–59 years<br>(9.6%) and then decreasing at 60–69 years (8.5%) and 70 years and over (7.8%) | 2+ |
| [36] | Makela | 1999 | Finland | Cross-sectional | Qnrs, interviews and clinical tests | COM<br>Two stage cluster sample of population representative of Finland | 7,217/8,000 (90%) | 30+ | Shoulder pain (self-reported during previous month) | There was a steady increase with age in the prevalence of shoulder pain from age 30–34 (M: 13%, F: 18%) up to age 60–64, after which shoulder pain decreased with age.<br>60–64 (M: 44%, F: 45%)<br>65–69 (M: 37%, F: 37%)<br>70–74 (M: 31%, F: 42%)<br>75–79 (M: 25%, F: 32%)<br>80+ (M: 25%, F: 36%) | 2++ |
| [49] | Mantyselka | 2004 | Finland | Cross-sectional | Structured face-to-face interview and clinical exam | COM<br>Population-based random sample of home-dwelling elderly, 75 with dementia and 446 without | 601/700 (86%) | 75+<br>Mean age for non-demented 79<br>Mean for demented 84<br>(ND and D) | Any pain in the last month and any daily pain in the last month | Any pain: All—65.1%<br>(ND: 68.8%, D: 42.7%)<br>Daily pain: All—37.6%<br>(ND: 40.1%, D: 22.7%)<br>or 40% and 21% for D when restricted to self-report only<br>Pain significantly lower for those with dementia. Prevalence of daily pain increased with age in both D and ND | 2+ |
| [14] | McCarthy | 2009 | USA | Cross-sectional | Telephone interview administered qnr | COM<br>Data from the Einstein Aging Study a representative community sample from electoral roll | 840 | 70–101<br>Average 80 | Any pain and chronic pain | 74.6% reported any pain. More women than men reported any pain (79.1 versus 70.3). The prevalence of chronic pain was 52.0% (58.9% in women and 39.7% in men). Common pain locations were legs/feet: 44.8%, back: 39.8% and neck/shoulders: 31.2%. Prevalence of chronic pain did not vary significantly by age | 2+ |
| [8] | McClean | 2002 | Australia | Cross-sectional | Face-to-face interviews and medical record review | NH<br>Residents of 15 nursing homes in New South Wales. Non-communicative excluded | 917/932<br>(98.4%)<br>Only 544 residents gave pain info | M-81.0<br>F-84.5 | Present pain (any ache, pain or discomfort at the moment) | 27.8% were in current pain (M-21% versus F-31%). Main sites of pain were limbs (24%), joints (20%), back (18%), abdomen (12%), head (11%). 25% reported mild pain, 34% moderate and 41% severe | 2+ |
| [286] | Meyer | 2007 | USA | Cohort | Postal survey | COM<br>Random sample of community dwelling from Health Outcomes Survey. Proxy responses and institutionalised adults excluded | 172,314 (62%) completed baseline qnr<br>91,347 in this analysis | 65+ | Low back pain (within last 2 weeks) | At baseline 47.5% had some kind of disabling back pain within the last 2 weeks. 9.8% reported disabling low back pain most or all of the time. Prevalence and degree of back pain did not differ between baseline and follow-up | 2+ |

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| Ref. no | First author | Year | Country | Study design | Methods | Population studied | Sample/response | Age group | Type of pain | Prevalence | Grade |
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| [37] | Miro | 2007 | Spain | Cross-sectional | Face-to-face interview | MIXED<br>Random representative sample of Catalonia. Those with dementia excluded | 592/600 (94.9%) | 65+<br>Mean 74.9 | Any pain (in the past 3 months, pain that has lasted for 1 day or longer in any part of the body)<br>Chronic pain (pain as above present for >3 months). Various site specific pains by age group | 73.5% reported any pain (M-62.0%, F-83.3%).<br>65–74: 72.7 (M-63.6, F-81.4)<br>75–84: 73.4 (M-56.4, F-87.7)<br>85+: 78.2 (M-78.9, F-80.0)<br>66.0% had chronic pain.<br>65–74: 70.8 (M-61.1, F-80.0)<br>75–84: 71.9 (M-54.2, F-87.0)<br>85+: 72.1 (M-73.3, F-57.5)<br>Joints (65.6, 63.8, 51.2)<br>Upper limbs (33.0, 34.4, 32.6)<br>Lower limbs (59.2, 62.6, 58.1)<br>Lower back (61.0, 62.6, 44.2)<br>Neck (52.6, 56.4, 53.5)<br>Head (32.0, 35.0, 34.9)<br>Abdomen (23.8, 20.2, 11.6)<br>Hip (30.3, 31.5, 30.2)<br>Foot (37.4, 44.1,55.8)<br>Thoracic (15.0, 12.9, 11.6) | 2++ |
| [38] | Pope | 2003 | England | Cross-sectional | Postal self-completion qnr | COM<br>Random population survey of adults from two practices in Cheshire | 3,385/3,847 (88%) for full sample<br>Only 936 aged 60+ | 18–85<br>Specific rates for 60+ | Hip pain in the past month (hip pain, during the past month, lasting at least 24 hours) | One-month period prevalence for full sample was 10.5%<br>18–39: 5.3%<br>40–59: 10.4%<br>60+: 15.5%<br>So hip pain prevalence increased with age | 2+ |
| [296] | Riley | 1998 | USA | Cross-sectional | Telephone interviews | COM<br>Stratified random sample of community-dwelling older adults from Florida | 1,636 (75.3%) | 65–100<br>Mean 73 | Orofacial pain symptoms during the past 12 months | Joint pain: 7.7% (F sig >)<br>Face pain: 6.9% (F sig >)<br>Toothache: 12.0% (M = F)<br>Oral sores: 6.4% (M = F)<br>Burning mouth: 1.7% (M = F) | 2+ |
| [55] | Ross | 1998 | Canada | Cross-sectional | Personal standardised face-to-face interviews | COM<br>Community-dwelling cognitively functioning elders receiving home nursing services | 66/81 (81%) | 64–99<br>Mean 78 | Pain in last 2 weeks (experienced any noteworthy pain within the previous 2 weeks) | 75.7% were frequently troubled with pain or had experienced pain of a noteworthy nature within the past 2 weeks. The three most frequently reported sites were multiple joint pain (40%), knee (30%) and foot/ankle pain (18%) | 2- |
| [15] | Sa | 2008 | Brazil | Cross-sectional | Face-to-face interviews using qnrs | COM<br>Structured stratified sample in 34 research areas in Salvador | 2,297 in whole sample, 197 >65 | >20 for full sample<br>Specific quotes for >65 | Chronic pain (longer than 6 months) | 41.4% of full study population<br>20–34: M-22.6%, F-39.8%<br>35–64: M-39.0%, F-51.6%<br>>65: M-44.6%, F-63.4%<br>Pain significantly increased with age in both sexes<br>The lumbar region was most commonly affected (16.3%), followed by the knee (11.2%) and dorsal region (9.2%). | 2+ |

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| [39] | Sandler | 2000 | USA | Cross-sectional | Telephone interview survey | COM<br>Semi-random sample of adults across USA. Sampling methods not fully random | 2,510/4,120 (60.9%)<br>441 aged 60+ | 18–75<br>Specific estimates for 60+ | Lower abdominal pain in the last month (excluding menstrual pain) | Abdominal pain for 60+:<br>M—7.1%, F—20.3%<br>Abdominal pain was lowest in the 60+ age group. Men highest 18–39 (19.6%). Women highest 40–59 (26.0%) | 2+ |
| [297] | Sheffield | 1998 | Various | Systematic review | Medline reviewed using keywords migraine, headache and prevalence | MIXED<br>Papers on the population-based 1 year prevalence estimates of migraine | 15 papers included in review | All adult age groups included | Migraine (1-year period prevalence) | One-year prevalence ranged from 1to 25%. Migraine prevalence peaked 35–50 years in women and 25–35 in men. Women outnumbered men 3:1 in 35–54 age groups, and 2:1 in 60–64 age group. | 2++ |
| [51] | Smalbrugge | 2007 | Holland | Cohort | Face-to-face interviews at baseline and at 6 months | NH<br>Subjects from 14 Dutch nursing homes. Lots of exclusions (e.g. cognitively impaired, language problems) | 350/592 eligible (59%) at baseline<br>229 (65.4% of baseline at follow-up | 55–99<br>Mean 79.3 | Pain in the past 2 weeks | Pain prevalence was 68.0% at baseline: 40.5% (mild) and 27.5% (serious) pain. 23.1% reported constant pain and 13.4% unbearable pain. The >80's had less mild and less severe pain than <80s but the differences were not significant. 79% of those with pain at baseline still had it after 6 months | 2+ |
| [40] | Thomas | 2004 | England | Cross-sectional | Postal self-completion qnr | MIXED<br>All adults 50+ registered with three general practices in one area | 7,878/11,055 (71.3%)<br>Mean 66.3<br>50–59:2,521<br>60–69: 2,352<br>70–79: 2,030<br>80+: 975 | 50+ | Any pain in the past 4 weeks that has lasted one day or longer in any part of the body (data for various sites shown), and widespread pain | Any pain: 66.2%; 50–59: M-66.3, F-69.2; 60–69: M-68.4, F-69.0; 70–79: M-60.9, F-64.3<br>80+: M-57.4, F-65.6. Similar across age groups but higher in women. Some regional pains declined in prevalence in the elderly (abdomen, forearm, hand, head, low back, neck, shoulder) while others similar/increased (foot, hip, knee)<br>Widespread pain: 12.5%; 50–59: M-9.5, F-16.3; 60–69: M-12.5, F-15.6; 70–79: M-8.3, F-11.7; 80+: M-6.6, F-14.0<br>Prevalence of widespread pain declined in the >70s, higher in women | 2++ |
| [9] | Tsai | 2004 | Taiwan | Cross-sectional | Face-to-face interviews | NH<br>Stratified random sample of elderly adults without cognitive impairment in eight nursing homes | 150/156 (96.2%) | 65+ | Current pain | 65.3% pain prevalence. There was no significant difference in the mean ages of those with and without pain (80.7 versus 80.6). The average number of pain sites was 3.24. Knees (27.6%), lower back (24.5%), and hips (18.4%) were the most common pain sites | 2+ |

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| Ref. no | First author | Year | Country | Study design | Methods | Population studied | Sample/response | Age group | Type of pain | Prevalence | Grade |
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| [41] | Tsang | 2008 | Various | Cross-sectional | Face-to-face interviews | COM<br>18 surveys in 17 countries across Americas, Europe, Middle East, Asia and New Zealand. All surveys were based on multi-stage, clustered area probability household samples | 85,052 adults Average response rate of 71% | 16–21+ | Chronic pain in joint, neck, back or head | Prevalence of all chronic pain combined increased with age.<br>Developed countries:<br>18–35: M-20.9, F-30.4<br>36–50: M-31.5, F-42.6<br>51–65: M-42.5, F-55.0<br>66+: M-47.2, F-63.1<br>Developing countries:<br>18–35: M-22.0, F-35.2<br>36–50: M-30.8, F-47.2<br>51–65: M-43.8, F-59.4<br>66+: M-59.8 , F-73.3<br>More females than males had chronic pain in all ages | 2+ |
| [42] | Urwin | 1998 | England | Cross-sectional | Postal self-completion qnr | COM<br>An age and sex stratified random sample from three general practices | 4,506/5,752 (78.5%) Approximately 2,500 from over 65s. | 16+<br>eight age/sex groups including (a) 65–74 (b) 75+ | MS pain (pain for >1 week in the past month in the back, neck, shoulder, elbow, hip, hand and knee) | Prev: 65–74 M, F; 75+ M, F<br>Back: 20, 32; 17, 30<br>Neck: 17, 23; 18, 21<br>Shoulder: 16, 26; 20, 24<br>Elbow: 6, 6; 6, 9<br>Hip: 13, 20; 11, 20<br>Knee: 27, 32; 27, 35<br>Hand: 14, 21; 12, 20<br>In over 65s, knee pain most common. Women had more pain. Pain tended to increase with age up 65–74 and then plateau, except elbow and back pain in men, which peaked at 45–64. The gradient of pain increase with age was steeper for women. In women, the number of pain sites increased with age up to 65–74, while in men, they were similar after 45. 34% had pain in one site. 1% had pain in all eight sites | 2++ |
| [54] | Vogt | 2003 | USA | Cross-sectional | Face-to-face interview using standard qnr and clinical exam | COM<br>Random sample of well-functioning Medicare beneficiaries from Health ABC study | 3,075 (no response detailed) | 70–79 | Neck and shoulder pain (lasting at least 1 month during the previous year) | The prevalence of neck pain was 11.9%. 7.7% had moderate or severe neck pain. The prevalence of shoulder pain was 18.9%. 12.7% had moderate or severe shoulder pain. There were no differences in the median age between no, mild, moderate or severe neck or shoulder pain (73) | 2+ |

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| [10] | Weiner | 1999 | USA | Cross-sectional | Face-to-face interview | NH<br>Residents of two nursing homes (one veteran affairs [VANH] and one community [CNH]). Numerous groups excluded | 137 patients included<br>93% of VANH, 52% of CNH recruited | VANH<br>35–99<br>Mean 74.4<br>CNH<br>63–99<br>Mean 86.5 | Pain or discomfort, every day or almost every day. Chronic pain (above pain for > 3 months) | VANH: 58% had pain. Pain was chronic in 91%. Legs/ hips (33%), Back (20%-16 lower/4 upper), Abdomen (14%), Arm/shoulder (12%), Hands (8%), Head (8%), Multiple joints (2%).<br>CNH: 45% had pain. Pain was chronic in 93%. Legs/hips (25%), Back (28.6%-14.3 lower/14.3 upper), Abdomen (25%), Arm/shoulder (21%), Hands (7%), Head (4%), Multiple joints (11%) | 2- |
| [298] | Weiner | 2003 | USA | Cross-sectional | Face-to-face interview using standard qnrs and clinical exam | COM<br>Random sample of well-functioning Medicare beneficiaries from Health ABC study | 3,075 (no response detailed) | 70–79<br>Mean 73.6 | Low back pain (any back pain in the last 12 months) | The prevalence of back pain was 35.7%. 13.1% had mild pain, 22.6% had moderate/severe pain | 2+ |
| [43] | Westerbotn | 2008 | Sweden | Cross-sectional | Face-to-face interview using semi-structured qnrs | COM<br>Fourth follow-up of a cohort of the oldest old living at home in a Stockholm community | 333<br>All those remaining in the cohort who lived at home | 84–101<br>Mean 88.6 | Pain (no specific info on wording used) | Overall—46% reported pain<br>84–89: 46% and 90–100: 46%<br>Prevalence significantly higher in women than men (49 versus 35%).<br>Worst pain came from legs (24%), back (23%), arms (13%), neck (4%), head (3%) and abdomen (2%) | 2- |
| [44] | Won | 1999 | USA | Cross-sectional | Face-to-face interview | NH<br>Medicaid residents from nursing homes in four US states who had participated in previous study (severe cognitively impaired and cancer patients excluded) | 49,971 included in analysis | 65+ | Daily non-malignant pain (any type of physical pain or discomfort in any part of the body occurring daily over the previous 7 days) | 26.3% had daily non-malignant pain<br>65–74: 30.1%<br>75–84: 27.4%<br>85+: 23.6%<br>Lower pain prevalence observed in older individuals<br>Pain generally observed to be higher in women than in men | 2- |
| [45] | Won | 2004 | USA | Cross-sectional | Face-to-face interview | NH<br>Elderly residents admitted to Medicare nursing homes over a 3-year period from 10 states | 21,380 | 65+ | Persistent pain (presence of any pain recorded in at least two of three quarterly assessments over a 6-month period) | 48.5% had persistent pain<br>65–74: 46.0%<br>75–84: 49.6%<br>85+: 48.6%<br>Females had more pain than males (51.6 versus 37.9). | 2- |
| [16] | Yu | 2005 | Taiwan | Cross-sectional | Face-to-face interview | COM<br>Multi-stage random sampling of 4/12 Taiwan districts | 219 (RR not given) | 65+<br>Mean 74.3 | Chronic pain | 42% had chronic pain. Females had higher proportion than males (60.9 versus 39.1)<br>65–70: 32.6%, 70–75: 17.4%, 75–80: 29.3%, 80+: 20.7%<br>Most had pain in the lower limbs (47.8%) and back (35.9%), upper limbs (16.3%) | 2- |
| [17] | Zanocchi | 2008 | Italy | Cross-sectional | Face-to-face interview | NH<br>All eligible elderly patients living in two nursing homes in Torino, Italy | 129/334 eligible. 105/129 (81.4%) took part | Mean 82.2 | Chronic pain (pain that lasted for > 3 months) | Chronic pain was present in 82.9%. There were no significant differences in prevalence by age or sex<br>Chronic pain was persistent in 49.4%, episodic in 44.8%, momentary in 5.7%.<br>Chronic pain was most common in the knees (19.5%), hip (16.5%) and back (11.5%) | 2+ |

CRP, chronic regional pain; CWP, chronic widespread pain.

## Pharmacology

| Ref No | First author | Year | Country | Study design | Methods | Population studied | Sample/ response | Age group | Type of pain | Results | CASP Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [113] | Barber | 2010 | Australia | Review | Not stated | | | | | Review of pharmacological management of persistent non-cancer pain with emphasis on drug safety. | 4 |
| [95] | American Geriatric Society | 2009 | US | Systematic review | | | | | | Reviews pharmacological treatments for persistent non-cancer pain in older people, including, paracetamol, NSAIDs, opioids, adjuvants and topical treatments | 1++ |
| [117] | Kress | 2009 | Austria | Review | Not stated | | | | | Reviews pharmacology, efficacy and safety of transdermal buprenorphine<br>Short section on use in elderly. Unaltered pharmacokinetics in renal impairment or older people | 4 |
| [118] | Likar | 2008 | Austria | Cohort study | Open label study<br>28 day duration | Moderate to severe pain<br>Prior treatment with non-opioid or weak opioid and unsatisfactory response | 82 patients | >65 years<br>30 patients<br>51–64 years<br>27 patients<br><50 years<br>25 patients | MS(65%);<br>Nervous system (13%);<br>Injury (8%);<br>Cancer (5%) | Transdermal buprenorphine has similar efficacy, tolerability and safety in patients aged over 65 years compared with younger patients | 3 |
| [107] | Pergolizzi | 2008 | Worldwide | Review | Not stated | | | | | Reviews evidence for 6 of the most commonly used strong opioids in cancer and non-cancer pain<br>Many recommendations are extrapolated from studies undertaken in younger populations | 4 |
| [108] | Mercadante | 2007 | Italy | Review | Not stated | | | | Cancer pain | Review of pharmacological management of cancer pain in older people<br>Majority of paper describes use of strong opioids. Non-opioids and adjuvants discussed also. | 4 |
| [112] | Mercadante | 2006 | Italy | Prospective cohort study | | Patients already receiving opioids admitted to palliative care unit for inadequate pain control | 100 consecutive patients | 58 patients aged <65 years;<br>37 patients aged 65—4 years;<br>10 patients aged >75 years | Cancer pain | Lower mean opioid dose at stabilisation in older patients<br>No difference in number of opioid changes or route of administration between groups | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|
| [109] | Won | 2006 | US | Cohort study | Used minimum data set | Nursing home residents with persistent non-cancer pain | 10,372 | Residents aged >65 years | | No change in analgesia prescription for 35% of residents<br>Use of non-opioids, shorting acting opioids and MR opioids was 38, 19 and 3%, respectively<br>Improved functional status and social engagement with MR opioids compared with short acting opioids<br>Trend to fewer falls with analgesic use<br>Incidence of other adverse effects not higher among long-term opioid users. | 3 |
| [116] | Otis | 2006 | US | Open label cohort study | | Persistent pain >6 months | 227 | Mean 52.0 years<br>44 patients aged >65 years | Inflammatory pain (57.7%)<br>Neuropathic pain (20.3%)<br>Multiple pain (22%) | Average duration of treatment 25.6 days<br>Overall average TD fentanyl daily dose 15.1 μg/h<br>Dose stabilised within 2–3 weeks of starting treatment<br>Efficacy, tolerability and safety similar in older people to younger population | 3 |
| [114] | Ackerman | 2004 | US | Retrospective cohort study | Patients prescribed TD fentanyl or oxycodone CR identified from Medicare pharmacy | Patients prescribed TD fentanyl or Oxycodone CR | 2,095 | All age groups | Any | 75 patients received constipation diagnosis (TD fentanyl 28; oxycodone CR = 417). Among patients who were 65 years or older, oxycodone CR patients were 7.33 times more likely to be constipated thon TD fentanyl patients (OR = 7.33; 95%CI = 1.98–27.13; $P = 0.003$) | 2+ |
| [120] | Jean | 2005 | Taiwan | Open label, randomised trial | Patients randomised to 200 mg, 400 mg or 600mg gabapentin for 3 days<br>Analgesic benefit and adverse effects studied | | 61 patients | Not stated | Post-herpetic neuralgia | Moderate analgesic benefit and few treatment related adverse effects similar in all groups | 1- |
| [103] | Nikolaus | 2004 | | Review | Not stated | | | | | Reviews pharmacological treatments for persistent non-cancer pain in older people, including, paracetamol, NSAIDs, opioids and adjuvants | 4 |
| [110] | Podichetty | 2003 | USA | Review | Although systematic analysis was undertaken no search strategy was identified | | | | MS pain | Review, with focus on clinical issues and opioid intervention | 4 |
| [115] | Menten | 2002 | Belgium | Cohort study | Opioid naive patients or patients converted from po morphine stabilised on TD fentanyl | Cancer patients requiring opioid therapy for pain control | 651<br>341 patients aged over 60 years | 18–91 years | Cancer pain | Lower initial morphine doses in older people (>70 years)<br>Similar mean duration of treatment to younger patients<br>Similar adverse effect profile | 3 |

Assistive devices

| Ref No | First author | Year | Country | Methods | Population and Sample | Age | Type of pain | Intervention(s) | Results | Grade |
|---|---|---|---|---|---|---|---|---|---|---|
| [232] | Mann | 1999 | USA | RCT | 104 home-based frail older people | Mean 73 (SD 8.4) | Not specified | An assistive devices/environmental adaptations service delivered over 18-month period. The service led by an occupational therapist (assisted by a nurse and technician) | After the 18-month intervention period, the treatment groups showed significant decline for FIM total score and FIM motor score, but there was significantly more decline for the control group<br>Functional Status Instrument pain scores increased significantly more for the control group<br>In a comparison of healthcare costs, the treatment group expended more than the control group for AT and EIs. The control group required significantly more expenditures for institutional care. There was no significant difference in total in-home personnel costs, although there was a large effect size<br>The control group had significantly greater expenditures for nurse visits and case manager visits | 1 Assessor not blinded |
| [233] | Stueltjens | 2004 | n/a | Systematic review | Articles concerning community-dwelling older people until July 2002 Some participants has multiple pathologies others had non-specified | ≥60 | Not specified | Provision, advice and instruction on assistive device use | Strong evidence for the efficacy of advising assistive devices on functional ability from three high-quality RCTs (two reported statistically significant effect sizes) and two low-quality CCTs. | 1 Assumed but not explicit presence of chronic pain in the participants in studies included in the review |
| [234] | Steultjens | 2004 | n/a | Systematic review | Articles concerning adults with rheumatoid arthritis until 2002 | Not specified | Chronic RA pain | Advice and instruction in the use of assistive devices | Insufficient data to determine the effectiveness of advice/instruction of assistive devices | 1 |

| Ref. no. | First author | Date | Country | Method | Intervention | Population and sample | Age | Type of rain | Results | CASP Score |
|---|---|---|---|---|---|---|---|---|---|---|
| [299] | Kaasalainen and Crook | 2004 | Canada | Design:<br>Comparative descriptive design of four groups: no cognitive impairment; mild cognitive impairment; moderate cognitive impairment; severe cognitive impairment<br>Analytic approach: descriptive statistics | N/A<br>To examine the differences in completion rates and self-report skills to measure their pain across groups of residents with varying levels of cognitive impairment | *n* = 130 long-term care residents<br>Resident for more than 3 months, English speaking, no significant visual or hearing impairment | ≥65 | Various chronic | No one in group 4 ( severe cognitive impairment) able to complete pain verbal self-report scales.<br>60% of moderate cognitive impairment group able to complete verbal self-report scales.<br>100% in groups 1 and 2 (no cognitive impairment and mild cognitive impairment) able to complete verbal self-report scales<br>Findings offer some support for use of self-report pain scales in seniors, however, not for those with severe cognitive impairment | 2 |
| [87] | McDonald | 2009 | USA | Design:<br>Non-randomised two-group design.<br>Secondary analysis from a randomised post-test double-blind study<br>Interrupted versus non-interrupted<br>Analytic approach: content analysis | Auditory interruption whilst communicating.<br>To assess whether older adults who were interrupted as they communicated about their pain described less pain information than a non-interrupted group | *n* = 312 community-dwelling residents<br>*n* = 96 interrupted group<br>*n* = 216 non-interrupted group<br>English speaking<br>No malignant pain | 60+ | Osteoarthritis | Older adults in the uninterrupted group responded with significantly more pain information<br>Interrupted group described 56% less information about source of pain<br>41% less about quality of pain<br>29% less about pain treatments<br>24% less about timing of pain<br>15% less about pain intensity<br>Interruption diminishes the amount of important information communicated by older adults. Deliberate interruptions by practitioners may thus reduce communication of pain information | 2 |
| [92] | McDonald | 2009 | USA | Design: randomised post-test double-blind two-group study<br>Analytic approach: content analysis | To describe the types of pain information described by older adults with OA pain when asked closed versus open-ended pain questions | *n* = 207 community-dwelling older adults<br>*n* = 111 open-ended pain questions group<br>*n* = 96 in closed-ended pain questions group<br>English speaking<br>No malignant pain | 60+ | Osteoarthtitis | Older adults most frequently described information about pain location, timing and intensity in response to the open-ended questions<br>Pain treatment information elicited only after repeated questioning<br>There is a need to ensure multi-dimensional pain assessment that measures functional interference, current pain treatments, treatment effects and side effects to ensure more complete pain management discussion. | 2 |

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| Ref. no. | First author | Date | Country | Method | Intervention | Population and sample | Age | Type of rain | Results | CASP Score |
|---|---|---|---|---|---|---|---|---|---|---|
| [300] | McDonald | 2009 | USA | Design: post-test double-blind design using 3 groups<br>Analytic approach: content analysis | To test how practitioners pain communication affected pain information provided by older adults | *n* = 312 | ≥60 | Osteoarthritis | Participants described more pain information in response to open-ended questions without a social desirability bias | 2 |
| [88] | Mallen | 2009 | UK | Design: cross-sectional survey<br>Analytic approach: frequencies and logistic regression, content analysis | N/A To gauge whether and why older patients with MS pain think prognostic information is important and how often they felt prognosis was discussed in the general practice consultation | *n* = 502 recruited from primary care<br>Non-inflammatory conditions | 50+<br>Mean 65 | MS pain | 33% recalled discussing prognosis in consultation with GP<br>82% thought prognosis important<br>Perceived importance of prognostic information strongly associated with recalled prognostic discussion<br>Over 80% of older people feel prognosis is important but prognosis was only recalled as being discussed in one third of consultations | 3 |

Self-management

| Ref no. | First author | Year | Country | Study design | Intervention | Sample | Age | Main result |
|---|---|---|---|---|---|---|---|---|
| [258] | Ersek | 2008 | USA—Community | RCT | Self-management versus control<br>Self-management: 7 group sessions, one per week for 7 weeks. Akin to ASMP in content<br>Control: education by way of book on managing pain | Persistent pain interfering with function<br>Total = 256<br>Intervention *n* = 133<br>Control *n* = 123 | Intervention mean (SD) 81.9 (6.3)<br>Control mean (SD) 81.8 (6.7) | At 6 and 12 months follow-up no statistically significant differences between groups in pain or function |
| [259] | Haas | 2005 | USA—Community | RCT | Self-management versus control<br>Self-management: CDSMP, six group sessions, one per week for 6 weeks<br>Control: 6 month wait list | Chronic low back pain.<br>Total = 109<br>Intervention *n* = 60<br>Control *n* = 49 | Intervention mean (SD) 78.6 (7.5)<br>Control mean (SD) 75.5 (7.5) | At 6 months follow-up no statistically significant difference between groups in pain or function<br>Statistically significant difference between groups in SF36 emotional health in favour of intervention, but not in energy/fatigue or general health |
| [261] | Hughes | 2006 | USA—Community | RCT | Self-management versus control<br>Self-management: 'Fit and Strong', group sessions, three per week for 8 weeks. CDSMP<br>Control: 6 month wait list | Hip and/or knee OA<br>Total = 215<br>Intervention *n* = 115<br>Control *n* = 100 | Intervention mean (SD) 73.3 (7.5 SD reported in interim paper)<br>Control mean (SD) 73.4 (7.5 SD reported in interim paper) | At 6 months statistically significant decrease in pain but not function<br>At 12 months no statistically significant difference between groups in pain or function |

Exercise

| Ref. no. | First author | Year | Country | Study design | Intervention | Sample | Age | Main result |
|---|---|---|---|---|---|---|---|---|
| [240] | Dias | 2005 | Brazil outpatient rehabilitation | RCT | Exercise versus control<br>Exercise: educational lecture plus 24 supervised group sessions, two per week, plus 40 minutes walking 3 times per week, for 12 weeks, advised to continue walking up to 6 months<br>Control: educational lecture | OA knee.<br>Total = 50<br>Intervention *n* = 25<br>Control *n* = 25 | Intervention median (IQR) 76 (70–78)<br>Control median (IQR) 74 (70–78) | At 6 months follow-up statistically significant difference between groups in favour of intervention showing decreased pain and increased function<br>No statistically significant difference between groups in SF36 emotional health |
| [241] | Hasegawa | 2010 | Japan Community-based. | RCT | Exercise versus control<br>Exercise: supervised group sessions focused on strength, balance and flexibility, one per week plus home exercise, for 12 weeks<br>Control: customary levels of activity | Knee pain.<br>Total = 28<br>Intervention *n* = 14<br>Control *n* = 14 | Intervention mean (SD) 77 (4)<br>Control mean (SD) 77 (4) | At post-intervention statistically significant differences between groups in favour of intervention showing decreased pain and increased function |

Psychology

| Ref. no. | First author | Date | Country | Methods | Intervention | Population and sample | Age | Type of pain | Results | Grade |
|---|---|---|---|---|---|---|---|---|---|---|
| [220] | Cipher | 2007 | USA | Pre-/post-treatment | Multimodal CBT | 44 residents with dementia in a long-term care facility | 82 | Chronic | Pain decreased pre- to post-treatment. | 2- |
| [221] | Cook | 1998 | Canada | Randomised pre-/post-comparison group design | Group CBT | 22 nursing home residents | 77 | Chronic | CBT, 80% in CBT group improved versus 34% controls | 1- |
| [223] | Green | 1998 | Canada | Secondary data analysis | None | 43 community dwelling | 72 | Chronic | Neuroticism, openness and agreeableness predictive of satisfaction with CBT. | 2- |
| [225] | Morone | 2008 | USA | Qualitative | Mindfulness meditation | 27 community dwelling | 74 | Chronic low back pain | Less pain | 3 |

Interventional studies in post-herpetic neuralgia in older people

| Ref. no. | First author | Date | Type of intervention | Study type | Population and sample | Results | Level of evidence |
|---|---|---|---|---|---|---|---|
| [203] | Tenicela | 1985 | Sympathetic block | RCT, double-blind | 20 patients with acute herpes zoster, 10 patients received sympathetic nerve blocks using a local anaesthetic and 10 received a placebo | Active treatment (local anaesthetic) was effective in resolving acute herpetic neuralgia in 90% of the patients while the placebo (control) was effective in 20%. ($P < 0.01$). | 1 |
| [301] | Pasqualucci | 2000 | Acyclovir and prednisolone versus epidural local anesthetic and methylprednisolone | RCT | Active treatment group received epidural injection of methylpred and local anaesthetic ($n = 290$); control group received acyclovir and oral prednisolone ($n = 279$). Active group received treatment every 3–4 days for 7–21 days. | Incidence of PHN at 1 year 22% in control group versus 1.6% in active group | 1 |
| [206] | van Wijck | 2006 | Epidural steroids and local anaesthetic | RCT | Single epidural injection of 80 mg methylprednisolone and bupivacaine, ($n = 301$) versus standard oral antiviral therapy and analgesics ($n = 297$)<br>The primary endpoint was the proportion of patients with zoster-associated pain 1 month after inclusion<br>Patients older than 50 years | Significantly less patients in active group had pain at 1 month ($P = 0.02$) but not at 3 and 6 months where pain was reduced in both groups.<br>At 1 month, 137 (48%) patients in the epidural group reported pain, compared with 164 (58%) in the control group. After 3 months these values were 58 (21%) and 63 (24%), respectively ($P = 0.47$) and at 6 months, 39 (15%) and 44 (17%; 0.85, 0.57–1.13, $P = 0.43$)<br>Authors concluded that although a single epidural injection of steroids and local anaesthetics in the acute phase of herpes zoster has a modest effect in reducing zoster-associated pain for 1 month, the treatment is not effective for prevention of long-term PHN. | 1 |
| [205] | Kotani | 2000 | Intrathecal methylprednisolone and lignocaine | RCT, double-blind | Intrathecal injection of methylprednisolone and 3% lignociane weekly for up to 4 weeks ($n = 89$), versus lignocaine only( $n = 91$) or no treatment ($n = 90$).<br>Mean age 63 ± 8 years | Minimal change in the degree of pain in the lidocaine-only and control groups during and after the treatment period<br>In the methylprednisolone–lidocaine group, the intensity and area of pain significantly decreased, compared with the control group and the use analgesia declined at 4 weeks | 1 |
| [207] | Kumar | 2004 | Neuraxial and sympathetic blocks in herpes zoster and post-herpetic neuralgia: an appraisal of current evidence | Systematic review | Electronic literature search of Medline, EMBASE and Cochrane Clinical Trial electronic databases from 1966 to 2001<br>An appraisal of 21 trials including 4 RCTs, 6 cohort studies and other case series<br>No age limits applied | There is strong evidence for epidural administration of local anaesthetic–steroid combination for pain control during the acute phase (grade A). There is also evidence for the use of intrathecal steroid–local anaesthetic for PHN studies<br>Evidence for use of nerve blocks in the acute phase of HZ in the prevention of PHN appears to be strong (grade A) | |
| [209] | Freund and Schwartz | 2001 | Botulinum toxin type A | Case series | Seven patients with trigeminal, thoracic, and lumbar PHN lasting longer than 6 months<br>No age reported | The mean pain score before injection for the group was 8/10 (0 = no pain, 10 = worst pain), and after treatment was 5/10 | 3 |
| [210] | Argoff | 2002 | Intramuscular botulinum toxin type A (BTX-A) injection | Case series | 11 patients were treated with up to 300U of BTX-A injected intramuscularly based on the patient's report of maximal pain and the presence of myofascial trigger points on examination. A total of 25–50U was injected, depending on the size of the muscle. Patients asked to report the effects of treatment at 6 and 12 weeks No age reported. | All patients reported substantial relief of their burning and dysesthetic pain in the affected extremities, as well as normalisation of skin colour and reduction of any oedema that existed before treatment. In addition, the thermal and mechanical allodynia present in all patients before treatment lessened appreciably. | 3 |

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| Ref. no. | First author | Date | Type of intervention | Study type | Population and sample | Results | Level of evidence |
|---|---|---|---|---|---|---|---|
| [211] | Ranoux | 2008 | Intradermal Botulinum toxin type A (BTX-A) versus placebo | RCT, double-blind | 29 patients with chronic painful neuropathy (PHN, post-traumatic and post-operative)<br>Patients received intradermal BTX-A (20–190 units) into the painful area and evaluated at baseline, then at 4, 12 and 24 weeks<br>Patients aged between 27 and 78 years, 5 above the age of 70 years | BTX-A treatment, relative to placebo, was associated with persistent effects on spontaneous pain intensity from 2 weeks after the injection to 14 weeks. These effects correlated with the preservation of thermal sensation at baseline ($P < 0.05$)<br>BTX also improved allodynia to brush and decreased pain thresholds to cold, without affecting perception thresholds. There were sustained improvements in the proportion of responders (NNT for 50 % pain relief: 3 at 12 weeks), neuropathic symptoms and general activity<br>Most patients reported pain during the injections, but there were no further local or systemic side effects | 1 |

Guidelines

| Literature yield/references for guidelines review section | | |
|---|---|---|
| Opioids and the Management of Chronic Severe Pain in elderly—Consensus Statement of IEP | Pergolizzi | *Pain Pract* 2008; 8: 287 |
| IASP Global Year Against Pain in Older Persons | Gibson | *Expert Rev Neurother* 2007; 7: 627 |
| Application of EB to Older People Pain Management | Hallemack | *I Am Med Dir* 2007; Supp 2 |
| Int. Society of Geriatric Oncology Clinical Practice Recommendations for Use of Bisphosphonates in Elderly Patients | Body | *Eur J Cancer* 2007; 43: 852 |
| Pain Management in a Long Term Care Facility | Mullins | *J Pain Palliat Care Pharmaco Ther* 2003; 17: 63 |
| AGS Guidelines on Persistent Pain in Older People: Like Specific Pharmaco Therapeutic Recommendations | Lussier | *JAGS* 2003; 51: 883 |
| Comment | JAGS | *JAGS* 2002; 50: s205 |
| Pain Management in Older Adults: Prevention and Treatment | Gloth | *JAGS* 2001; 49: 188 |
| An Interdistiliary Expert Consensus Statement on Assessment of Pain in Older Persons | Hadjistabropoulous | *Clin.J Pain* 2007; 23: S1–43 |
| Evaluating the NGC Evidence Based Acute Pain Management Guidelines in Elderly for Use in Korea | Son | 2006; 122: 916 |
| Post Operative Pain Management in Elderly Patients: Correlations between adherence to guidelines and patient satisfaction | Sauaia | *JAGS* 2005; 53: 274–282 |
| New Paradmimes for Treating Elderly Patients with Cancer: Comp Geriatric Assessment and Guidelines for Supp Care | Balducci | *J Support Oncol* 2003; 1: 30–37 |
| Evidence Based Management of Osteoarthritis: Practical Issues Relating to the Data | Doriti | *Best Pract.Res Cl. Rheumatol* 2001; 15: 517–525 |
| Management of Chronic Pain in Older Persons. AGS Panel on Chronic Pain in Older Persons | AGS Panel | *In Geriatrics* 1998; 53 (Suppl 3): S8–24 |
| Treatment of Trigeminal Neuralgia with Thermorhizotomy | Sindou | *Neurochirurgie* 2009; 55: 203 |
| Medicare's New Restrictions on Rehabilitation Admissions | Segal | *AmJ Phys Med Rehabil* 2008; 87: 872 |
| Effect of Pulsed Radio Frequency for Post Herpetic Neuralgia | Kim | *ACTA Anesthes Scand* 2008; 52: 1140 |
| Intra-articular Use of Hyaluronic Acid in the Treatment of OA | Migliorie | *Clin Interv Aging* 2008; 3: 365 |
| Supportive Care of Elderly Patients with Cancer | Balducci | *Support Cancer Ther* 2005; 2: 225 |
| Ins and Outs of Neurologic Therapy for Chronic Pain (German) | Sternberg | *Nervenarzt* 2008; 79: 1164–1179 |
| Does Regular Exercise Reduce Pain and Stiffness in OA | Blackham | *Journal Fam Pract* 2008; 57: 476 |
| Monitored Anaesthesia Care in the Elderly: Guidelines and Recommendations | Ekstein | *Drugs Aging* 2008; 25: 477 |
| Pharmacologic Treatment of Neuropathic Pain in Older Persons | Haslam | *Clin Interv Aging* 2008; 3: 111 |
| Current Concepts in Pain Management | Stern | *Clin Podiatry Medical Surg* 2008: 25: 381 |
| Genetherapy and Cement Injection for Restablising Loosened Prosthesis | De Poorter | *Hum Gere Ther* 2008; 19: 83 |
| What is the Evidence for Viscosupplementation in Treatment of Hip OA? Systematic Review | Van den Bekeron | *Arch Ortho Trauma Surg* 2008; 128: 815 |
| Optimising the Role of Nurse Practitioner to Improve Pain Management in Long Term Care | Kassalainin | *Can J Nurse Res* 2007; 39: 14 |
| Treating Pain in the Older Person | Hunt | *J Pain Palliat Care Pharmacother* 2006; 20: 55 |
| Flouroscopically Guided Epidural Steroid Injections for Lumbar Canal Stenosis | Barre | *Pain Physician* 2004; 7: 187 |
| Bisphosphonates in Palliative Treatment of Bone Mets in Terminal Oncological Elderly | Santagelo | *Arch Gerontal Geri* 2006; 43: 187 |
| Long Term Outcome of Laminectomy for Spinal Stenosis in Octogenerians | Galliano | *Spine* 2005; 30: 332 |
| Management of Cancer Pain in Geriatric Patients | Balducci | *Palliat Support Oncol* 2003; 1: 175 |
| Demographic Assessment and Management of Pain in Elderly | Davis | *Drugs & Aging* 2003; 20: 23 |