4. Osteoarthritis

4.1 Overview

Osteoarthritis is the most common form of chronic arthritis. The condition affects approximately 1.4 million Australians, or approximately 7.3% of the population (AIHW 2002a). Osteoarthritis is characterised by joint pain and mobility impairment associated with the gradual wearing of cartilage. The cause of osteoarthritis is not completely understood, however, it is thought to be a complex, adaptive response of the joints to biomechanical, genetic and environmental stresses (Dieppe 1998). Treatment is primarily symptomatic and at present there is no known cure. The prevalence of osteoarthritis increases with age.

Osteoarthritis poses a substantial and increasing burden on individuals and society as a result of population dynamics, impaired health-related quality of life and the socio-economic impact of the condition. This report outlines opportunities to improve the prevention and management of osteoarthritis. The findings are summarised in Figure 4.1 below.

Prevention and management of osteoarthritis across the disease continuum

Figure 4.1: Summary of opportunities to improve osteoarthritis prevention and management

Disease continuum →

Stage of disease continuum	**Well population**	**At risk population**	**Established disease**	**Controlled chronic disease**
Level of prevention	**Primary prevention**	**Secondary prevention / early detection**	**Disease management and tertiary prevention**	
Goal	*Prevent incident disease*	*Prevent progression to established Disease*	*Prevent repeated acute episodes, readmissions, and prevent or delay complications*	*Optimise health-related quality of life*
Nature of intervention	*Promote awareness of the need for weight control and joint injury prevention (sport, recreational, occupational)	*Knowledgeable health professionals *Promote weight control and joint injury prevention *Support attendance at an educational program	*Manage co-morbidities *Provide timely access to joint replacement surgery *Promote healthy lifestyle behaviours	*Support ongoing self-management *Optimise symptom relief *Preserve function and independence *Provide psychosocial support
Responsible sectors	*Public health *Primary care *Other sectors	*Primary care *Public health *Community care	*Primary care *Specialist services *Hospital care	*Primary care *Community care
Promotion of HRQOL	Health Promotion	Health Promotion	Health Promotion	Health Promotion

NB Each stage requires critical assessment of: workforce requirements, resource allocation, data requirements, evidence base, cost-effectiveness, quality measures, guidelines and standards, monitoring and evaluation, roles and responsibilities (National, State, public/private), equity impact, consumer involvement etc.

Source: Adapted from the National Public Health Partnership group framework (2001)

Identifying osteoarthritis

Osteoarthritis, also known as 'osteoarthrosis' and 'degenerative joint disease', is a complex condition affecting the cartilage as well as other elements of the joint structure. The condition is associated with joint pain and disability. The point of onset of osteoarthritis is undetectable; however, pathology (radiological changes) and symptoms are used as markers of the disease. In the future, it may be possible to use molecular markers for diagnostic purposes (Degroot et al 2002).

Radiological definition

Radiological (x-ray) changes, characterised by decreased inter-bone distance and the presence of osteophytes, can be used to detect osteoarthritis (Felson and Zhang 1998), and a system for staging radiological changes is widely used in epidemiological studies (Kellgren and Lawrence 1957). Radiological changes occur late in osteoarthritis and there is limited correlation between changes seen on x-ray and the presence of symptoms such as pain and impaired function (Sowers 2001). Furthermore, the degree of inter-bone distance loss seen on plain radiographs is dependent in part on the technique used to obtain the x-ray (Wolfe et al 2002). Wide-scale use of plain radiography for the purposes of population screening for osteoarthritis is impractical and not economically viable (March et al 1998).

Clinical definition

A system to classify knee, hip and hand osteoarthritis on the basis of radiological and clinical findings incorporates a number of criteria, including the presence of joint pain (Altman 1995). There is no validated system for identifying stages of the condition based on the physical findings or symptoms of osteoarthritis (WHO 2003). Clinical diagnosis is usually based on the presence of joint symptoms and evidence of structural change seen on x-ray.

Natural history and disease progression

Clinical presentation

Osteoarthritis usually progresses slowly and may produce non-specific local symptoms that impair health-related quality of life, such as pain with joint use, stiffness, loss of joint mobility and function and alteration in the shape of the joint. Swelling of the affected joint(s) may be evident, together with tenderness, joint deformity and muscle weakness (O'Reilly and Doherty 2003). The knee is most commonly involved, followed by the hip (Felson et al 2000). The spine, foot and joints of the hand can also be affected.

Symptoms and signs may vary over time and between joint sites. While many people with osteoarthritis adapt to and cope with their symptoms over time, some will develop severe joint damage, disability and pain (Cooper et al 2000). Anxiety and depression may also occur (CDC 1994; Haq et al 2003; O'Reilly and Doherty 2003).

Pathological changes associated with osteoarthritis are usually visible by plain x-ray. However, evidence of radiological change has little relationship to the pain and disability experienced by the affected individual, and not all people with radiological evidence of osteoarthritis have symptoms, and not all people with symptoms have radiological evidence of osteoarthritis (Lawrence et al 1966; WHO 2003; Lachance et al 2001).

Radiological and symptomatic progression

Long-term studies show that radiological progression of knee osteoarthritis occurs gradually in one to two-thirds of people (Spector et al 1992; Hernborg and Nilsson 1977; Cooper et al 2000), and the rate and degree of symptomatic deterioration varies. Symptoms may stabilise once the condition is established; however, knee pain at baseline and involvement of both knees appear to increase the likelihood of symptomatic progression (Spector et al 1992).

Danielsson (1964) and van Saase (1990) demonstrated that radiological progression occurs in the majority of cases of hip osteoarthritis; however, there are conflicting reports of symptomatic progression (Seifert et al 1969; Danielsson 1964). Spontaneous radiological and symptomatic recovery, while rare, has been reported (Bland and Cooper 1984).

Longitudinal studies of hand osteoarthritis have established that radiological progression occurs in about 50% of cases. The incidence and rate of progression increases with age and the rate of progression slows as severity increases (Kallman et al 1990; Hart et al 1994).

Treatment goals

There is currently no cure for osteoarthritis, although it may be possible to reduce cartilage loss and slow the progression of the condition in the future. The major goals of treatment are pain control with minimal adverse effects, maintenance or improvement of joint mobility and function, and improved health related quality of life. Treatment should be tailored to each individual (ACR 2000).

Non-pharmacological interventions including physiotherapy, occupational therapy, weight loss and exercise can be used to alleviate the symptoms associated with osteoarthritis. These are often used in conjunction with pharmacological interventions. Joint replacement surgery may be indicated for symptom relief (ACR 2000, Jordan et al 2003).

KEY OBJECTIVE: Promote best practice for the optimal management of osteoarthritis.

4.2 Burden of disease

The global burden of osteoarthritis is substantial; more than 50% of people over 65 years of age have radiological evidence of osteoarthritis (Felson and Zhang 1998). The pain and disability associated with osteoarthritis affects approximately 10% of men and 18% of women over 60 years of age. The incidence and prevalence of osteoarthritis will continue to rise as the population ages unless measures are taken to improve disease prevention. Based on current trends, osteoarthritis is forecast to become the fourth leading cause of disability worldwide by the year 2020 (Woolf and Pfleger 2003).

Incidence

There are inherent difficulties in obtaining incidence data for osteoarthritis due to problems in defining the disease and its point of onset. The Australian Burden of Disease and Injury Study (AUSBODI), using DISMOD software to model the incidence of osteoarthritis, showed a higher incidence of osteoarthritis among women in all age groups (0.29%) compared to men (0.17%). According to this model, the incidence of radiological osteoarthritis is highest among women between the ages of 65 and 74 (1.35%), and among men aged 75 years and over (0.9%) (Mathers et al 1999). In other studies, the incidence of osteoarthritis ranges from 1% to 3.3% per year (Oliveria et al 1995; Cooper et al 2000; Felson et al 1995; Schouten 1991; Hart et al 1999).

Prevalence

Accurate measurement of osteoarthritis prevalence is confounded by the difficulties in defining the condition and its point of onset. Symptoms, radiological changes and self-report of the condition are used to measure osteoarthritis prevalence; figures vary according to the method and definition of osteoarthritis used.

Symptomatic prevalence

Studies suggest that around 10% of people over 60 years of age report significant clinical problems as a result of osteoarthritis (WHO 2003). Pain is the most common symptom (Lachance et al 2001). On the basis of symptoms alone, the prevalence of knee osteoarthritis is approximately 3% to 11%, and the prevalence of hip osteoarthritis is approximately 3% (Felson et al 1987; Felson and Zhang 1998; Spector et al 1991).

Radiological prevalence

Radiological evidence alone demonstrates that the prevalence of osteoarthritis increases with age in all joints in men and women, with an overall prevalence of 7.7% to 14.3% in those aged 45 to 49 years (van Saase et al 1989), 30% to 41% in those aged 55 to 64 years (Kellgren and Lawrence 1958), and 40% to 60% in those aged 75 to 79 years (Bagge et al 1992). Radiologically defined disease is present in at least one joint in more than 50% of people over the age of 65 (Lawrence et al 1998).

Self-reported prevalence

Arthritis, comprising osteoarthritis and rheumatoid arthritis, is the most common self-reported chronic condition in Australia among people aged 75 years and above (52%), second among those aged between 65 and 74 years (45%), and third in people aged 55 to 64 years (33%) (ABS 2002a). Overall, more Indigenous Australians report ‘arthritis’ (16%) than non-Indigenous Australians (7%) (ABS 2002b). Osteoarthritis is the most common form of arthritis.

Self-reports of osteoarthritis are increasing. In 1995, approximately 1.2 million Australians reported osteoarthritis (64 per 1000 population, or 6.4%) (AIHW 2002a). According to the National Health Survey in 2001, approximately 1.4 million Australians self-reported osteoarthritis (approximately 7.3 per 1000 population, or 7.3%) (ABS 2002a). In other Australian studies, the self-reported prevalence of osteoarthritis ranges from 8.6% (5.1% of men and 11.9% of women) (Hill et al 1999), to 10% of men and 19.5% of women (March et al 1998), to 25% of people aged over 60 years (Jones et al 1995).

There are limitations to the measurement of osteoarthritis prevalence on the basis of self-report because of problems in defining the disease and its point of onset, wide variation in the severity and impact of the condition, and different thresholds for pain and disability (Lachance et al 2001), and for seeking medical attention (March et al 1998). In addition, epidemiological surveys may use broad diagnostic terms such as 'arthritis' or 'rheumatism' during data collection, which do not distinguish between different forms of arthritis (Picavet and Hazes 2003). Accurate self-reporting is more likely for diseases with clear diagnostic criteria and a specific treatment regime, such as diabetes (Kehoe et al 1994; Kvien et al 1996). Compared to well-defined conditions, arthritis is likely to be over-reported (Kehoe et al 1994).

Studies attempting to validate self-reports of osteoarthritis by comparing them with a clinical diagnosis have used different methods. An Australian study showed that postal surveys have the potential to identify people who self-report 'definite' or 'no' general osteoarthritis in the community, compared to people who are unsure. In this study, self-reported 'definite' osteoarthritis in at least one joint was subsequently confirmed through clinical examination in 81% of cases, and a negative report was confirmed in 89% of cases (March et al 1998). An American cross-sectional study comparing self-reported symptoms of osteoarthritis with clinical findings found that self-reports of pain correlated with radiological evidence in only 15% and 40% of reports by Caucasian and African American women, respectively (Lachance et al 2001). Among people attending a rheumatology clinic, 52% of people self-reporting osteoarthritis had a corresponding physician diagnosis of the condition (Rasooly et al 1995).

The significance of validating self-reported osteoarthritis is unclear, given the evidence that people with radiological evidence of osteoarthritis may not have pain, and people with pain may have no radiological evidence of the condition. A combination of self-reported symptoms and clinical examination is the best method to confirm a diagnosis of osteoarthritis (March et al 1998). However, self-reports of musculoskeletal conditions are consistently correlated with pain, and thus are a useful source of information when assessing diseases characterised by pain and functional limitation (Picavet and Hazes 2003).

Health services utilisation

In Australia in 2002-03, osteoarthritis was the tenth most commonly managed problem in general practice (Britt et al 2003) and the second most commonly reported chronic condition after hypertension in the primary care setting (O'Halloran 2003). It is the second most common reason for consulting a rheumatologist (Lybrand 2003), and the third most common reason for imaging after back pain and fracture, comprising 4.1% of all orders (Britt et al 2001). In general practice settings in 2002-03, approximately 30% of arthritis problems resulted in the prescription of non-steroidal anti-inflammatory drugs, specifically Cox-2 inhibitors (Britt et al 2003).

In 1995-96, osteoarthritis accounted for 1.6% of older patient hospital separations and 0.9% of total hospital separations (AIHW 1997). Hospital separations for osteoarthritis in Australia increased by 42%, from 39 186 in 1993-94 to 55 578 in 1999-00 (AIHW 2002b).

Osteoarthritis is the most common reason for joint replacement surgery in Australia, accounting for 96% of primary (initial) total knee replacement procedures and 88% of primary total hip replacement procedures performed in 2001-02 (AOA 2003). The number of joint replacement procedures increased by 9.1% between 1999-00 and 2000-01, and by 13.4% between 2000-01 and 2001-02 according to data from the Australian Orthopaedic Association National Joint Replacement Registry. The increase is due to growing demand for joint

replacement surgery by younger individuals, an increase in the number of older people with joint pain and disability and the need for more revisional procedures as people outlive their prosthetic devices (AOA 2003).

Costs

Costs to society

There are few studies of the direct cost of osteoarthritis in Australia. In 1993-94, direct costs to the health system associated with osteoarthritis were estimated at A$624 million (Mathers and Penm 1999). In 2000-01 the direct cost of osteoarthritis was A$1.188 billion, or 2.42% of the total allocated health system expenditure, based on data sources used in the development of a recent report (AIHW 2004). The direct costs to the health system in these studies included such items as public and private hospital, nursing home, medical, pharmaceutical and imaging costs.

A report by Access Economics, which used a different costing methodology and included consideration of indirect costs, estimated the total cost of both osteoarthritis and rheumatoid arthritis to be A$8.96 billion dollars in 1999-00, with a total cost per capita of A$468.93. In this report, indirect costs comprised 75% of the total cost of all types of arthritis. Separate cost data for osteoarthritis were not provided (Access Economics 2001b).

A recent study demonstrated that total joint replacement surgery is highly cost effective, as well as efficacious, compared to other treatments for osteoarthritis. The estimated cost per quality-adjusted life year for total knee and total hip replacement is A$10,000, and A$7,500, respectively (Segal et al 2004). The estimated cost of joint replacement procedures in Australia exceeds A$500 million per annum (Graves et al 2004).

Costs to individuals

People with osteoarthritis have higher direct costs compared to those without the condition. They incur higher charges for in-patient care, diagnostic and therapeutic procedures, general medical care and equipment, and higher expenses for the care of co-morbid conditions compared to people without osteoarthritis (Gabriel et al 1997). Ninety-six percent of people with osteoarthritis use prescription medications (Gabriel et al 1999b).

An Australian study demonstrated that the cost of osteoarthritis is high for women in particular, who spend more on medications and special equipment. Pain severity, longer disease duration, poorer social function and mental health are determinants of disease-related expenditure (Lapsley et al 2001). Complementary and alternative medicines are used by 40% of Australians with osteoarthritis to treat their symptoms, at an average cost of A$32.25 per person per year, ranging from no outlay to A$603.30 (Zochling et al 2004). Costs reported by individuals with osteoarthritis are likely to underestimate the true cost (Lapsley et al 2001).

The indirect costs of musculoskeletal conditions include tangible items such as loss of income and lost productivity, pain, disability, emotional impairment, impaired social function and other health-related quality of life issues (Lubeck 2003).

Diminished employment capacity and subsequent income loss can affect economic status. Occupational disability is higher and household income lower in people with osteoarthritis compared to those without the condition. It is estimated that more than half of the costs of osteoarthritis result from work loss, as many people begin to experience the effects of

osteoarthritis during their working life (Felson and Zhang 1998). Older age, lower educational attainment and co-morbidity are believed to account for a large proportion of the earnings loss (Pincus et al 1989).

Trends

The prevalence of osteoarthritis increases with age, and the increasing number of people over 65 years of age is contributing to the growing problem of osteoarthritis worldwide (Reginster 2002). The proportion of Australians aged 65 and over is forecast to increase from 12% of the population in 1997, to 18% by 2021 (AIHW 2000). The direct and indirect costs to society and individuals are already substantial and are likely to increase.

4.3 Impact

The World Health Organization reports that 80% of people with osteoarthritis have some degree of limitation, with 25% unable to carry out activities of daily life. The major consequences of osteoarthritis are: pain, stiffness, loss of joint mobility, disability, loss of independence, reduced social interaction, deformity, decline in well-being, and to a limited extent, mortality (WHO 2003).

Health-related quality of life

Globally, osteoarthritis ranks fourth after ischaemic heart disease, cerebrovascular disease and total musculoskeletal disease in impact on health-related quality of life (Reginster and Khaltaev 2002). The major outcomes and indicators associated with osteoarthritis are pain or discomfort, limitation of activities and reduced participation (WHO 2003).

Pain

Pain is the major symptom associated with osteoarthritis and the principal reason for seeking care (Davis et al 1992). Pain may be exacerbated by weight-bearing activities and stair-climbing and generally abates with rest. People with pain from osteoarthritis have significantly lower quality of life compared with population norms in Australia (Hill et al 1999). Symptomatic osteoarthritis is more likely to be associated with disability (Creamer et al 1999), which is linked to other aspects of life such as social integration and participation (Verbrugge and Juarez 2001). Pain related to osteoarthritis has also been linked to psychosocial factors, including anxiety, depression and helplessness (Keefe et al 2002; Creamer et al 1999).

Disability

Arthritis (comprising osteoarthritis and rheumatoid arthritis) is the leading cause of disability in Australia, resulting in approximately 14% of all disability and affecting more women than men (AIHW 2002b). In Australia, osteoarthritis accounted for 2.2% of total disability-adjusted life years (DALYs) in 1996. Osteoarthritis ranked third highest after depression and breast cancer as a cause of DALYs in women aged 25 to 64 years (4.9%) and tenth in women over 65 years of age (2.2% of total DALYs). Osteoarthritis was the ninth leading cause of

disability burden, measured in years of life lost due to disability, or YLD, in men (3.9% of total YLD), and the third leading cause of disability burden among women (5.7% of total YLD) (Mathers et al 1999). Disability affects quality of life; people with osteoarthritis have significantly lower quality of life scores in physical function and role limitation (physical) compared to population norms (Hill et al 1999).

Disability in people with osteoarthritis is related to joint pain, which may become persistent and more severe as the disease progresses. In addition to pain, other factors and determinants contributing to disability in osteoarthritis include disease duration and severity, age, female gender, obesity, depression, anxiety, lower socio-economic status, quadriceps muscle weakness and the presence of co-morbid conditions (Creamer et al 2000; Sharma et al 2003b).

In comparison with other chronic conditions, people with arthritis disability tend to have more physical limitations, difficulties with personal care and problems with maintaining their household. The onset of disability is likely to be gradual and of mild to moderate severity. As a result, people with osteoarthritis are more likely to adapt to their disability and to rely on the use of mobility aids and self-care techniques, both relatively accessible and inexpensive, than on formal assistance. They remain more independent than people disabled for other reasons (Verbrugge and Juarez 2001).

Psychosocial impact

The pervasive nature of arthritis symptoms and their effect on physical, social and occupational activities can be demoralising. People with arthritis are more likely to self-identify as 'disabled' compared to those with other chronic conditions (Verbrugge and Juarez 2001). They may experience psychological symptoms, including anxiety, depression and helplessness (Keefe and Bonk 1999). It has been reported that 10% of people with osteoarthritis are depressed (Abdel-Nasser et al 1998), and that psychological symptoms exacerbate pain and disability (Keefe and Bonk 1999).

Coping ability and self-efficacy influence the response to osteoarthritis and play a role in the associated pain and disability (Keefe et al 2002). Self-efficacy refers to confidence in one's ability to successfully undertake and accomplish a particular health task (Bandura 1977). Greater self-efficacy is associated with improved self-reported and performance-based pain and disability outcomes in osteoarthritis (Sharma et al 2003a; Warsi et al 2003). Self-care ability may mediate and moderate pain and psychosocial health in people with arthritis (Keefe et al 2002).

Social well-being, including relationships, leisure activities and community involvement, may be affected by osteoarthritis (CDC 2003). Social support is linked to health outcomes in osteoarthritis (Keefe et al 2002) and with more effective self-management behaviour (Gallant 2003). Social support appears to have a direct impact on functional status in knee osteoarthritis (Weinberger et al 1990), protecting against functional decline (Sharma et al 2003a). Women are more likely than men to receive social support (Lapsley et al 2001).

Mortality

Osteoarthritis is associated with a low mortality (death) rate, with 0.3 and 0.8 deaths per 1,000,000 men and women, respectively (Mathers et al 1999). Mortality has been associated with serious gastrointestinal adverse events from non-steroidal anti-inflammatory drugs which may be used in the management of osteoarthritis pain (Schnitzer 2001; Bidaut-Russell and Gabriel 2001).

4.4 Risk factors and determinants of health

Overview

Osteoarthritis is associated with a range of intrinsic, behavioural and environmental risk factors and determinants. It is difficult to make a distinction between risk factors and determinants associated with the development and progression of osteoarthritis, and with disability and other quality of life issues related to the condition. Risk factors and determinants may have a synergistic or cumulative effect (Felson and Zhang 1998).

Description of risk factors and determinants

Age

The prevalence of osteoarthritis rises with age (Felson et al 1987); age is the strongest predictor of osteoarthritis development (Felson et al 1995; van Saase et al 1989). The majority of people have radiological evidence of osteoarthritis in at least one joint by 90 years of age. Diminished capacity for cartilage repair, hormonal changes and the cumulative effects of environmental exposures are possible age-related mechanisms (Petersson and Jacobssen 2002).

Gender

Several large studies have demonstrated that women are more prone to developing osteoarthritis than men. Osteoarthritis in the knee, hand and multiple joints is more common in women over 50 years of age than men (Egger et al 1995; Felson et al 1995; Oliveria et al 1995), and women over 65 years of age are more likely to have hip osteoarthritis than men (Felson and Zhang 1998; Richette et al 2003). Gender differences are less marked after 80 years of age (Felson and Zhang 1998). The incidence of symptomatic hip, knee and hand osteoarthritis is approximately twice as high among women compared to men (Oliveria et al 1995).

Family history

A study of twins demonstrated that genetic effects account for at least 50% of cases of osteoarthritis in the hands, hips and knees of women, taking other known factors into account (Spector et al 1996a). Familial aggregation of osteoarthritis has also been seen in men, although it is not possible to determine whether this is attributable to genetic or environmental effects (Kirk et al 2002). Children of parents with early onset osteoarthritis or osteoarthritis involving more than one joint are at increased risk of developing the condition (Loughlin 2002). Knee osteoarthritis is less likely to be inherited and more likely to be associated with exposure to environmental factors (Felson and Zhang 1998).

Overweight and obesity

Obesity is an established risk factor for the development and progression of osteoarthritis of the knee (Felson et al 1988; Felson and Zhang 1998; Cooper et al 2000). The relationship

between weight and knee osteoarthritis is stronger in women than in men and there is greater risk that both knees will be affected. Osteoarthritis of the knee is more likely to progress among overweight people compared to those who are not overweight (Sowers 2001; Felson 2004).

The relationship between excess weight and hip osteoarthritis is not as strong (Felson and Zhang 1998); although, a systematic review concluded there is moderate evidence that obesity has a positive influence on the development of hip osteoarthritis (Lievense et al 2002). Excess body weight is associated with increased reports of pain related to hip osteoarthritis, and hip pain is a predictor of osteoarthritis progression (Hochberg 2004). High body mass index, particularly at a young age, is associated with a greater risk of hip replacement due to osteoarthritis (Karlson et al 2003b).

According to the 2001 National Health Survey, 42% of Australian men and 25% of women are overweight, and 16% of men and 17% of women are obese. The proportion of people classified as overweight or obese was highest in those aged 45-75 years in both sexes, with the highest prevalence in the 55 to 64 year age group, where 68% of men and 59% of women were classified as overweight or obese. Sixty-seven percent of men and 78% of women who were overweight or obese reported sedentary or low exercise levels (ABS 2002a). Indigenous Australians are more likely to be classified as overweight or obese (61%) compared to non-Indigenous Australians (48%) (ABS 2002b).

The prevalence of overweight and obesity is increasing in Australia. Between 1980 and 1999-00, the prevalence of overweight increased from 27% to 47% among women aged 25 to 64 years, and from 47% to 66% among men in this age group. In 1999, women weighed 4.8kg more on average than their counterparts in 1980 and men weighed 3.6kg more. Men were more likely to consider their weight 'acceptable', when in fact they were overweight based on their calculated body mass index (ABS 2002a). Between 1980 and 1995 there was a marked increase in obesity prevalence in Australia, with an increase from 7.8% to 17.6% in men and from 6.9% to 16.1% in women aged between 25 and 64 years. Projections to 2016 estimate (conservatively) a 50% increase in the prevalence of obesity and a stable prevalence of overweight (Mathers et al 1999).

The association of excess body weight with osteoarthritis is significant because overweight and obesity are serious public health problems. Theoretically, it is believed that between 25% and 50% of symptomatic knee osteoarthritis is preventable by eliminating obesity (Felson and Zhang 1998). Weight loss appears to reduce symptoms and slow the progression of knee osteoarthritis; women who lose an average of 5kg can decrease their risk of symptomatic knee osteoarthritis by 50% (Felson et al 1992). Weight control programs focused on increasing the level of physical activity and reducing body fat appear to be more effective than weight loss per se in relieving the symptoms of knee osteoarthritis (Toda et al 1998). Overweight and obesity have been identified as important modifiable risk factors for knee osteoarthritis.

Physical activity

Physical activity confers a range of health benefits including joint health, muscle strength and weight management (Hootman et al 2003). Moderate, recreational, weight-bearing physical activity, including recreational running, does not appear to be a risk factor for the development or the progression of knee osteoarthritis (Felson and Zhang 1998; Lane et al 1998). The effects of frequency, intensity and duration of physical activity on the development of osteoarthritis appear to be minimal in recreational runners and walkers; however, they may affect elite athletes (Hootman et al 2003).

According to the 2001 National Health Survey, 70% of Australian adults participate in activities such as walking, or moderate and vigorous exercise. Women are more likely to walk for exercise than men, and men are more likely to undertake moderate and vigorous exercise. In relation to exercise level (exercise type, frequency and duration), 65% of men and 74% of women engage in exercise classified as sedentary and low levels. There was a small reduction in the number of people exercising at sedentary and low levels compared to previous surveys conducted in 1989-1990 and 1995 (ABS 2002a).

Muscle weakness

Quadriceps muscle weakness is common in people with knee osteoarthritis, independent of the effects of age, gender and body weight, and has been attributed to disuse atrophy resulting from knee pain (Slemenda et al 1997). However, while small increases in the strength of the muscles, ligaments and tendons that stabilise the knee have been associated with improvement in knee pain and function, quadriceps strength does not appear to reduce the progression of knee osteoarthritis (Brandt et al 1999), and may increase the progression of knee osteoarthritis in misaligned and lax knees (Sharma et al 2003b). It appears that muscle weakness may be both a risk factor for, and a consequence of, knee osteoarthritis (Brandt 2003).

Joint trauma (sport, recreational, occupational)

Individuals with a history of joint trauma or repetitive, load-bearing activities are more likely to develop osteoarthritis of the knee and hip (Gelber et al 2000; Wilder et al 2002; Lau et al 2000). Joint trauma occurring as a result of dislocations, contusions, fractures, tears of the menisci or ligaments, or as a result of surgical meniscectomy, precedes the development of osteoarthritis in a large proportion of affected joints (Felson et al 2000; Englund et al 2003; Roos et al 1998). Repetitious activities that load or stress the joints and fatigue the surrounding protective muscle also increase the risk of osteoarthritis, although the mechanism for the association is unclear.

Sporting activities that involve high levels of repetitive impact or torsional loading, such as soccer and football, are associated with osteoarthritis; however, the risk varies depending on individual factors, protective equipment, shoes and playing surfaces (Felson et al 2000; Buckwalter 2003). Elite athletes have an increased risk of developing osteoarthritis in the major weight-bearing joints (Oliveria et al 1995; Spector et al 1996b; Kujala et al 1995; Drawer and Fuller 2001). Participation in competitive sporting activities involving repetitive, high-intensity, direct joint impact from contact with playing surfaces, other participants or equipment, increases the risk of knee and hip osteoarthritis. However, athletes with no history of joint injury and no biomechanical joint abnormalities do not have a higher incidence of osteoarthritis compared to population norms (Smith and Ghosh 1998).

Occupations involving repetitive, load-bearing activities are also associated with the development of osteoarthritis (Felson et al 1991; Maetzel et al 1997; Manninen et al 2002). Repeated squatting, kneeling and heavy lifting are associated with high rates of knee osteoarthritis. Climbing stairs and lifting heavy objects are associated with hip osteoarthritis (Schouten et al 2002; Lau et al 2000). There is an association between knee osteoarthritis and floor-laying, farming, construction and forestry work (Schouten et al 2002), and between hip osteoarthritis and farming (Maetzel et al 1997).

Joint trauma has been identified as an important modifiable risk factor, particularly for knee osteoarthritis. It is estimated that knee osteoarthritis is seven times more likely to occur in people with a history of knee injury (Wilder et al 2002). It has been proposed that modification of tasks involving heavy lifting and repeated squatting could prevent between 15% and 30% of knee osteoarthritis, and joint injury prevention programs could prevent between 14% and 25% of knee osteoarthritis (Felson and Zhang 1998).

Bone mineral density

High bone mineral density is associated with a higher prevalence of knee, hip and hand osteoarthritis (Felson et al 2000). Longitudinal studies have shown that high bone mineral density or an increase in bone mineral density appears to be associated with the risk of developing knee osteoarthritis (Zhang et al 2000; Hart et al 2002). Further research is needed to determine whether bone mass affects the radiological progression of osteoarthritis (Hochberg et al 2004).

Oestrogen level

It has been suggested that reduced oestrogen levels in post-menopausal women may be associated with the development of osteoarthritis (Silman and Newman 1996); however, there is inconclusive evidence for an association between serum oestrogen levels and osteoarthritis, and no epidemiological data to support such an association (Richette et al 2003). While hormone replacement therapy appears to reduce symptomatic and radiological hip and knee osteoarthritis, differences in outcome measures (symptomatic versus structural osteoarthritis), populations and duration of hormone replacement therapy use make it difficult to draw conclusions from existing studies (Richette et al 2003; Hunter et al 2002; Reginster et al 2003).

Nutritional factors

Antioxidants are thought to confer protection against the progression of osteoarthritis and other age-related diseases (Felson et al 2000). Results from the Framingham Study indicate that high intake of vitamin C may be associated with a lower risk of knee osteoarthritis progression, but does not appear to prevent the onset of disease (McAlindon et al 1996a).

Vitamin D obtained from dietary sources or sun exposure is required for normal bone metabolism; low levels may affect bone repair and muscle strength, predisposing to progression of osteoarthritis (Felson et al 2000). There is evidence from longitudinal studies that low dietary and serum levels of vitamin D may be associated with the development of hip osteoarthritis (Lane et al 1999), and with the progression of knee osteoarthritis (McAlindon et al 1996b; McAlindon and Felson 1997).

Co-morbid conditions

Co-morbidity is associated with lower health-related quality of life (NPHP 2001) and a higher level of disability in people with chronic conditions (Gabriel et al 1999a). Age increases the prevalence of multiple co-morbid conditions (Gijsen et al 2001).

Co-morbidities associated with osteoarthritis include peptic ulcer disease, renal disease, diabetes, cardiovascular disease, hypertension, peripheral vascular disease, depression, respiratory disease and obesity (Kadam et al 2004). The majority of people with osteoarthritis have at least one co-morbid condition (Marks and Allegrante 2002) and nearly 60% have two or more co-morbid conditions (Maetzel et al 2004).

The presence of co-morbidities increases the impact of osteoarthritis (Breedveld 2004; Marks and Allegrante 2002). Co-morbid conditions, particularly obesity, heart disease and pulmonary disease, increase the likelihood of disability in people with knee osteoarthritis (Ettinger et al 1994). Similarly, disability is higher in people with hip osteoarthritis when there are two or more related co-morbid conditions. Hypertension, cardiovascular disease, peripheral vascular disease, respiratory disease and diabetes are the most common co-morbid conditions in people with hip osteoarthritis (Marks and Allegrante 2002).

Psychosocial factors

Depression, anxiety, helplessness and self-efficacy are correlated with pain and physical function in osteoarthritis. Mental health status appears to predict physical function (Sharma et al 2003a).

There is a higher rate of depression among people with arthritis than the general population, with reports that 10% of people with osteoarthritis are depressed (Abdel-Nasser et al 1998). However, the social and mental function profile of people with osteoarthritis is similar to that of people with other chronic conditions (Hill et al 1999). A randomised controlled trial involving a large diverse population of older adults with arthritis (mostly osteoarthritis) demonstrated that improvement in depression care reduces pain and improves functional status and quality of life (Lin et al 2003).

Depression and anxiety associated with osteoarthritis can lead to feelings of helplessness and loss of self-control, and altered self-esteem (CDC 2003). Helplessness has been correlated with functional impairment and self-reported pain severity in symptomatic knee osteoarthritis (Creamer et al 2000; Creamer et al 1999). Strategies to address helplessness include support and education (Creamer et al 1999).

There is growing evidence that in addition to physical impairments and disease processes, functional disability may be linked to self-efficacy beliefs in older adults, particularly in the presence of lower extremity weakness (Rejeski et al 2001). Self-efficacy comprises skill, experience, general self-worth and motivation (Lorig et al 1989a). Self-efficacy has been linked to improvements in performance-based outcomes and lower self-reported disability in older adults with functional limitations from knee pain (Rejeski et al 2001; Mazzuca et al 1997). Formal educational programs to promote self-efficacy lead to small reductions in pain and disability in mixed (osteoarthritis and rheumatoid arthritis) populations (Warsi et al 2003).

Congenital joint anomalies

Congenital dislocated hip, an abnormality of the hip present at birth, is associated with the development of osteoarthritis of the hip (Felson et al 2000).

Socio-economic status

Socio-economic factors such as educational level, income and occupation are associated with the prevalence of osteoarthritis and the risk of disability (King 1955; Badley and Ibanez 1994). Lower socio-economic status has been linked with inactivity (Clark 1996), and with obesity (WHO 2003), which is an established risk factor for knee osteoarthritis.

The prevalence of osteoarthritis rises as annual household income in Australia declines (Hill et al 1999). In general, lower income and education levels are correlated with obesity, older age and female gender. Exposure to these major risk factors for osteoarthritis increases the prevalence of osteoarthritis and the potential need for joint replacement surgery. However, there is evidence from overseas studies that low socio-economic status affects access to health services, particularly joint replacement surgery. Poor rates of joint replacement surgery increase the prevalence of pain and disability and reduce the quality of life (Hawker et al 2002).

Low educational attainment is linked to pain and disability in osteoarthritis (Hannan et al 1992; Creamer et al 1999), and is a strong predictor of prevalence and possibly the progression of osteoarthritis (Leigh and Fries 1991). Behavioural risk factors such as health-seeking behaviour, diet, access to and utilisation of health services, self-efficacy, stress level and income may be related to educational level (Badley and Ibanez 1994).

AREA FOR URGENT ACTION: Reduce disadvantage by considering groups with special needs.

Potentially modifiable risk factors and determinants

Table 4.1 summarises the potentially modifiable and the non-modifiable risk factors and health determinants associated with the development and/or progression of osteoarthritis described in the preceding text.

Table 4.1: Risk factors and determinants of health for osteoarthritis

Risk Factors	Potentially Modifiable	Non-modifiable
Behavioural factors	• Joint trauma (occupational, sport, recreational)	-
Psychosocial factors	• Depression	-
Biological risk factors	• Overweight and obesity • Co-morbid conditions	• Age • Female gender • Family history • Congenital joint anomalies • High bone mineral density
Environmental risk factors	• Exposure to repetitive tasks involving joint loading	• Socio-economic status

4.5 Non-pharmacological interventions for osteoarthritis

Due to the scope of this report, a systematic review of all non-pharmacological interventions for osteoarthritis was not conducted. A summary of Cochrane Reviews in Table 4.2 provides Level I evidence (Appendix C) for non-pharmacological interventions for osteoarthritis, including surgical intervention and rehabilitation.

It is difficult to draw conclusions on the effectiveness of non-pharmacological interventions because few studies have been conducted and methodological issues hamper many of the studies that exist. Insufficiency of evidence should not be construed as evidence of ineffectiveness or used as a basis for the non-provision of a treatment, but rather as an indication of the need for further research.

Table 4.2: Cochrane Reviews of non-pharmacological interventions for osteoarthritis

Cochrane Review	Population and Outcome Measures	Conclusion
Therapeutic ultrasound vs placebo, Welch et al 2004 (last updated 2001)	• Adults with osteoarthritis, unspecified. • Pain, physical function, patient global assessment, joint imaging (for studies of one year or longer).	No significant difference between therapeutic ultrasound and placebo for pain, range of motion, gait velocity
Therapeutic ultrasound vs active therapies Welch et al 2004 (last updated 2001)	• Adults with osteoarthritis, unspecified. • Pain, physical function, patient global assessment, joint imaging (for studies of one year or longer).	Significantly greater pain relief with therapeutic ultrasound from continuous therapeutic ultrasound versus galvanic current, but no difference in global assessment. No difference between pulsed or continuous therapeutic ultrasound versus shortwave diathermy.
Herbal therapy vs placebo Little et al 2004 (last updated 2001)	• Adults with hip osteoarthritis • Pain, mobility, grip strength, usage of non-steroidal anti-inflammatory drugs, serum lipids, fatty acids, any adverse reaction, quality of life or satisfaction indicators.	Avocado-soybean unsaponifiables (ASU) improve pain, function and global assessment, and reduce non-steroidal anti-inflammatory drug use.
Thermotherapy (ice massage) vs control Brosseau et al 2004a (last updated 2003)	• Adults with knee osteoarthritis • Pain, function, number of tender joints, number of swollen joints, patient and physician global perspective on disease.	Ice massage had a statistically significant effect on function and range of motion but no clinically relevant benefit. The effect on knee strength was statistically and clinically relevant. The effect on pain was unclear.
Thermotherapy (hot or cold packs) vs control Brosseau et al 2004a (last updated 2003)	• Adults with knee osteoarthritis • Knee swelling.	Cold packs decreased swelling. Hot packs had no beneficial effect on swelling compared with placebo or cold application.
Thermotherapy (ice packs) vs control Brosseau et al 2004a (last updated 2003)	• Adults with knee osteoarthritis • Pain.	There was no statistically significant difference between ice packs and control for pain relief.
Low level laser therapy vs placebo Brosseau et al 2004b (last updated 2003)	• Adults with osteoarthritis • Pain, joint mobility, muscular testing, systematic components, medication usage and adverse side effects.	No significant difference between laser and placebo for pain and other outcomes.
Transcutaneous electrical nerve stimulation (TENS) (including acupuncture-like TENS) vs placebo Osiri et al 2004a (last updated 2000)	• Knee osteoarthritis • Pain, physical function, patient global assessment, joint imaging (for studies of one year or longer).	TENS relieved knee stiffness compared to placebo and improved pain compared to placebo when treatment duration was greater than four weeks. Acupuncture-like TENS (AL-TENS) was effective for pain relief, reduced stiffness, and improved quadriceps muscle strength and knee flexion compared with placebo.
Posterior versus lateral approach for total hip replacement surgery Jolles and Bogoch 2004 (last updated 2003)	• Adults, hip osteoarthritis, primary total hip replacement • Adverse outcomes, functional outcomes, complications, ill-health and death, revision rate, prosthesis survival, health-related quality of life, mobility	No conclusion can be drawn between the different approaches to hip replacement surgery due to methodological limitations.

Cochrane Review	Population and Outcome Measures	Conclusion
High intensity vs low intensity aerobic exercise Brosseau et al 2004c (last updated 2003)	• Adults with knee osteoarthritis • Functional status, overall and acute pain, gait capacity, aerobic capacity	No statistically or clinically significant differences between high intensity and low intensity aerobic exercising (stationary cycling) for measures of functional status, pain, gait, and aerobic capacity.
Land-based exercise regimes vs control Fransen et al 2004 (last updated 2001)	• Adults with knee osteoarthritis • Self-reported physical pain and physical function.	Land-based exercise programs reduced pain and improved physical function in people with osteoarthritis of the knee compared with education, sub-therapeutic ultrasound, watchful waiting/no intervention, non-steroidal anti-inflammatory drugs alone, and range of motion and relaxation.
Progressive resistance training (PRT) Latham et al 2004 (last updated 2002)	• Institutionalised or community-dwelling adults; mean age of 60 years • Physical disability, measures of impairment and functional limitation	PRT had a large positive effect on strength, and a positive effect on some functional limitations, but did not appear to have an effect on physical disability (complex activities). PRT may be appropriate for pain management in osteoarthritis.
Continuous passive motion (CPM) plus physiotherapy (PT) vs physiotherapy alone Milne et al 2004 (last updated 2003)	• Adults with rheumatoid arthritis, knee osteoarthritis, post-knee replacement surgery. • Active, passive knee range of motion, pain, length of stay, swelling and quadriceps strength.	CPM combined with PT increased active knee flexion, reduced length of stay, and reduced the need for post-operative knee manipulation two weeks post-operatively compared to PT alone.
Pre-operative education vs standard care for hip or knee replacement McDonald et al 2004 (last updated 2003)	• All patients undergoing planned total hip or total knee replacement (including osteoarthritis and rheumatoid arthritis). • Postoperative, length of hospital stay, compliance, patient satisfaction, deep vein thrombosis, range of motion, anxiety, mobility	Insufficient evidence to support the use of pre-operative education for people undergoing hip or knee replacement surgery in relation to measures of pain, function and length of stay. Has modest beneficial effect on anxiety.
Pulsed electromagnetic fields (PEMF) vs placebo Hulme et al 2004 (last updated 2001)	• Adults with knee, neck osteoarthritis • Pain, physical function, patient and physician global assessment, joint imaging, health related quality of life	PEMF resulted in significant improvements in all primary outcome measures in knee osteoarthritis, and in pain and joint pain on motion in neck osteoarthritis, however the effects were not clinically significant.

4.6 Pharmacological interventions for osteoarthritis

Due to the scope of this report, a systematic review of all pharmacological interventions for osteoarthritis was not conducted. However, a summary of Cochrane Reviews (refer Table 4.3) provides Level I evidence (Appendix C) for a number of pharmacological interventions for osteoarthritis.

Table 4.3: Cochrane Reviews of pharmacological interventions for osteoarthritis

Cochrane Review	Population and Outcome Measures	Conclusion
Paracetamol/Acetaminophen vs placebo. Towheed et al 2004a (last updated 2002)	• Osteoarthritis at any site including the axial and peripheral skeleton. • Pain, function, patient global assessment, adverse events	Paracetamol/Acetaminophen was superior to placebo and had a similar safety profile.
Paracetamol/Acetaminophen vs non-steroidal anti-inflammatory drugs (NSAID). Towheed et al 2004a (last updated 2002)	• Osteoarthritis at any site including the axial and peripheral skeleton. • Pain, function, patient global assessment, adverse events	Paracetamol/Acetaminophen was less effective in pain and global assessment but similar to NSAIDs in functional status outcomes. NSAIDs appeared more effective for moderate to severe pain than Paracetamol/Acetaminophen. Traditional (i.e. non-coxib) NSAIDs were more likely to be associated with gastrointestinal adverse events.
Non-steroidal anti-inflammatory drug (NSAID) vs NSAID Towheed et al 2004b (last updated 1997)	• Osteoarthritis hip (adults over the age of 18) • Pain, global assessment, range of motion, toxicity	No clear recommendation can be made.
Non-steroidal anti-inflammatory drugs (NSAID) vs placebo Towheed et al 2004b (last updated 1997)	• Osteoarthritis hip (adults over the age of 18) • Pain, global assessment, range of motion, toxicity	NSAIDs significantly reduced pain and improved global assessment compared to placebo.
Non-steroidal anti-inflammatory drug (NSAID) vs NSAID. Watson et al 2004 (last updated 1996)	• Osteoarthritis knee • Patient global assessment, pain, physical function, inflammation.	Insufficient evidence was available to distinguish between the efficacy of equivalent recommended doses of NSAIDs. NSAID selection for osteoarthritis knee should be based on relative safety, patient acceptability and cost.
Glucosamine vs non-steroidal anti-inflammatory drugs (NSAID). Towheed et al 2004c (last updated 1999)	• Osteoarthritis at any site including the axial and peripheral skeleton. • Pain, range of motion, functional assessments, global assessments, toxicity.	Glucosamine was equivalent to NSAIDs in two studies and superior in two studies. No clear recommendations can be made.
Glucosamine vs placebo Towheed et al 2004c (last updated 1999)	• Osteoarthritis at any site including the axial and peripheral skeleton. • Pain, range of motion, functional assessments, global assessments, toxicity	Glucosamine was effective for pain and function versus placebo, however included trials only evaluated one preparation of glucosamine; further research is necessary.

4.7 Clinical practice guidelines for osteoarthritis

Three recent clinical practice guidelines for the management of lower limb osteoarthritis were located, developed by the European League Against Rheumatism (EULAR) (Jordan et al 2003), the American College of Rheumatology (ACR 2000), including an update on the role of Cox-2 inhibitor drugs published in 2002 (Schnitzer 2002), and the Institute for Clinical Systems Improvement (ICSI 2003a). A comparison of the recommendations made by each guideline is provided in Table 4.4. There is general agreement among the recommendations contained in the guidelines; however, the guideline development methodology differs (refer to Table 4.5).

Table 4.4: Osteoarthritis practice guidelines: comparison of treatment recommendations

Intervention	Guideline		
	ICSI	EULAR	ACR
Non-pharmacological treatments			
Physical activity	√	√	√
Aerobic exercise	√	√	√
Strengthening and range-of motion exercise	√	√	√
Restorative sleep	√	-	-
Physical therapy	√	√	√
Occupational therapy	√	√	√
Walking assistive devices (eg. shoe inserts, cane)	√	√	√
Appropriate footwear	-	-	√
Assistive devices for activities of daily living	√	√	√
Weight loss	√	√	√
Education	√	√	√
Self-management education	√	√	√
Telephone contact	√	√	√
Joint protection techniques	√	-	√
Planning of activities	√	-	√
Glucosamine (with or without chondroitin)	√	√	IE
Chondroitin	√	√	IE
Nutrients	√	√	-
Minerals and vitamins	√	√	IE
Knee brace or taping	√	√	√
Heat or ice (thermotherapy)	√	-	√
Acupuncture	√	√	NR
Electrical stimulation (eg. TENS)	√	√	-
Massage	√	-	-
Herbal remedies	-	√	-
Laser	-	√	IE
Pulsed electromagnetic frequency	-	√	IE
Spa therapy	√	√	-
Avocado/soybean unsaponifiables (ASU)	-	√	-
Diacerein	-	√	-
Surgical treatments			
Lavage / tidal irrigation	-	√	-
Arthroscopy ± debridement	-	√	-
Osteotomy	-	√	-
Total joint replacement	-	√	-
Uni-compartmental knee replacement	-	√	-
Pharmacological treatments			
Paracetamol (Acetaminophen)	√	√	√
NSAIDs (plus proton pump inhibitor or misoprostol in those at risk of UGI events)	√	√	√
Cox-2 inhibitors	√	√	√ (at risk of UGI events)
Capsaicin cream	√	√	√
Other topical cream (eg. NSAID cream)	√	√	√
Corticosteroid joint injection	√	√	√
Hyaluronic acid joint injection	√	√	√
Opioid analgesics	√	√	√
Antidepressant medication	-	√	-
Sex hormones	-	√	-

Source: Adapted from Pencharz et al 2002 and updated to include more recent versions of these guidelines. √=recommended; -=no mention/discussion; ICSI=Institute for Clinical Systems Improvement (ICSI 2003a); EULAR=European League Against Rheumatism (Jordan et al 2003); ACR=American College of Rheumatology (ACR 2000; Schnitzer 2002); NSAID=non-steroidal anti-inflammatory drug; OA=osteoarthritis; TENS=transcutaneous electrical nerve stimulation; UGI=upper gastrointestinal; NR=not recommended; IE=insufficient evidence to conclude

Table 4.5: Osteoarthritis practice guidelines: guideline development process according to AGREE (2001) criteria

AGREE Domain	Rating of guidelines		
	ICSI	EULAR	ACR
Scope and purpose			
1. Overall objective(s)	+	+	+
2. Clinical question(s)	+	+	-
3. Target patient population	+	+	+
Stakeholder involvement			
4. Development group representative	+	-	-
5. Patient views and preferences	-	-	+
Rigour of development			
6. Systematic evidence search	-	+	-
7. Selection of evidence explicit	-	+	-
8. Formulation of recommendations explicit	-	+	-
9. Benefits, side effects, and risks described	+	+	+
10. Explicit link between evidence and recommendations	+	+	+
11. External review	-	-	-
12. Procedure for updating guideline	+	+	+
Clarity and presentation			
13. Specific and unambiguous recommendations	+	+	+
14. Different treatment options	+	+	+
15. Key recommendations easily identified	+	+	+
Applicability			
16. End users of guideline stated	+	-	-
17. Barriers to implementation are discussed	+	-	-
18. Cost implications are discussed	-	-	+
19. Tools for application	+	-	-
20. Review/monitoring criteria defined	+	-	-
21. Pilot testing	+	-	+
Editorial independence			
22. Editorial independence from funding body	+	-	-
23. Conflicts of interest are stated	+	-	+

Source: Adapted from Pencharz et al 2002 and updated to include more recent versions of these guidelines; + indicates that the guideline has met the criterion; - indicates that it has not met the criterion; ICSI=Institute for Clinical Systems Improvement (ICSI 2003a); EULAR=European League Against Rheumatism (Jordan et al 2003); ACR=American College of Rheumatology (ACR 2000). NB: This comparison was conducted by the author of this report.

KEY OBJECTIVE: Promote best practice for the optimal management of osteoarthritis.

4.8 Approaches to the management of osteoarthritis

Joint replacement surgery

Joint replacement surgery may be required in cases of severe, progressive osteoarthritis unresponsive to non-surgical interventions. The procedure is cost-effective and has been shown to improve health-related quality of life. There is evidence that outcomes are better if surgery occurs early in the course of functional deterioration (Sanders et al 2004; Juni et al 2003).

Cost effectiveness

An Australian cost-utility analysis has shown that in addition to being the most efficacious intervention for osteoarthritis, joint replacement surgery is also the most cost-effective intervention (Segal et al 2004). Joint replacement surgery is cost-effective in people with functional limitation due to osteoarthritis and at the very least is as cost-effective as other well-accepted life-extending surgical procedures, such as renal dialysis and coronary artery bypass graft surgery (Chang et al 1996).

Health-related quality of life

Joint replacement surgery has been shown to improve the health-related quality of life of people with osteoarthritis. Improvements in pain and function measures have been reported in a number of studies (Hawker et al 1998; Kennedy et al 2002; Hajat et al 2002). An Australian study demonstrated that quality of life scores after total hip or knee replacement surgery for osteoarthritis improved up to, and in some cases beyond, population norms (March et al 1999).

In order to maximise the benefits, joint replacement surgery needs to be considered relatively early in the course of osteoarthritis. Poorer pre-operative physical function and higher baseline pain scores are predictive for worse function and pain outcomes following hip and knee replacement surgery (Fortin et al 1999; Fortin et al 2002). While patients with worse pre-operative scores enjoy the greatest gain from surgery, their post-operative scores are not as high as those of patients with better pre-operative scores (Kennedy et al 2002; Hajat et al 2002). There appears to be no correlation between pre-operative radiological stage of osteoarthritis and post-operative quality of life outcomes (Nilsdotter et al 2001). However, delaying joint replacement surgery until there is severe radiological change, pain and functional impairment reduces the opportunities to benefit from this treatment option.

While the timing of joint replacement surgery appears to be critical to its success, there are no validated criteria for the optimal timing of the procedure. Among developed countries, major variation in the rates of hip replacement procedures is likely to reflect the varied criteria for undertaking joint replacement surgery, rather than differences in demographics, health expenditure or osteoarthritis prevalence (Merx et al 2003). Longitudinal data provided by joint replacement registry data collection can help to determine the optimal time for surgery over the course of osteoarthritis (Kennedy et al 2002).

Inequity in service provision

In addition to problems with the timing of joint replacement surgery, inequities in service provision associated with female gender and older age have been identified in studies conducted overseas. A number of reasons for this have been suggested, including the existence of negative attitudes towards osteoarthritis and the value of joint replacement surgery, the lack of simple tools to assess the severity and impact of osteoarthritis in the community, and the absence of clear guidelines or indications for joint replacement surgery (Dieppe et al 1999). Interaction dynamics between health professionals and their patients has been suggested as another reason for service inequity (Suarez-Almazor 2002; Hawker et al 2000).

Gender bias in joint replacement surgery has been demonstrated. Women are less likely to have discussed the option of surgery with their doctor and less likely to undergo joint replacement surgery compared to men (Hawker et al 2000). The pre-operative pain and

functional status of women tends to be significantly worse compared with men, suggesting that women have access to joint replacement surgery later in the course of the disease. As a result, women tend to have poorer post-operative outcomes (Holtzman et al 2002; Katz et al 1994; Hawker et al 2000).

There is also evidence of an age bias in joint replacement surgery (Hawker et al 2000; Katz et al 1996). A number of studies have demonstrated that age does not increase complications, and that joint-specific pain and functional outcomes are not age-dependent (Jones et al 2001; Hawker et al 1998), including an Australian study (March et al 1999).

AREA FOR URGENT ACTION: Reduce disadvantage by considering groups with special needs.

Trends in demand and health services utilisation

Demand for total hip and knee replacement surgery is increasing worldwide and this trend is projected to continue. Osteoarthritis was the primary diagnosis in 96% of the primary (initial) total knee and 88% of the primary total hip replacement operations performed in 2001-02 in Australia. The number of primary total knee replacement procedures increased by 18.6% over the course of one year, mainly in the private sector (AOA 2003).

The trend is being fuelled by demographic changes, higher quality of life expectations, increasing demand for joint replacement surgery by younger individuals, and greater need for revisional procedures as people outlive their prosthetic devices. Changes to the threshold for surgery would further increase the number of joint replacements (Birrell et al 1999).

According to Australian hospital statistics for the years 2001-02, the median waiting time for elective surgery was 45 days, with 8% of all people on surgical waiting lists waiting for over 12 months. Total knee replacement had the highest median waiting time of 131 days, with 19.4% of people (on waiting lists) waiting over 12 months for knee replacement surgery. In the case of hip replacement surgery, 11.7% waited longer than 12 months for the procedure (AIHW 2003).

Despite the evidence that joint replacement surgery is an effective treatment for the pain and disability of osteoarthritis and cost-effective (Chang et al 1996; Segal et al 2004), the procedure is under-utilised (Hawker et al 2000; Suarez-Almazor 2002).

KEY OBJECTIVE: Promote timely joint replacement for people with osteoarthritis.

Self-management of osteoarthritis

Individuals in the community setting, together with their families and carers, undertake the vast majority of care associated with osteoarthritis. As a result, they require the skills, knowledge and motivation to effectively manage their day to day health needs. Access to information, education and social support is vital (Dieppe and Brandt 2003). Behavioural modification techniques combined with education can facilitate the development of the skills and confidence (self-efficacy) needed to undertake the ongoing day-to-day management of chronic illness (Lorig and Holman 2003).

The term 'self-management' is used to describe the health promotional and management activities undertaken by individuals (Keysor et al 2003). In osteoarthritis, self-management involves developing the capacity to manage pain, adapt to changes in functional performance (Allegrante and Marks 2003), and manage psychosocial factors including anxiety, depression and helplessness (Creamer et al 1999).

Self-management programs aim to inform and empower individuals to self-manage their health and participate in decisions about their care. As knowledge acquisition alone is less likely to be effective, programs need to provide information in combination with problem-solving skills and motivational activities (Dieppe and Brandt 2003). Strategies aimed at improving self-efficacy are more beneficial than educational strategies alone for improving the health status of people with osteoarthritis (Allegrante and Marks 2003).

Outcomes of arthritis self-management programs

Health self-management appears to offer physical, psychosocial and systems benefits (Walker et al 2003), and is one of six core components of the model for chronic illness care proposed by Wagner et al (1996). Self-management programs can improve health behaviour and communication with health professionals, improve health (physical and cognitive function) and social outcomes and reduce health services utilisation (Lorig and Holman 2003; Lorig et al 1993). The exact mechanism behind the success of self-management programs is unclear; however, it appears that increased perception of personal control, or self-efficacy, is associated with changes in health behaviour and health status (Lorig et al 1989b). In the case of arthritis, self-management programs have been shown to increase self-efficacy, improve pain management, reduce depression and increase the adoption of favourable health behaviours such as maintenance of ideal weight and participation in physical exercise (Lorig et al 1985; Lorig et al 1986; Lorig et al 1993).

A number of studies have linked self-efficacy with self-reported or performance-based functional outcomes in knee osteoarthritis (Rejeski et al 2001; Mazzuca et al 1997; Sullivan et al 1998). Self-efficacy appears to protect against poor functional outcomes (Sharma et al 2003a), improving the ability and motivation to perform daily activities independently and effectively (Allegrante and Marks 2003). Improvements in function appear to be sustainable over time, together with feelings of increased self-control (Lindroth et al 1989; Lindroth et al 1995).

Self-efficacy is also related to adaptive pain coping (Keefe et al 2000) and self-management education has been associated with a reduction in osteoarthritis knee pain (Mazzuca et al 1997), although there are conflicting reports (Lindroth et al 1989). On average, patient education interventions have been shown to be 20% as efficacious as non-steroidal anti-inflammatory drugs for the relief of osteoarthritis pain (Superio-Cabuslay et al 1996). Australian data show that improvements in pain are sustained for two years following attendance at an arthritis self-management course (Osborne et al 2002).

Increased self-efficacy is associated with reductions in health services utilisation. Cost savings have been demonstrated for people with osteoarthritis (Lorig et al 1999; Lorig et al 2001). Reductions in ambulatory health services use, fewer emergency department visits and fewer days spent in hospital have been demonstrated following completion of an arthritis self-management course (Lorig et al 2001), with visits to physicians decreasing by 35% (Lorig and Holman 1989). The cost of delivering a modified version of the Stanford Arthritis Self-Management Program was found to reduce the utilisation and cost of health services associated with knee osteoarthritis, with 80% of the program cost offset within one year (Mazzuca et al 1999).

Methodological limitations

A recent meta-analysis reviewed the effect of arthritis self-management programs on pain and disability in controlled studies. Small beneficial effects on pain and disability were found, although drop out rates were high and there were differences in program delivery and intensity between studies (Warsi et al 2003). While the findings are generally positive in relation to osteoarthritis outcomes, there are a number of methodological limitations to studies on arthritis self-management programs.

There are many different approaches to self-management courses and the definition of the term varies. Many programs claim to be 'self-management programs' yet fail to meet established criteria (Lorig and Holman 2003), making it difficult to compare studies. A lack of detailed information about control groups or what constituted 'usual care' has made it difficult to replicate studies. Not all studies involving people with musculoskeletal conditions distinguish between osteoarthritis and other forms of arthritis.

Methodological weak points include recruitment strategies and the potential for self-selection bias, problems with randomisation, small sample sizes, difficulties in concealing the identity of participants from the researchers and other issues that compromise the ability to generalise results (Walker et al 2003).

Differences in participants have not been controlled for. Outcomes may be dependent upon participant readiness to adopt new behaviours, cultural and socio-economic differences (Allegrante and Marks 2003) and the method of recruitment (Solomon et al 2002). The ability to generalise results across culturally, linguistically and socio-economically diverse groups requires further study (Walker et al 2003).

Process variables such as program delivery methods, content and leadership have not been examined. Differences in leader training, knowledge and communication styles, in addition to program content, design and duration have not been controlled for. Some programs are purely information or education-based, whereas others employ complex behavioural modification techniques (Allegrante and Marks 2003).

Despite methodological limitations there is mounting evidence that self-efficacy is linked to positive outcomes for people with osteoarthritis and there is demand for self-management programs from people who wish to play an active role in their care. Further research is needed on process variables that determine success and on the impact of self-management programs on clinical outcomes in diverse populations.

KEY OBJECTIVE: Promote self-management to improve health outcomes for people with osteoarthritis.

Priority setting in the management of established osteoarthritis

The following factors are important to consider when choosing interventions for early and established osteoarthritis (Dieppe and Brandt 2003):

- Age;
- Co-morbidity;
- Clinical severity of osteoarthritis;
- Individual preferences;
- Cost.

A means for classifying the level of disability associated with osteoarthritis and suggestions for secondary and tertiary prevention at different levels of disability has been developed (Dieppe and Brandt 2003). Figure 4.2 outlines this classification system, which is based on the International Classification of Functioning, Disability and Health (ICF) model (WHO 2001).

Figure 4.2: Classification and management of osteoarthritis disability

Category	Description	Suggested management strategy
Category 1: mild osteoarthritis	Modest discomfort and joint stiffness only, with little or no interference with daily activities or participation in life.	▪ Education, advice, empowerment
Category 2: moderate osteoarthritis with no other problem	Significant pain and discomfort in joints or impairment of motion of sufficient severity to interfere with normal activities or participation in aspects of life of importance to that individual in the absence of other major health problems	▪ Education, advice, empowerment ▪ Non-pharmacological interventions, including consideration of lifestyle changes (exercise, footwear, other aids, dietary changes) ▪ Use of simple analgesics, progressing to non-steroidal anti-inflammatory drugs as required ▪ Intraarticular injections for knee and hand pain
Category 3: mild or moderate osteoarthritis complicated by other health problems	Problems with osteoarthritis as above, complicated by other psychosocial and medical problems such as depression, neurological problems, or reduced sight or hearing, or a combination of problems	▪ It is important to discern the extent to which osteoarthritis needs treating as opposed to treating co-morbidities, which may exacerbate pain (eg. depression) or disability (eg. neurological or sensory problems). Treatment of co-morbidities may be more effective than treating the osteoarthritis
Category 4: severe osteoarthritis	Pain or disability of such severity as to prevent the individual from sleeping, working, or carrying out many of their everyday activities ('cannot work, walk or sleep')	▪ Treat co-morbidities (as per above) ▪ Give early consideration to joint replacement surgery

Adapted from Dieppe and Brandt 2003

4.9 Opportunities to improve the prevention and management of osteoarthritis

Osteoarthritis is the outcome of cumulative exposures to and interactions between risk factors and determinants. Health promotion and prevention strategies can be designed according to behavioural and contextual aspects across the life course.

'At risk' populations

There are limitations to the ability to determine whether particular risk factors and determinants contribute to the development (incidence) or progression of osteoarthritis, or both, owing to the problems in defining the onset of the condition. In addition, the interaction between risk factors and determinants is unclear. Elements that are highly likely to increase the osteoarthritis risk profile include some demographic characteristics, the presence of structural change, signs and symptoms of the condition and a family history (Lohmander and Felson 2004). The groups at highest risk of developing osteoarthritis and experiencing symptomatic or radiological progression of the condition include:

- Older aged people (over 50 years of age);
- Women;
- People with a family history of osteoarthritis;
- People with symptomatic evidence of osteoarthritis;
- People with radiological evidence of structural change;
- Overweight and obese people;
- People with a history of joint trauma;
- People who perform repetitive load-bearing tasks;
- People with abnormal joint anatomy or alignment;
- Disadvantaged groups.

Primary prevention: whole of well population

Preventative strategies to reduce the burden and impact of osteoarthritis should aim to address potentially modifiable risk factors and determinants to reduce their prevalence. Risk reduction is most efficient when risk factors and determinants are modified in those at highest risk of the condition (Felson and Zhang 1998).

Opportunities for improvement

Education and behavioural modification can reduce the risk of developing osteoarthritis:

- Educate the general population about osteoarthritis;
- Promote the maintenance of ideal weight to reduce the risk of developing knee osteoarthritis;
- Prevent acute joint trauma related to sports and recreational activities through measures such as protective equipment, low impact sports, cross-training;

- Introduce ergonomic interventions, environmental modification and joint protection measures to reduce the risk of occupation-related joint stress.

KEY OBJECTIVE: Promote healthy lifestyles and joint injury prevention to optimise health outcomes.

Secondary prevention: 'at risk' population

People at risk of and those with early osteoarthritis can benefit from secondary prevention measures to slow progression of the disease.

Opportunities for improvement

Secondary prevention of osteoarthritis involves lifestyle and behavioural modification in identified 'at risk' groups and the prevention of further joint injury:

- Promote weight reduction to reduce the risk of knee osteoarthritis (and co-morbid conditions, such as diabetes and cardiovascular disease);
- Prevent further joint injury through the introduction of injury prevention measures (sports, occupational, recreational);
- Provide access to educational programs with a behavioural component to help affected individuals develop the knowledge, skills and self-confidence to manage osteoarthritis.

KEY OBJECTIVE: Promote healthy lifestyles and self-management to minimise the progression of osteoarthritis.

Tertiary prevention and disease management: population with established disease

Opportunities for improvement

Tertiary prevention and disease management involves ongoing disease management, support and education strategies to reduce symptoms and disability and improve the health-related quality of life for people with established osteoarthritis:

- Facilitate timely access to joint replacement surgery to reduce pain, preserve function and improve health-related quality of life;
- Effectively manage co-morbid conditions;
- Promote weight control to reduce pain and disability associated with knee osteoarthritis;
- Facilitate access to non-pharmacological interventions to improve function, promote joint protection, manage pain, preserve independence;
- Optimise use of pharmacological measures to relieve pain;

- Provide access to depression care where appropriate;
- Promote ongoing self-management.

KEY OBJECTIVE: Promote best practice for the optimal management of osteoarthritis.

4.10 Conclusion

The goals of the National Action Plan (Appendix A) are to increase health-related quality of life and decrease the burden of disease and disability associated with osteoarthritis. This report has reviewed the literature on osteoarthritis to identify opportunities to address the goals of the National Action Plan through improved disease prevention and management. The following opportunities were identified:

- Raise awareness about osteoarthritis prevention;
- Reduce the prevalence of modifiable risk factors such as obesity and joint injury;
- Provide access to education to improve the knowledge, skills and self-confidence of affected individuals;
- Improve the timeliness of joint replacement surgery.

In response, the National Action Plan recommends the following initial efforts to improve health outcomes in osteoarthritis:

- Promote healthy lifestyles and self-management to optimise health outcomes for people with osteoarthritis;
- Promote best practice for the optimal management of osteoarthritis
- Promote timely joint replacement surgery for osteoarthritis;
- Develop, prioritise and progress a research agenda, including establishing and implementing ongoing data collection systems.