



AGING, PHYSICAL ACTIVITY, **AND ARTHRITIS**

*Living a Quality Lifestyle with Osteoarthritis,
through Active Living*

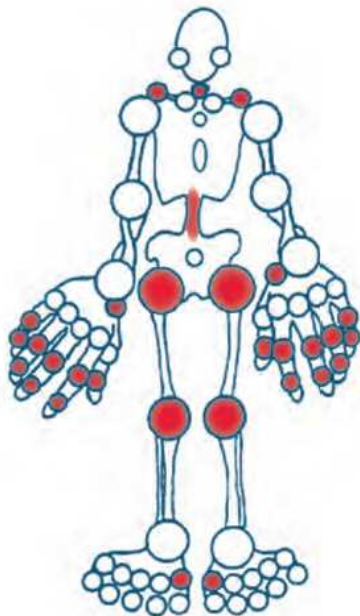
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Introduction

Arthritis and other rheumatic conditions make up a large group of disorders affecting the joints, ligaments, bones, and other components of the musculoskeletal system. There are more than 100 different conditions, ranging from mild forms such as tendinitis, to illness in systemic forms, such as rheumatoid arthritis. Generally, the major types of arthritis are divided into five categories as depicted in Table 1 (1, 2, 4, 35, web 10). Osteoarthritis (OA) is the most common form of arthritis and thus one of the most common causes of physical disability and pain in seniors (web11) and one of the major reasons why seniors limit their physical activity. This paper will deal primarily with osteoarthritis, although reference will be made, at times and usually in general terms, to the other major types of arthritis.

Arthritis is a general term that refers to any inflammatory condition of a joint (7, 11, web 3). Osteoarthritis is caused by a general wearing down of cartilage, the material that cushions the ends of the bones. It is generally believed that when the cartilage is damaged this leads to arthritis (there must be pain to be termed arthritis). The joints most commonly affected by arthritis are the weight-bearing joints; the ankles, knees, hips, and spine (48, see cartoon below). As a result of everyday working pressures finger and thumb joints are also often affected. Although there is little scientific evidence that arthritis is hereditary, it is commonly believed that specific types of arthritis, such as defective cartilage, or joint malalignment, may be related to genetic factors. Although approximately the same percentage of women and men contract arthritis, the disease seems to affect women in the hands, knees, ankles and feet, whereas men are affected more in the hips, wrist, and spine. Also, women are more likely to experience symptoms in more than one joint than are men (76).



Joints affected by OA

- End joints of fingers
- Middle joints of fingers
- Joint at the base of the thumb
- Hips
- Knees
- Joints at the base of the big toe
- Neck (cervical spine)
- Low back (lumbar spine)

Taken from www.arthritis.ca

Table 1 Major types of arthritis

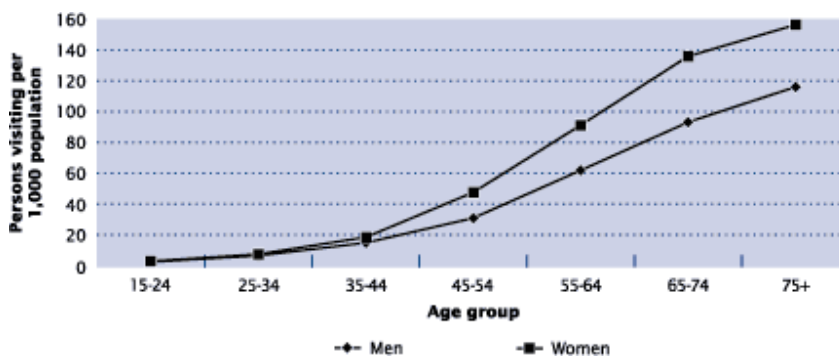
	Osteoarthritis (OA)	Rheumatoid Arthritis (RA)	Systemic Lupus Erythematosus (SLE)	Ankylosing Spondylitis (AS)	Gout
Background	OA results from the deterioration of the cartilage in one or more joints. Leads to joint damage, pain, and stiffness. Typically affects the hands, feet, knees, spine and hips.	RA is caused by the body's immune system attacking the body's joints (primarily hands and feet). This leads to pain, inflammation and joint damage. RA may also involve other organ systems such as eyes, heart, and lungs.	SLE is a connective tissue disorder causing skin rashes and joint and muscle swelling and pain. There may also be organ involvement. This disease, as with RA, fluctuates over time, with flare-ups and periods of remission.	AS is inflammatory arthritis of the spine. Causes pain and stiffness in the back and bent posture. In most cases the disease is characterized by acute painful episodes and remissions. Disease severity varies widely among individuals.	Gout is a type of arthritis caused by too much uric acid in the body that is normally flushed out by the kidneys. Most often affects the big toe but can also affect the ankle, knee, foot, hand, wrist or elbow.
Prevalence	The most common type of arthritis, affecting an estimated <i>10% of Canadian adults</i> .	RA affects approximately <i>1% of Canadian adults</i> , and at least twice as many women as men.	SLE affects <i>0.05% of Canadian adults</i> . Women develop lupus up to 10 times more often than men.	AS affects as many as <i>1% of Canadian adults</i> . Men develop AS 3 times more often than women.	Gout affects up to <i>3% of Canadian adults</i> . Men are 4 times more likely than women to develop gout.
Possible Risk Factors	Old age, heredity, obesity, previous joint injury	Sex hormones, heredity, race (high disease prevalence is seen among Aboriginal Peoples)	Heredity, hormones and a variety of environmental factors	Heredity and, possibly, gastrointestinal or genitourinary infections	Heredity, certain medications (e.g. diuretics), alcohol and certain foods
Disease Management	<i>There is no cure for OA.</i> Treatments exist to decrease pain and improve joint mobility, and include medication (e.g. analgesics, anti-inflammatory drugs), exercise, physiotherapy and weight loss. In severe cases, the entire joint - particularly the hip or knee - may be replaced through surgery.	<i>There is no cure for RA.</i> Early, aggressive treatment by a rheumatologist can prevent joint damage. Drugs used for treatment include non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, disease-modifying anti-rheumatic drugs (DMARDs), and biologic response modifiers.	<i>There is no cure for SLE.</i> The aim of treatment is to control symptoms, reduce the number of flare-ups and prevent damage. Commonly used medications include analgesics, anti-inflammatory drugs, cortisone and disease-modifying anti-rheumatic drugs (DMARDs). Diet and exercise are also important in the management of lupus.	<i>There is no cure for AS.</i> Medications similar to those used for other types of arthritis are often prescribed to treat AS. Exercise is the cornerstone of AS management. If damage is severe, surgery may be considered.	<i>There is no cure for gout.</i> Non-steroidal anti-inflammatory drugs (NSAIDs) are often used to help reduce the pain and swelling of joints and decrease stiffness. Cortisone may also be used for this purpose. Drugs such as allopurinol can be used on a long-term basis to reduce uric acid levels and prevent future attacks. Other methods for controlling gout include dietary changes, weight loss and exercise.

Data source: www.arthritis.ca 

OA is a slow process that develops over many years. It usually starts in the 40's and 50's and is more common as age progresses (web 14). A joint is where two bones meet and a smooth, slippery, fibrous connective tissue, called articular cartilage, acts as a protective cushion or shock absorber between the bones. OA is the type of arthritis that affects one or more joints in the body in an asymmetrical pattern and does not spread throughout the entire body (i.e. it is not systemic). OA occurs when the cartilage progressively deteriorates and wears away, causing friction. Having a cartilage surface free from irregularities or roughness allows the bones to move smoothly and pain-free. When a joint develops OA the surface of the joint is damaged and the cartilage gradually becomes rough, fragmented, eroded and thin, and the bone underneath reacts by becoming thicker (sclerosis). With articular cartilage degradation, the joint space between the bones narrows. The synovium (a membrane that produces a fluid that helps to nourish the cartilage) becomes inflamed and thickened. The ends of the bones may form spurs called osteophytes and the cartilage may wear away entirely. Over a period of years the joint slowly changes and eventually results in the pain, stiffness and swelling of bone-on-bone movement in the affected joint.

OA is divided into two classes: primary and secondary. Primary OA is more commonly known as the wear and tear aspect of the disease and may be caused by an intrinsic defect in the cartilage, and/or excessive weight, and/or occupational overuse. Secondary OA is abetted by several factors including defects in joint structure, disease and/or inflammation (68, web 5).

Figure 1. Person-visit rates to all physicians for osteoarthritis, by age, Canada, 1998/99

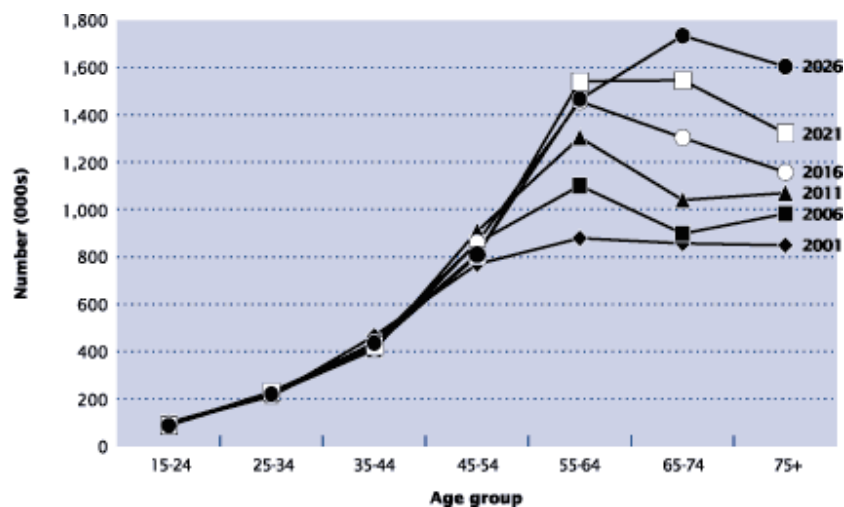


Source: Provincial physician billing data (BC, AB, SK, MB, ON, QC, NS)

Demographics and Statistics

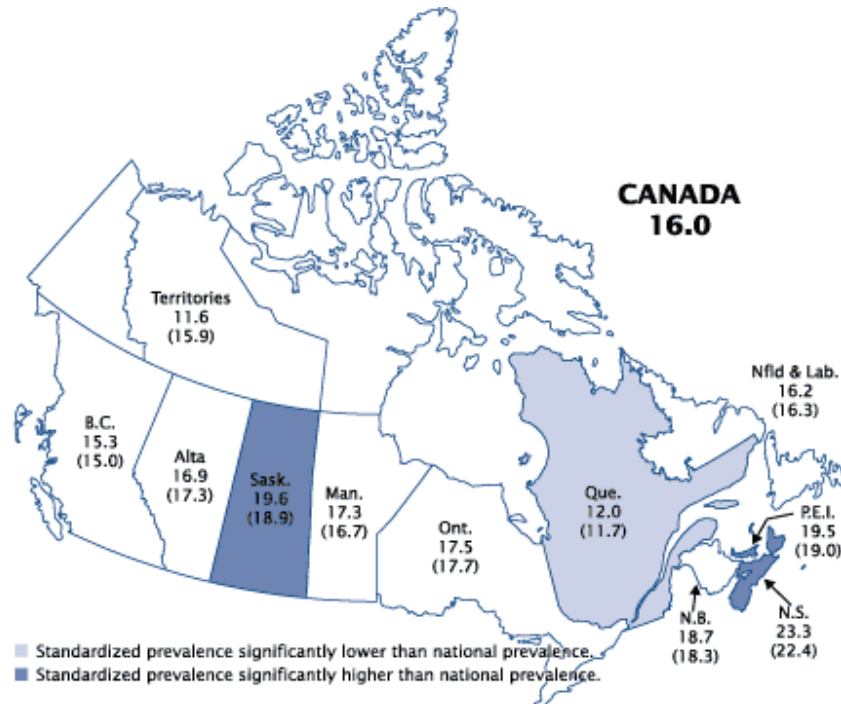
Arthritis is the leading cause of long-term disability in North America. OA thus results in a high incidence of physician visits per year (Fig. 1) affecting about one in ten Canadian adults. The greatest increase in incidence is expected to be in the over -45-age group (Fig. 2). It has been estimated by Statistics Canada (web 12) that at least 85% of Canadians will be afflicted with OA by the age of 70 years (5, 6, and Fig.3)). Today, it is surmised that arthritis and the complications from the disease cost North Americans approximately \$200 billion per year in lost wages and health care costs (76). According to The Public Health Agency of Canada Health Topic (web 13) arthritis and other rheumatic conditions affect around four million Canadians, of all ages, with numbers expected to double by 2020, and the group most affected is the senior population (web 13). Arthritis was calculated to carry an economic burden estimated at \$4.4 billion per year in Canada alone in the year 1998, and these figures will have increased substantially in the new millennium.

Figure 2. Number of individuals projected to have arthritis/rheumatism, by year and age group, household population aged 15 years and over, Canada, 2001-2026



Data source: Canadian Community Health Survey 2000, Statistics Canada; Population projections 2001-2026, Statistics Canada

Figure 3. Crude (age-sex standardized) prevalence of arthritis/rheumatism, by province/territory, household population aged 15 years and over, Canada, 2000



Data source: Canadian Community Health Survey 2000, Statistics Canada

The majority of arthritis care in Canada occurs in an ambulatory, or outpatient setting, and OA is estimated to affect 10-12 % of the adult population, and the majority of seniors (web 13). In 1998/99 (the latest figures available), approximately 163 of every 1000 Canadians aged 15 years and older made at least one visit to a physician for arthritis and related conditions (Table 2). As can be seen in the table, the majority of these visits related specifically to OA. About 5% of all physician visits were for arthritis and related conditions.

OSTEOARTHRITIS IS A NON-INFLAMMATORY
 CONDITION IN WHICH THE SHOCK-
 ABSORBING, SMOOTH, GEL-LIKE CARTILAGE
 IN BETWEEN THE JOINTS IS WORN DOWN,
 CAUSING THE REMAINING BONES TO RUB
 ABNORMALLY AGAINST ONE ANOTHER,
 RESULTING IN PAIN IN THE INVOLVED JOINT
 (webs 3, 4, 5, 9)

Table 2 Visits to all physicians for arthritis and related conditions among adults aged 15 years and over, Canada, 1998/99

Condition	Persons Visiting per 1,000 Population	Sex Ratio (Women:Men)	Estimated Total Number of Visits*	Average Number of Visits per Person
Arthritis and Related Conditions	162.7	1.3:1	8,800,000	2.3
Osteoarthritis	40.7	1.6:1	2,000,000	2.1
Rheumatoid Arthritis	7.4	2.4:1	540,000	3.1
Connective Tissue Disorders (e.g. lupus)	1.9	3.1:1	110,000	2.5
Ankylosing Spondylitis	1.1	1.0:1	40,000	1.8
Gout	5.2	0.3:1	200,000	1.6

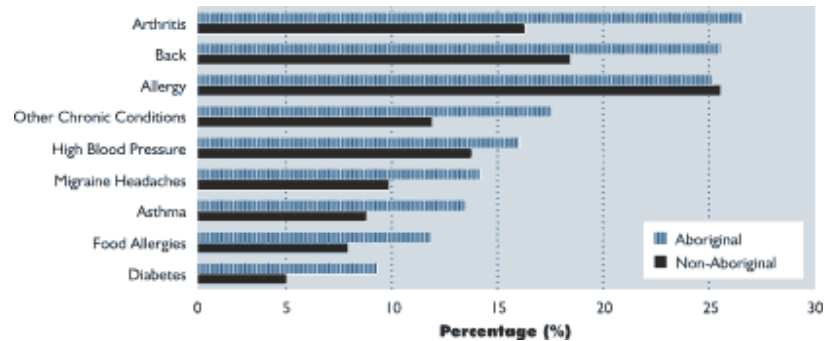
* A Canadian rate was calculated using data from the participating provinces, and visits for non-participating provinces were estimated by applying this rate to the respective 1998 provincial populations.

Source: provincial physician billing data (BC, AB, SK, MB, ON, QC, NS)

It is important to note that statistics for Aboriginal peoples, a very large sub group in Manitoba, demonstrate that they suffer from a much higher incidence of arthritis than non-Aboriginals (Fig. 4). Interestingly, differences were also noted for Aboriginals living off-reserve and those residing on reserves for women of all age groups, but not for the senior population of men (Fig.5). Differences between Aboriginals living off-reserve and non-Aboriginals are also significantly different for all age groups, except for the senior population (Fig. 6). No rationale could be found to explain these differences (web 1).

ARTHRITIS IS A GENERAL
TERM THAT REFERS TO ANY
INFLAMMATORY CONDITION
OF A JOINT (web 5).

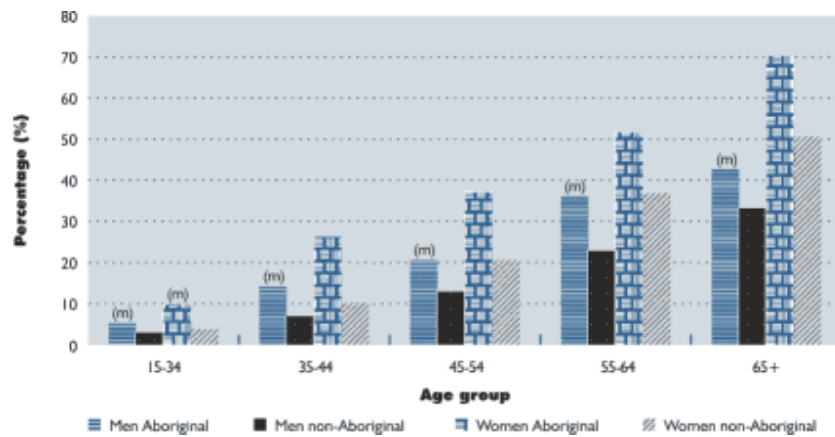
Figure 4. Standardized prevalence rates of specific chronic conditions among Aboriginal people living off-reserve and non-Aboriginal people aged 15 years and over, household population, Canada, 2000



Note: Differences between Aboriginals and non-Aboriginals are statistically significant at $p < 0.05$ except for allergy and high blood pressure.

Data source: Canadian Community Health Survey 2000, Statistics Canada

Figure 5. Self-reported prevalence of arthritis among Aboriginal people living off-reserve and non-Aboriginals, by age and sex, household population aged 15 years and over, Canada, 2000

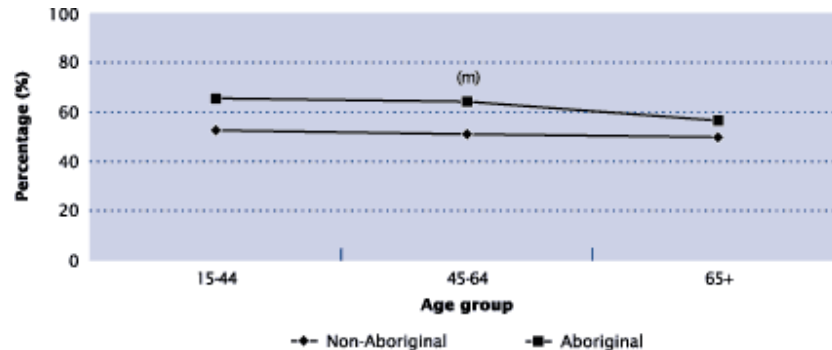


Note: Differences between Aboriginals living off-reserve and non-Aboriginals are statistically significant at $p < 0.05$ for females of all age groups and for males aged 35 to 44.

(m) indicates that the coefficient of variation is between 16.6% and 33.3%.

Data source: Canadian Community Health Survey 2000.

Figure 6. Proportion of individuals with arthritis reporting activity limitations, by age, Aboriginal people living off-reserve and non-Aboriginal people, household population aged 15 years and over, Canada, 2000



Note: Differences between Aboriginals living off-reserve and non-Aboriginals are statistically significant at $p < 0.05$ except for people aged 65 years and over. (m) indicates that the coefficient of variation is between 16.6% and 33.3%.
Data source: Canadian Community Health Survey 2000, Statistics Canada

Risk Factors

The key risk factors for the development of arthritis, which accompany the aging process, are excess weight, injury and complications from other conditions, genetic or heredity factors, immune system abnormalities or autoimmune disease, and lack of physical activity. Physical activity protects against the development of chronic disease and disability. There appears to be little risk of damage to joints from regular, moderate-level exercise. Patients with OA can safely participate in exercise programs and often have relief of pain and disability. The most difficult problem facing practitioners is how to get people with arthritis to start and maintain an exercise program (28). There is no known cure for arthritis, but the causal mechanisms and risk factors are better understood, and significant improvements in medications and treatments have been made in recent years (web 13).

Healthy Aging with Arthritis through Physical Activity: An Overview

The prevention of disability in activities of daily living (ADL) may prolong older persons' autonomy. However, proved preventive strategies for ADL disability are lacking. A sedentary lifestyle is an important cause of disability (65). Sedentary persons who improve their physical fitness are less likely to die of all causes. There is a wealth of data demonstrating that physical activity and exercise may ameliorate disease and delay decline in function in the geriatric population (8, 9, 55, 57, 58, 61, 62, 67). Exercise can improve body composition, diminish falls, increase strength, reduce depression, reduce arthritis pain, reduce risks for diabetes and coronary artery disease, and improve longevity (40).

Unfortunately, many healthcare professionals are not adequately prepared to design and prescribe exercise programs for their patients and thus the emergence of the team concept has taken on increased importance for the care and treatment of OA. This team should include a physician specializing in the disability, a nurse, a nurse practitioner, a rheumatologist, a social worker, a pharmacist, a dietitian, a physiotherapist, a kinesiologist or similarly trained exercise specialist, and an orthopedic surgeon (74). Health care providers are strongly encouraged to promote a less sedentary life style for their older patients, which may augment quality of life in these older individuals (17). Since many Canadians who suffer from arthritis avoid regimented exercise programs and most forms of physical activity because of the fear of inducing arthritic symptoms such as pain or fatigue, this team of specialists should be able to answer any questions and alleviate the concerns of the patients (44) even though there are so many different types of arthritis, and the symptoms and complications are specific to the individual (32).

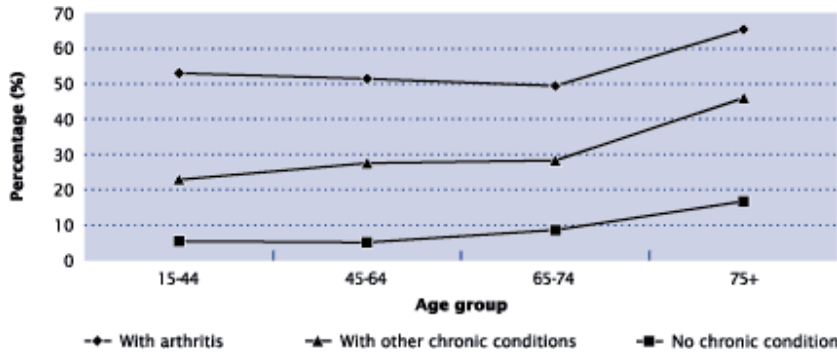
Unfortunately, aging with joint disease results in chronic pain, adoption of a sedentary lifestyle, and functional dependency. Regular exercise does not exacerbate pain or accelerate disease progression. On the contrary, exercise training may increase the physiologic reserve and reduce the risk for functional dependency in older adults with joint disease. The goals for an exercise program should be directed toward increasing flexibility, muscle strength, endurance, and cardiovascular fitness. An exercise training program that is tailored specifically to an older adult's physical limitations may achieve these goals, and by optimizing patient safety lead to improved long-term exercise compliance (64). It is very important that the exercise programs cater to the individual through adaptations to meet individual abilities, needs, and goals.

**YOU'RE NEVER TOO OLD
TO INCREASE YOUR LEVEL
OF PHYSICAL ACTIVITY
(40).**

Physical activity and exercise can decrease the symptoms of arthritis. Health Canada recommends at least 30 minutes of moderately intensive activity on most days of the week (30, 31). The loss of lean body mass (sarcopenia) can be diminished through a strength training program. With these benefits of maintaining an active lifestyle, healthcare providers should become proactive in emphasizing the benefits of physical activity to the older population (20). Since it is not possible to prevent the onset of arthritis, or to change some of the factors which make one susceptible to arthritis (age, sex, heredity), it is necessary to change those factors that can be at least partially controlled, such as by adopting a healthy life style, by strengthening supporting muscles, by maintaining joint mobility, and by controlling body weight (76). Nonetheless, a high percentage of Canadian seniors curtail physical activity, because of the limitations imposed by arthritis (Fig. 7).

**ARTHRITIS IS A COMPLEX DISEASE
WITH NO KNOWN CURE. AS A RESULT,
TREATMENT INVOLVES A WIDE
VARIETY OF MEDICATIONS AIMED AT
RELIEVING PAIN, PRESERVING JOINT
FUNCTION, AND LIMITING
PROGRESSION OF THE DISEASE (47).**

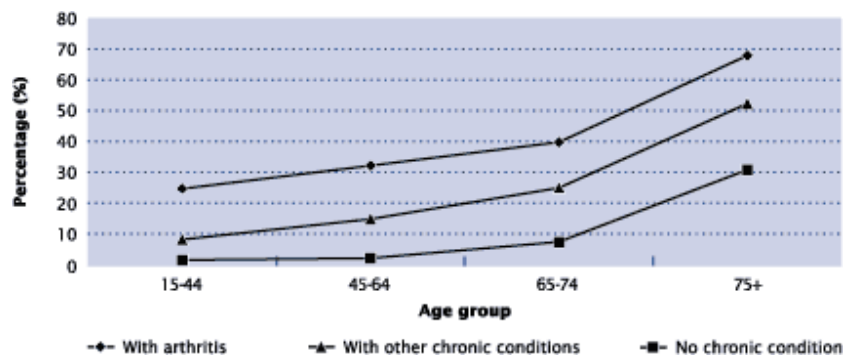
Figure 7. Proportion of individuals reporting activity limitations, by age, household population aged 15 years and over, Canada, 2000



Note: Values for people with arthritis are significantly higher than values for people with other and no chronic conditions at $p < 0.05$. Data source: Canadian Community Health Survey 2000, Statistics Canada

In Canada, roughly 56% of persons with rheumatic conditions engage in regular leisure time physical activity (12 or more 15-minute sessions per month). Only 13.2% of women and 18.9% of men with rheumatic conditions are sufficiently active at the level recommended to yield optimal health benefits. Both moderate and higher intensity leisure time physical activities are associated with less generalized distress. This relationship is more pronounced for women and older patients with rheumatic conditions. Thus, a significant proportion of Canadians with rheumatic conditions are physically inactive. Better efforts must be directed at promoting leisure time physical activity as part of the multidisciplinary management of arthritis (21). The rates are substantially higher than rates among people with either other or no chronic conditions of any type (2-10 fold). And these individuals generally tend to require assistance with everyday household chores (Fig. 8).

Figure 8. Proportion of individuals requiring help with daily activities, by age, household population aged 15 years and over, Canada, 2000



Note: Values for people with arthritis are significantly higher than values for people with other and no chronic conditions at $p < 0.05$. Data source: Canadian Community Health Survey 2000, Statistics Canada

The primary aims of any exercise program for individuals suffering from arthritis are to reduce pain, improve range of motion, increase strength around the affected joints, normalize gait, and permit the individual to perform ADL i.e. to generally increase the quality of life of the individual participants (13-15). If joint pain is already prevalent, then non-weight-bearing training should be initiated, with a gradual buildup to weight bearing, if possible. One should not participate in any exercise session during a period of pain or inflammation.

ARTHRITIS IS ONE OF THE MOST PREVALENT
CHRONIC HEALTH CONDITIONS IN CANADA AND
A MAJOR CAUSE OF MORBIDITY, DISABILITY, AND
HEALTH CARE UTILIZATION (4, 5, 6).

Osteoarthritis: Clinical Care

SYMPTOMS

The pain of OA typically begins gradually and progresses slowly over many years and is generally described as aching or throbbing. The pain often varies and there may be good days or bad days for no apparent reason. Some people find that a change in the weather or a drop in atmospheric pressure increases their pain level. As the day progresses and the joints are used, the pain and discomfort usually worsens. Movement of the joint can sometimes cause a grating, creaking sound or feeling (crepitus). The pain and swelling worsens with activity involving the affected joint and is initially relieved with rest. It is common for the joint to feel stiff at certain times, often in the morning and usually lasts less than 30 minutes, or after prolonged rest, which can restrict movement. A patient with OA of the hip may complain that it is difficult to put on socks due to stiffness. Over time, as the cartilage wears down and bone spurs form, the joints may slowly appear bony and enlarged. Naturally, all of the pain and stiffness cause the joints to be used less often and the muscles surrounding the joint weaken causing intermittent giving way due to muscle pain inhibition. Patients with OA of the knee often complain of instability or buckling, especially when they are descending stairs or stepping off curbs. Patients with OA often complain of problems with gait leading to a more sedentary lifestyle (web 11).

DIAGNOSIS

When a patient presents to his/her physician with signs and symptoms of OA, the physician will get a clear medical history and gather information about the extent of the pain and dysfunction being experienced. A physical examination to assess joint motion, stability, strength and overall alignment will be performed. Radiographs are typically ordered to help with the diagnosis. Early in the

WHEN DONE PROPERLY,
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DECREASE
OSTEOARTHRITIS
SYMPTOMS AND MAKE
YOU FEEL BETTER
OVERALL (webs 2, 3, 4)

disease process, physical examination findings may appear normal with only a mildly antalgic (painful) limp. Later in the disease process there may be visible and palpable osteophytes (bone spurs), swelling, limitations in range of motion, weak muscles surrounding the joint and soft tissue contractures. There is currently no routine blood test for OA, although blood tests are sometimes used to rule out other types of arthritis (e.g. rheumatoid arthritis). The x-ray is the most useful initial test to confirm OA; however the findings are nonspecific and often negative early in disease. An MRI is more sensitive in early OA and can also report on soft tissue structures such as cartilage. An x-ray helps with the diagnosis but it cannot predict how much pain a patient will experience. The association between joint pain and radiographic features of OA is not constant. An x-ray that looks bad does not necessarily mean a lot of pain or disability.

Table 3: Classification Criteria for OA of the Hip and Knee

Classification Criteria for Osteoarthritis of the Hip	Classification Criteria for Osteoarthritis of the Knee
Hip pain plus at least two of the following: <ul style="list-style-type: none"> - ESR <20mm/hr - Femoral or acetabular osteophytes on radiographs - Joint space narrowing on radiographs 	Knee pain plus osteophytes on radiographs and at least one of the following: <ul style="list-style-type: none"> - Age over 50 years - Morning stiffness lasting less than 30 minutes duration - Crepitus on active range of motion
Adapted from (2)	Adapted from (1)

MEDICAL MANAGEMENT

Appropriate medical management requires early diagnosis of OA, recognizing the factors that may affect the prognosis or complicate the disease, and making effective use of the numerous treatments available for OA (54). Pain control and maintenance of function are essential to quality patient care. These goals should be achieved with minimal toxicity. Management must be individualized and patient-centered and usually involves multiple strategies. Often drug therapy must be prescribed. Drug therapy should be individualized according to symptom severity, co-morbid conditions, concomitant therapy, side effects, therapy cost and patient preferences. Unfortunately, there is currently no medication that has been shown to consistently slow down the progression of OA.

NON-PRESCRIPTION MEDICATIONS

Acetaminophen

Acetaminophen (Tylenol®) is an effective first-line medication for pain relief which can be used for both short and long-term pain control of OA (79). It is currently the first choice for treating OA but may be less effective than NSAIDs in reducing moderate-to-severe pain. Acetaminophen is an inexpensive and relatively safe drug and poses far less of a risk for gastrointestinal problems than Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). There are daily limitations on the amount of acetaminophen that should be consumed as excess acetaminophen can cause liver

damage. The maximum daily recommended dose is 4 grams (4000 mg). Acetaminophen is a pain reliever, but does not reduce inflammation. For this reason it can usually be safely taken along with most prescription anti-inflammatory medications.

Ibuprofen & ASA

Non-prescription NSAIDs are a class of medications used to treat the early stages of OA. They have both analgesic (reduce pain), and anti-inflammatory (reduce swelling) activities. Acetylsalicylic Acid (ASA, Aspirin®, Entrophen®, Novasen®) and Ibuprofen (Advil®, Motrin®) are NSAIDs which can be purchased over-the-counter. It is safe to take 200-800mg of Ibuprofen 3-4 times per day. Patients must be careful to avoid taking ibuprofen with other doctor- prescribed NSAIDs as it can increase the risk of developing serious stomach problems. With the exception of low dose ASA for circulation problems, two different NSAIDs should not be taken simultaneously.

PRESCRIPTION MEDICATIONS

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

NSAIDs (Naprosyn®, Indocid®, Voltaren®), can be prescribed to help reduce pain and swelling of the joints, and decrease stiffness. However, they do not prevent further joint damage. People who take NSAIDs have less pain and stiffness and greater physical function than people who take solely acetaminophen. NSAIDs can be taken on an as needed basis but some patients find it helpful to take NSAIDs regularly to control their symptoms. Indigestion, heartburn/acid reflux, stomach cramps, diarrhea, and nausea are the most common side effects of NSAIDs. NSAIDs can affect the protective lining of the stomach making it more susceptible to ulcers and gastrointestinal bleeding. Patients should also be aware that NSAIDs can increase blood pressure and cause kidney damage. A prescription stomach protector (proton pump inhibitor) may be recommended in addition to the NSAID as it appears to be effective in prevention and healing of NSAID- induced ulcers and erosions (56).

WHILE
OSTEOARTHRITIS IS
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ARTHRITIS, MORE
THAN 100 DIFFERENT
CONDITIONS EXIST
(webs 13, 14).

COX-2 selective inhibitors (COXIBs)

COX-2 inhibitors (Celebrex®, Mobicox®) are a form of NSAID that directly target the enzyme responsible for inflammation and pain but have been custom-designed to reduce the risk of stomach and kidney side effects (23). They are very well tolerated and successful in the management of OA. Health Canada has reviewed all of the available data and an important 2006 study (60) found that NSAIDs and COXIBs are equally effective for pain relief but both are associated with an increased risk of cardiovascular events (angina, heart attack, stroke). The risk is greatest in those patients who use these medications at higher doses for long periods of time and have pre-existing risk factors for, or a history of, cardiovascular disease (37). Patients should discuss with their doctors whether these drugs are appropriate and safe for them.

Topical Medications

There are a number of over-the-counter creams and rubs available to help with the symptoms of OA (3). These products may contain salicylate (ASA), capsaicin or menthol as the active ingredient to relieve pain. Capsaicin cream, a pepper-plant derivative, has been shown to relieve the pain of OA when applied to the joint four times daily (3).

To relieve pain, inflammation, and minimize gastrointestinal side-effects, NSAIDs can also be delivered topically. In Canada, diclofenac (1.5%) solution is available in a prescription topical NSAID preparation called Pennsaid®. When applied topically to the skin, very little of the medication is absorbed systemically into the body which significantly reduces the usual side effects associated with oral NSAIDs. Pennsaid® is the only available prescription NSAID topical solution approved by Health Canada for OA of the knees specifically (81).

Narcotic Analgesics

When pain becomes a major problem and less potent pain relievers are ineffective, stronger, more powerful pain medications such as narcotics may be prescribed to enhance pain control of OA. Narcotics are pain-relieving and sleep-inducing drugs that act on the central nervous system. Although the use of narcotics for arthritic pain is controversial, there is gold level evidence that tramadol, taken for up to three months may decrease joint pain and stiffness, and improve function and overall-well being (16). A 2006 study suggested that a fentanyl patch may offer pain relief and improved function to patients with severe knee or hip OA who have difficulty tolerating NSAIDs (51). Narcotic medications should be taken under the direct supervision of a physician to monitor side effects.

COMPARED WITH PEOPLE WITH OTHER CHRONIC CONDITIONS, THOSE WITH ARTHRITIS EXPERIENCE MORE PAIN, ACTIVITY RESTRICTIONS, AND LONG- TERM DISABILITY, AND ARE MORE LIKELY TO NEED HELP WITH DAILY ACTIVITIES (webs 7, 9).

Corticosteroid Injections

When OA progresses to the point where pain relief becomes challenging, corticosteroid injections into the affected joint may be an option. An injection can provide almost immediate relief for a tender, inflamed joint (10, 18). However, this treatment can only be used sparingly, since recurrent intra-articular injections of corticosteroids can damage the cartilage and weaken the bone, resulting in further joint problems. As a general rule, a reasonable approach is to limit the frequency of injections to 3-4 to each joint per year. Most corticosteroid injections typically take 24-48 hours to take full effect and can often offer relief for up to three months. However, the length of time an injection will last is variable with some patients reporting months of relief while others find only a few days of relief. A patient should rest the joint for 24 hours after an injection as studies have shown this may improve the effect of the injection. If a significant benefit is achieved

OSTEOARTHRITIS CAN BE TREATED WITH MEDICATION, HEAT OR COLD APPLICATION, WEIGHT CONTROL, VISCOSUPPLEMENTATION, EXERCISE, AND FINALLY SURGERY (76).

after the first injection then an argument can be made for a repeat injection. Most joint injections result in no side-effects or complications.

Hyaluronan Injections (Viscosupplementation)

Viscosupplementation (Synvisc®, Neovisc®, Suplasyn®, Durolane®) is a relatively new treatment in Canada for people with OA. OA is characterized by a decreased concentration of naturally occurring hyaluronic acid in the joint which acts as a biologic lubricant and shock absorber. Intra-articular injection of sodium hyaluronate has been shown to be safe and effective for the symptomatic relief of OA. Viscosupplementation helps the synovial fluid regain its ability to lubricate joint cartilage (much like oil lubricates an engine), and allows the joint to absorb mechanical shock to help reduce pain (46). Unfortunately the injections are expensive and not always covered by personal benefits and drug plans.

COMPLEMENTARY THERAPY

Alternative approaches for the management of OA exist and may complement a patient's treatment plan but are not meant to replace it. Proper selection of supplements and complementary therapies should be discussed with a physician in case of possible interactions with other medications.

Glucosamine & Chondroitin

Glucosamine and chondroitin are normal components of articular cartilage and a very popular supplement taken by patients with OA. They are available without a prescription and although many people with OA use these medications there is conflicting evidence as to whether they are actually effective (47, 78).

The safety records of both substances appear excellent. The typical recommended dose of glucosamine is 500 mg three times per day and the usual dose of chondroitin is 400 mg three times per day. Chondroitin is usually found combined with glucosamine in a single tablet. If patients do not experience any benefit after three months of use, it is unlikely going to be therapeutic or successful and should be stopped.

Surgery

When OA pain becomes severe and medical therapies are no longer effective, different surgical procedures are available as a final measure to relieve pain and increase function in patients with OA (10, 50). Types of procedures vary according to the site and the degree of involvement and consultation with an orthopaedic surgeon is necessary to determine the best surgical option. To be a suitable candidate for surgery, patients must be medically fit and able to participate in a rehabilitation program postoperatively.

a) Arthroscopy

Arthroscopic lavage is a procedure using saline to "wash out" loose fragments of bone and other tissues from the joint. A debridement is a relatively minor surgery that can be performed to clean out cartilage debris from the joint, smooth the surfaces, and trim or remove flaps of damaged or calcified cartilage. It is performed as outpatient surgery and

PEOPLE WITH ARTHRITIS CAN IMPROVE THEIR HEALTH AND FITNESS THROUGH PROPER EXERCISE WITHOUT HURTING THEIR JOINTS (web 6).

does not usually require an overnight stay in hospital. Unfortunately, recent (2008) evidence shows that a debridement procedure provides only short term pain relief and in all probability does not improve pain or ability to function compared to placebo (sham surgery) or lavage (52).

b) Osteotomy

If only a certain section of the joint is damaged and deformed by OA (i.e. medial or lateral compartment), then a joint realignment surgery or osteotomy may be performed. The bone is reshaped, realigned and repositioned to remove the deformity to unload an overloaded compartment. This procedure can ease symptoms and slow disease progression. Osteotomy typically has been considered for younger and more active patients and is best used in adults who are under the age of 60 (69).

c) Total Joint Replacement/Arthroplasty

When OA becomes so relentless that pain and immobility make normal functioning impossible, severely damaged joints can be reconstructed or surgically replaced (arthroplasty) with an artificial (prosthetic) joint implant. Joint replacement is major surgery and is most often performed to replace hip and knee joints. Joint

IF YOU HAVE ARTHRITIS
OR STIFF JOINTS-THEN IT
IS EVEN MORE IMPORTANT
THAT YOU MAKE A
COMMITMENT TO DOING
GENTLE MOVEMENTS (40)

replacements relieve pain, improve function and restore the ability to move joints. Artificial joints can last 10-20 years before they wear out and require revision, which is why this type of surgery is delayed until it is clearly necessary. There is consensus that high-impact activities are deleterious after joint replacement arthroplasty and may lead to early wear and failure of the implant

and potential loosening of the prosthesis. It has been recommended that nothing more strenuous than cycling, doubles tennis, low-impact aerobics, cross-country or light downhill skiing be performed following joint replacement surgery (41).

Prevention: Physical Activity Prescription and Management of OA

There appear to be no specific contraindications to exercise regarding the treatment of OA. Although it is recommended that an individual first receive medical clearance to participate in any form of exercise (71). Due to the prevalence of knee OA, and to a lesser degree hip OA, the majority of research with regards to the prevention and treatment of OA focuses on these two joints. Prevention is the best possible intervention for the treatment of OA. Ideally, one should focus on primary prevention (helping healthy individual stay healthy), but, realistically, secondary (identifying those at risk and possibly preventing the development of OA) prevention is also necessary (38). It should be emphasized that the development of OA is not simply part of the aging process. As Hurley (43) states:

“Health care professionals, patients and the lay population regard osteoarthritis as an inevitable consequence of life, resulting in

CAUSES OF OSTEOARTHRITIS:
AGE, HERIDITY, EXCESS
WEIGHT, JOINT INJURY, WEAR
AND TEAR, COMPLICATIONS OF
OTHER TYPES OF ARTHRITIS
(webs 2, 3, 4).

a slow, relentless deterioration, which is not only incurable but also virtually untreatable”.

There are individual factors that predispose an individual to develop OA and these factors have the potential to be effectively prevented or managed. In order to assist in the prevention of OA, risk factors that can contribute to its development must be identified. This section of the paper will focus on the modifiable risk factors, because this is where the clinical team can have the greatest impact.

Bijlsma (12) identified a multitude of modifiable risk factors, but this section focuses on those that can be affected by conservative treatment. Obesity, muscle weakness, joint injury, sports participation and occupational stresses are all potentially modifiable risk factors for the development of OA (12). Obesity has been identified as one of the most important risk factors for the development of hip OA (25, 26). Each kg/m² of BMI > 27 (body mass index), increases the risk of knee OA by approximately 15% (73). Not only does risk increase with obesity, but also the progression of the disease itself, when compared to those who are not overweight (73). While it is easy to understand that, as weight increases, joints experience more force and impact, research has also demonstrated that fatty tissue may possess particular hormones that can affect cartilage and underlying bone, predisposing them to the development of OA (38). The maintenance of a healthy body weight may be the single most important factor in preventing OA in weight bearing joints (42). Obese women have approximately four times the risk of developing knee OA compared to women with a BMI < 25 and obese men have five times the risk. Obesity is the number one factor accounting for knee OA in females and the number two factor for males (31).

As one ages, the strength in the quadriceps muscle (thigh) slowly decreases (65). Muscular strengthening may prevent the development of knee OA or slow down the progression in those who already possess some knee OA (44, 45).

An acute injury to either the knee or hip has been shown to be a risk factor in the development of OA. In fact, it is the number one factor accounting for knee OA in males (31). For the hip, the injury must have been severe enough to be non-weight-bearing for at least one week (26) whereas for the knee, injuries to the ACL, PCL or menisci have been associated with a higher prevalence of knee OA later in life. Occupations requiring a significant amount of kneeling and squatting will increase the potential risk of developing knee OA (26) and farm chores represent the greatest relative risk for developing OA of the hip or knee (19). And finally, the current literature does not support the development of OA in sports such as football or running, unless an injury has occurred (25, 42).

ARTHRITIS AND OTHER
RHEUMATIC CONDITIONS
AFFECT ABOUT FOUR MILLION
CANADIANS OF ALL AGES, WITH
NUMBERS EXPECTED TO
DOUBLE BY 2020 (webs 13, 14).

Treatment

A surplus of evidence exists that advocates the use of physical activity/exercise (both aerobic and strengthening) in the treatment of various forms of OA. Hurley (43) even goes so far as to state that “failure to recommend exercise to our patients is professional negligence”. The majority of treatment addresses knee OA, once again due to the prevalence of injuries to this joint, but it is feasible that the principles of therapeutic exercise can be applied to all forms of OA. There are typically three forms of therapeutic approaches utilized in the treatment of OA: joint mobility, strengthening exercises, and aerobic endurance types of physical activity (63).

While generalized exercise programs can benefit those with OA, treatment should be individualized and specific to the individual’s particular objective, findings, and goals. When assessing an individual with OA (especially in the weight bearing joints), the entire lower kinetic chain should be examined to better determine the underlying biomechanical mechanisms that may be contributing to the presence of the particular symptoms. The analogy of a car’s steering alignment is very applicable in this instance. If a car’s steering alignment is off, it can cause the tires to go bald. One option is to simply continue to replace the balding tires. While less time consuming, the more appropriate intervention would be to address the underlying issue with the alignment. The message is to address the cause of the problem, not to simply fix the effect.

The majority of research compares strengthening exercises with those of aerobic exercises or a combination of each. Either aerobic exercise or strengthening exercises improve ADL disability, e.g. transferring from a bed to a chair, eating, dressing, using a toilet or bathing, in those people who suffer from knee osteoarthritis and in order to assist with the prevention of disability later in life (66). The use of manual physical therapy combined with exercise improves pain, stiffness and function, while decreasing the need for surgical intervention (30). Deyle et al (25) compared a home based exercise program

MANY OF THE TREATMENT OPTIONS TRY TO DEAL WITH THE PAIN ASSOCIATED WITH OSTEOARTHRITIS AND WITH THE PREVENTION OF FURTHER DAMAGE (webs 5, 9).

to one in a clinical setting, supervised by a physiotherapist. After one year, both groups demonstrated significant improvements, but the clinical group was less likely to be taking medication and was more satisfied. Even though both forms of intervention were extremely beneficial, the added treatment of a physiotherapist further improved outcomes (26). Both aerobic walking and home based quadriceps strengthening exercises are effective in reducing pain and disability in subjects with knee OA (70, 71) and no advantage of one over the other is apparent. However, strengthening exercises appear to exhibit greater outcomes in the short term, while aerobic exercise appears to be more beneficial in the long term (8, 14, 29, 55, 64, 70). Resistance training, when prescribed appropriately, is effective for developing fitness and health, and for the prevention and rehabilitation of orthopaedic injuries. For healthy persons of all ages and many patients with chronic diseases, single set programs

of up to 15 repetitions performed a minimum of two days per week(19) are recommended. Each workout session should consist of 8-10 different exercises that train the major muscle groups. Single set programs are less time consuming and more cost efficient, which generally translates into improved program compliance. Further, single set programs are recommended for the above-mentioned populations because they produce most of the health and fitness benefits of multiple set programs. The goal of this type of program is to develop and maintain a significant amount of muscle mass, endurance, and strength to contribute to overall fitness and health. Patients with arthritis may have to limit range of motion for some exercises and use lighter weights with more repetitions (29). In order to maximize overall patient outcomes, an exercise program incorporating strengthening and aerobic elements together with other specific exercise based on individual requirements is most appropriate. Once again, research supports strongly the use of physical activity in the treatment of OA, yet the best way to deliver treatment is still equivocal (71).

Adherence is a major predictor of response to exercise. Therefore, having the option of aerobic exercise and/or strengthening exercises allows for variation that will hopefully improve patient compliance.

Attrition and adherence: In order to provide successful interventions to increase physical activity among inactive older adults, it is imperative to understand motivational factors influencing exercise itself: knee OA has been positively related to motivation from an organized exercise opportunity and from efficacy/outcome expectations, and knee pain has been shown to be positively related to motivation from social support and experience with the exercise task. Understanding these motivators might help in targeting recruitment efforts and interventions designed to increase physical activity in older adults with lower extremity arthritis. (22)

People with OA are often asked to adhere to prescribed exercise regimens that must be undertaken in the presence of pain and other disease-related symptoms. Research has shown that there are multiple determinants of exercise adherence; however, these determinants have not been carefully studied in the context of exercise adherence and OA. Almost all studies of exercise adherence among people with OA are short-term and do not use validated measures of adherence. Moreover, poor adherence is the most compelling explanation for the declining impact of the benefits of exercise over time. Interventions to enhance self-efficacy, social support, and skills in long-term monitoring of progress are necessary to foster exercise adherence among people with OA (59).

WHILE OSTEOARTHRITIS IS ONE OF THE MOST COMMON FORMS OF ARTHRITIS, MORE THAN 100 DIFFERENT CONDITIONS EXIST (webs 13, 14).

Table 4: General Principles for the Treatment of Osteoarthritis

1. Both strengthening and aerobic exercise can reduce pain and improve function and health status in patients with knee and hip osteoarthritis.
2. There are few contraindications to the prescription of strengthening or aerobic exercise in patients with hip or knee osteoarthritis.
3. Prescription of both general (aerobic fitness training) and local (strengthening) exercises is an essential, core aspect of management for every patient with hip or knee osteoarthritis.
4. Exercise therapy for osteoarthritis of the hip and knee should be individualized and patient-centred taking into account factors such as age, co-morbidity and overall mobility.
5. To be effective, exercise programs should include advice with education to promote a positive lifestyle change with an increase in physical activity.
6. Group exercise and home exercise are equally effective and patient preference should be considered.
7. Adherence is the principle predictor of long-term outcome from exercise in patients with knee or hip osteoarthritis.
8. Strategies to improve and maintain adherence should be adopted, e.g. long-term monitoring/review and inclusion of spouse/family in exercise.
9. The effectiveness of exercise is independent of the presence or severity of radiographic findings
10. Improvements in muscle strength and proprioception gained from exercise programs may reduce the progression of hip and knee OA.

It should be noted that the above recommendations are based on both rigorous scientific research and expert opinion (Roddy et al, 2005 #17 68-70)

Alternative or Complementary Treatment of osteoarthritis

While there is a plethora of evidence that supports the use of exercise in the treatment of OA, there exist other options (although it would be recommended that these interventions be utilized with exercise rather than independently). The use of acupuncture in the treatment of hip OA has been shown to help to control pain, improve function and decrease pain medication use when compared to education and exercise (39). The majority of the research on the use of acupuncture in the treatment of OA is promising, but inconclusive at this stage (63). While most commonly used for knee OA, bracing and/or orthotics can provide an effective means to improve function and control symptoms. Braces and/or orthotics have the ability to help improve shock absorption, disperse abnormal forces within the joint, improve balance and increase stability when prescribed appropriately. For patients diagnosed with medial knee compartment OA, the use of an *Unloader Knee Brace* may be indicated (38). This type of brace can help

prevent further disease progression. It has also been shown that the use of a basic neoprene sleeve can be equally as effective as the *Unloader Knee Brace* in reducing pain and improving function. As well, orthotics, specifically heel wedges, have been shown to help control the symptoms of OA and may possibly represent an alternative to total knee replacements (38).

As stated above, most people with arthritis are not regularly active. Understanding what factors influence exercise is essential for designing programs to increase participation. Exercisers are less likely than non-exercisers and insufficiently active people to report that arthritis negatively affected their physical and social functioning. Exercisers also report less pain than non-exercisers. The health assessment team needs to target exercise self-efficacy when designing exercise interventions and to tailor exercise programs to individuals' physical limitations (24).

Learning to Learn about Your Osteoarthritis

It is clear that there is much to learn and understand about osteoarthritis. As is the case with many medical conditions, there is a plethora of information that can guide, inform, and potentially confuse anyone of any age group. Thus it is imperative to learn how to process this information in a meaningful way and become knowledgeable about credible and reliable resources.

WHILE MOST INDIVIDUALS WITH ARTHRITIS AND RELATED CONDITIONS ARE TREATED IN AN AMBULATORY CARE SETTING, SOME WILL REQUIRE ADMISSION TO A HOSPITAL AND/OR SURGICAL INTERVENTION (webs 13, 14).

“Contrary to conventional wisdom about the nature and purpose of education in later life, education for older adults should relate to their gaining power over their lives, to retraining, self-fulfillment, and empowerment” (36)

Learning how you learn is an important step in the learning process. In the past 30 years, the education field has focused much attention on Howard Gardiner’s (1983) work on Multiple Intelligences. Gardiner’s theory purports that learning is not one-dimensional and that there are various ways in which people learn. In fact, learning styles and rates differ from one individual to another. Learning

involves developing and challenging the conventional ways of processing information to explore the new ways in which learning takes place (77).

Gardiner’s theory of multiple intelligences (33, 34) includes eight different types of intelligences that describe the potential pathways to learning. They are as follows:

1. Linguistic intelligence (words: using language to express oneself)
2. Logical-mathematical intelligence (numbers or logic: capacity to analyze problems; deductive reasoning)
3. Spatial intelligence (pictures; recognize patterns)
4. Bodily-Kinesthetic intelligence (a physical experience to solve problems)

5. Musical intelligence (music: performance, composition and appreciation of musical patterns)
6. Interpersonal intelligence (a social experience; people smart; working effectively with others)
7. Intrapersonal intelligence (self-reflective; capacity to understand oneself)
8. Naturalist intelligence (an experience in the natural world; environment) (33, 34, 35)

According to Gardiner, knowing how we learn can enhance our ability and motivation to learn. Gardiner also suggests that people learn best using one or more of these intelligences, but not all eight. From the list above, what type of learner do you think you are?

SOME PEOPLE FIND THE APPLICATION OF HOT OR COLD COMPRESSES BEFOR AND AFTER EXERCISE, VERY COMFORTING.

How do I process all this information on Osteoarthritis?

- Try to limit the amount of information you process at any given time. It is best to “chunk” or group the information and avoid sensory/processing overload.

“Learning takes place at all ages. Studies have indicated that the ability to learn is about the same at age 80 as it is at age 12. Learning may be slower for the elderly but it can be accomplished” (36)
- Write down questions specific to your situation instead of trying to remember them when you speak to the health care professionals. Perhaps it is best to keep a written account of your exercise program and indicate right on the program when you weren’t clear on something. This will allow for a better dialogue with the health care professionals when you meet with them.
- Gather a few good resources and read through them carefully. It can become very confusing when we have too much information and we try to sort through it.
- Choose reliable and current resources such as Health Canada (see bibliography). There is so much information on the internet and it is important to choose websites that are government sponsored web-sites (53)
- In the event that you want clarification or more information, choose resources where contact information is readily available.

EXERCISE IS ONE OF THE BEST TREATMENTS FOR ARTHRITIS.

Who is Responsible for My Exercise Program?

It is important to recognize that you play an integral role in the design, implementation and management of your exercise regimen. In fact it is important to be actively involved in the process of working with health care professionals when individualizing your exercise program. Only you know your likes, dislikes, and motivation level. It is necessary to incorporate self-directed learning goals, approaches to exercise and resources needed to successfully start and maintain physical activity that is appropriate for you (40). You need to feel empowered by your choices and input regarding a program that is specific to your needs and abilities.

Canada in a Leadership Role

For several decades Canada and Canadians have been considered worldwide to be leaders in the study of geriatrics and gerontology. In particular Canada has been the leader in the affects of physical activity on aging. In fact, Health Canada, with the assistance of ALCOA and CSEP, produced the first major manual (40) concerned with aging and physical activity for seniors. This manual, which is referred to and used internationally grew from “The Blue Book” (72), the culmination of a series of think tank sessions by Canadian experts in aging, physical activity, gerontology and geriatrics. Additionally Canada hosted a national (with invited foreign experts) (75) and an international conference on aging and physical activity with particular emphasis on comparisons of the problems related to aging around the world (27, 45).

The Public Health Agency of Canada, in collaboration with several key partners, is further contributing to the enhancement of this knowledge through the production of the book entitled “Arthritis in Canada: An Ongoing Challenge” (web 13). This publication synthesizes the available data on the impact of arthritis in Canada and includes the effects of aging, and exercise as a modulator. Most importantly, the book identifies strategies that might be used to alleviate the health care problems related to arthritis and its adverse consequences.

Most recently (2008), the Government of Canada has established a Senate Committee on Aging. Most importantly, one complete chapter (Chapter 2) of the six in the Second Interim Report has been dedicated to active aging (Special Senate Committee on Aging: Second Interim Report, 2008). It is apparent that the members of this committee (at the highest level of government) have been made aware of the significance and importance of the effects of exercise on the healthy aging process, in particular, the relationship to the debilitating diseases of aging.

Bibliography

- 1) Altman R, Alarcon G, Appelrouth D, Bloch D, Borenstein D, Brandt K, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. Arthritis Rheum 34: 505-14, 1991.
- 2) Altman R, Asch E, Bloch D, Bole G, Borenstein D, Brandt K, Christy W, Cooke TD, Greenwald R, Hochberg M, et al. Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Arthritis Rheum. Aug; 29: 1039-49, 1986.
- 3) Altman RD, Auen A, Holmburg CE, Pfeifer LM, Sack M, Young GT. Capsaicin cream 0.025% as monotherapy for osteoarthritis: a double-blind study. Semin Arthritis Rheum 23(suppl 3): S25-33, 1994.
- 4) Badley E. The effect of osteoarthritis on disability and health care use in Canada. J. Rheumatoid Suppl. 43: 19-22, 1995.
- 5) Badley E., Rothman L. Wang P. Modeling physical dependence in arthritis: the relative contribution of specific disabilities and environmental factors. Arthritis Care Research, 11: 335-345, 1998.
- 6) Badley E., Wang P. Arthritis and the aging population: projections of arthritis prevalence in Canada 1991-2031. J. Rheumatol. 25: 138-144, 1998.
- 7) Bagge E, Brooks P. Osteoarthritis in older patients. Optimum treatment. Drugs Aging. 7:176-83, 1995.
- 8) Baker KR, Nelson ME, Felson DT, Layne JE, Sarno R, Roubenoff R. The efficacy of home based progressive strength training in older adults with knee osteoarthritis: a randomized controlled study. J Rheumatol. 28:1655-65, 2001.
- 9) Bean JF, Vora A, Frontera WR. Benefits of exercise for community-dwelling older adults. Arch Phys Med Rehabil.85: (Suppl 3):S31-42, 2004.
- 10) Bellamy N, Campbell J, Robinson V, Gee T, Bourne R, Wells G. Intraarticular corticosteroid for treatment of osteoarthritis of the knee. Cochrane Database Syst Rev. 2:CD005328, 2005.
- 11) Bienenstock H, Fernando KR. Arthritis in the elderly: An overview. Med Clin North Am. 60:1173-89, 1976.
- 12) Bijlsma JWJ and Knahr K. Strategies for the prevention and management of osteoarthritis of the hip and knee. Best Practices & Research Clinical Rheumatology. 2007;21(1):59-76.
- 13) Buchner DM. Physical activity and quality of life in older adults. JAMA. 277:64-6, 1997.
- 14) Butler RN, Davis R, Lewis CB, Nelson ME, Strauss E. Physical fitness: benefits of exercise for the older patient. 2. Geriatrics. 53:46, 49-52, 61-2, 1998.
- 15) Cann AP, Vandervoort AA, Lindsay DM. Optimizing the benefits versus risks of golf participation by older people. J Geriatr Phys Ther. 28:85-92, 2005.
- 16) Cepeda MS, Camargo F, Zea C, Valencia L. Tramadol for osteoarthritis. Cochrane Database of Systematic Reviews . Issue 3, 2006.
- 13) Christmas C, Andersen RA. Exercise and older patients: guidelines for the clinician. J Am Geriatr Soc. 48:318-24, 2000.
- 14) Cole BJ, Schumacher HR Jr. Injectable corticosteroids in modern practice. J Am Acad Orthop Surg. 13:37-46, 2005.
- 15) Cooper C, Inskip H, Croft P, Campbell L, Smith G, McLaren M and Coggon D. Individual risk factors for hip osteoarthritis: obesity, hip injury and physical activity. American Journal of Epidemiology 1998;147(6):516-522.
- 16) Curl WW. Therapeutic and physical fitness exercise prescription for older adults with joint disease: an evidence-based approach. Aging and exercise: are the compatible in women? Clin Orthop Relat Res. 372:151-8, 2000.
- 17) Da Costa D, Lowensteyn I, Dritsa M. Leisure-time physical activity patterns and relationship to generalized distress among Canadians with arthritis or rheumatism. J Rheumatol. 30:2476-84, 2003.
- 18) Damush TM, Perkins SM, Mikesky AE, Roberts M, O'Dea J. Motivational factors influencing older adults diagnosed with knee osteoarthritis to join and maintain an exercise program. J Aging Phys Act. 13:45-60, 2005.

- 19) Deeks, JJ, Smith, LA, Bradley, MD. Efficacy, tolerability, and upper gastrointestinal safety of celecoxib for treatment of osteoarthritis and rheumatoid arthritis: systematic review of randomised controlled trials. BMJ 325(7365):619,2002.
- 20) Der Ananian C, Wilcox S, Watkins K, Saunders R, Evans AE. Factors associated with exercise participation in adults with arthritis. J Aging Phys Act. 16:125-43, 2008.
- 21) Deyle GD, Akison SC, Matekel RL, Ryder MG, Stang JM, Gohdes DD et al. Physical therapy treatment effectiveness for osteoarthritis of the knee: a randomized comparison of supervised clinical exercise and manual therapy procedures versus a home exercise program. Physical Therapy, 2005; 85(12): 1301-1317.
- 22) Deyle GD, Henderson NE, Matekel RL, Ryder MG, Garber MB, Allison SC. Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee: a randomized, controlled trial. Annals of Internal Medicine 2000; 132(3): 173-181.
- 23) Ecclestone, N., A.W. Taylor. 6th World Congress on Aging and Physical Activity "From Research to Action for an Aging Society" Final Report, CCAA Press, 2004, (114 pages).
- 24) Ettinger WH Jr. Physical activity, arthritis, and disability in older people. Clin Geriatr Med. 14:633-40, 1998.
- 25) Feigenbaum MS, Pollock ML. Prescription of resistance training for health and disease. Med Sci Sports Exerc.31:38-45, 1999.
- 26) Felson DT. Weight and Osteoarthritis. AM J Clin Nutr 1996;63(suppl):430S-2S.
- 27) Felson DT and Zhang Y. An update on the epidemiology of knee and hip osteoarthritis with a view to prevention. Arthritis & Rheumatism, 1998; 41(8): 1343-1355.
- 28) Frier, B. & Taylor A.W. Osteoarthritis, Aging, and Physical Activity. European Review of Aging and Physical Activity 2: 47-56, 2005.
- 33) Gardiner, H. Frames of Mind: The Theory of Multiple Intelligences. New York: Basic, 1983.
- 34) Gardiner, H. Multiple Intelligences: The Theory in Practice. New York: Basic, 1993.
- 35) Gardiner, H. Intelligences Reframed: Multiple Intelligences for the 21st Century. New York, Basic, 2000.
- 36) Glendenning, F. and Battersby, D. Educational Gerontology and Education for Older Adults: A Statement of First Principles. Australian Journal of Adult and Community Education; 30 :38-44, 1990.
- 37) Graham, D, Campen, D, Hui, R, Spence, M, Cheetham, C, Levy, G, Shoor, S, Ray, W. Risk of acute myocardial infarction and sudden cardiac death in patients treated with cyclo-oxygenase 2 selective and non-selective non-steroidal anti-inflammatory drugs: nested case-control study. The Lancet. 365, Issue 9458, 475-481XXXX.
- 38) Gravlee JR and Van Durme DJ. Braces and splints for musculoskeletal conditions. American Family Physician. 2007; 75(3): 342-348.
- 39) Haslam R. A comparison of acupuncture with advice and exercise on the symptomatic treatment of osteoarthritis of the hip – a randomized controlled trial. Acupuncture in Medicine 2001; 19(1):19-26.
- 40) Health Canada, ALCOA, & CSEP. Canada's Physical Activity Guide to Healthy Active Living for Older Adults. Canada Communication Group, Ottawa, 1999, 22 pages.
- 41) Healy WL, Iorio R, Lemos MJ. Athletic activity after joint replacement. Am J Sports Med. 29:377-88, 2001.
- 42) Hinton R, Moody RL, David AW, Thomas SF. Osteoarthritis: diagnosis and therapeutic considerations. American Family Physician 2002;65(5): 841-848.
- 43) Hurley MV. Muscle, exercise and arthritis. Ann Rheum Dis 2002;61:673-675.
- 44) Jones, G. R., Jakobi, J.M., Taylor, A.W., Petrella, R.J., Vandervoort, A.A.. Community Exercise Program for Older Adults Recovering from Hip Fracture: A Pilot Study. Journal of Aging and Physical Activity 14: 439-455, 2006.
- 45) Jones, G., A. W. Taylor, N. Ecclestone (Eds). Scientific Proceedings from the 6th International Congress on Aging and Physical Activity: Research to Action for an Aging Society. London: CCAA Press, 2005, (253 pages+ a diskette with 60 articles).

- 46) Jüni P, Reichenbach S, Trelle S, Tschannen B, Wandel S, Jordi B, Züllig M, Guetg R, Häuselmann HJ, Schwarz H, Theiler R, Ziswiler HR, Dieppe PA, Villiger PM, Egger M; Swiss Viscosupplementation Trial Group. Efficacy and safety of intraarticular hyaluron or hyaluronic acids for osteoarthritis of the knee: a randomized controlled trial. *Arthritis Rheum.* 56:3601-9, 2007.
- 47) Kasman N. & Badley E. Arthritis-related prescription medications. In: *Arthritis in Canada*. Public Health Agency of Canada, Ottawa, 2009.
- 48) Kee CC. Osteoarthritis: manageable scourge of aging. *Nurs Clin North Am.* 35:199-208, 2000.
- 49) Kijowski R, Blankenbaker D, Stanton P, Fine J, De Smet A. Arthroscopic validation of radiographic grading scales of osteoarthritis of the tibiofemoral joint. *Am J Roentgenol.* 187:794-9, 2006.
- 50) Kirkley A, Birmingham TB, Litchfield RB, Giffin JR, Willits KR, Wong CJ, Feagan BG, Donner A, Griffin SH, D'Ascanio LM, Pope JE and Fowler PJ. A randomized trial of arthroscopic surgery for osteoarthritis of the knee. *N Eng J Med*, 2008;359:1097-107.
- 51) Langford R, McKenna F, Ratcliffe S, Vojtassák J, Richarz U. Transdermal fentanyl for improvement of pain and functioning in osteoarthritis: a randomized, placebo-controlled trial. *Arthritis Rheum.* 54:1829-37, 2006.
- 52) Laupattarakasem W, Laopaiboon M, Laupattarakasem P, Sumananont C. Arthroscopic debridement for knee osteoarthritis. *Cochrane Database Syst Rev.* Jan 23:CD005118, 2008.
- 53) Liszka, H.A., Steyer, T.E., and Hueston, W.J. (2005) How to Guide Patients for Online Information: Focus on Chronic Disease. Pub Med ID 16711618 *JSC Med Assoc.* 101: 378-80, 2005.
- 54) Loeser RF Jr. Aging and the etiopathogenesis and treatment of osteoarthritis. *Rheum Dis Clin North Am.* 26:547-67, 2000.
- 55) Luepingsak N, Amin S, Krebs DE, McGibbon CA, Felson D. The contribution of type of daily activity to loading across the hip and knee joints in the elderly. *Osteoarthritis Cartilage.* 10:353-9, 2002.
- 56) Manek NJ, Lane NE. Osteoarthritis: Current concepts in diagnosis and management. *American Family Physician* 37: 21-28, 2000.
- 57) Mangani I, Cesari M, Kritchevsky SB, Maraldi C, Carter CS, Atkinson HH, Penninx BW, Marchionni N, Pahor M. Physical exercise and comorbidity. Results from the Fitness and Arthritis in Seniors trial (FAST). *Aging Clin Exp Res.* 18:374-80, 2006.
- 58) Mangione KK, McCully K, Gloviak A, Lefebvre I, Hofmann M, Craik R. The effects of high-intensity and low-intensity cycle ergometry in older adults with knee osteoarthritis. *J Gerontol A Biol Sci Med Sci.* 54:M184-90, 1999.
- 59) Marks R, Allegrante JP. Chronic osteoarthritis and adherence to exercise: a review of the literature. *J Aging Phys Act.* 13:434-60, 2005.
- 60) McGettigan P, Henry D. Cardiovascular risk and inhibition of cyclooxygenase: a systematic review of the observational studies of selective and nonselective inhibitors of cyclooxygenase 2. *JAMA.* 296:1633-44, 2006.
- 61) McKeag DB. The relationship of osteoarthritis and exercise. *Clin Sports Med.* 11:471-87, 1992.
- 62) Miller ME, Rejeski WJ, Reboussin BA, Ten Have TR, Ettinger WH. Physical activity, functional limitations, and disability in older adults. *J Am Geriatr Soc.* 48:1264-72, 2000.
- 63) NIH Conference. Osteoarthritis: New Insights. *Ann Intern Med.* 2000;133:726-737.
- 64) O'Grady M, Fletcher J, Ortiz S. Therapeutic and physical fitness exercise prescription for older adults with joint disease: an evidence-based approach. *Rheum Dis Clin North Am.* 26:617-46, 2000.
- 65) O'Reilly S, Jones A and Doherty M. Muscle weakness in osteoarthritis. *Current Opinions in Rheumatology* 1997;9:259-262

- 66) Penninx B.W., Messier S.P., Rejeski W.J., Williamson J.D., DiBari M., Cavazzini C., Applegate W.B., Pahor M. Physical exercise and the prevention of disability in activities of daily living in older persons with osteoarthritis. Arch Intern Med. 161:2309-16, 2001.
- 67) Powell A.P. Issues unique to the Masters athlete. Curr Sports Med Rep. 4:335-40, 2005.
- 68) Public Health Agency of Canada. Arthritis in Canada: an ongoing challenge. Ottawa: Government of Canada Press, 2003.
- 69) Richmond JC. Surgery for osteoarthritis of the knee. Rheum Dis Clin North Am. 34:815-25, 2008.
- 70) Roddy E, Zhang W, Doherty M. Aerobic walking or strengthening exercise for osteoarthritis of the knee? A systematic review. Ann Rheum Dis 2005;64:544-548.
- 71) Roddy E, Zhang W, Doherty M, Arden KN, Barlow J, Birrell F, Carr A, Chakravarty K et al. Evidence-based recommendations for the role of exercise in the management of osteoarthritis of the hip or knee – the MOVE consensus. Rheumatology 2005;44:67-73.
- 72) Simard, C., Dampier, D., Dell, F., Drouin, D., Moore, T., Nikolai, A., Paterson, D.H., Taylor, A.W. Taylor, B. Moving Through The Years: A Blueprint For Action For Active Living and Older Adults. (Bilingual), Government of Canada Press, Ottawa, 1999, (40 pages).
- 73) Sowers M. Epidemiology of risk factors for osteoarthritis: systemic factors. Current Opinions in Rheumatology 2001; 13:447-451.
- 74) Stokes, B and Helewa, A. Arthritis: How to Stay Active and Relieve Your Pain. Bull Publishing Company, Boulder Colorado, 2007.
- 75) Taylor, A.W., Ecclestone, N. A., Jones, G.R., and Paterson, D.H. (Eds) Activity for Older Adults: From Research to Action. Double Q Press, London, Canada, 1999, (345 pages).
- 76) Taylor, A. W. & Johnson, M. Physiology of Exercise and Healthy Aging. Champaign, Il, Human Kinetics, 2007, (274 pages).
- 77) Thornton, J.E. Educational Activities for Older Adults. Retrieved from <http://www.slrklowna.ca/handbook.html>, March 12, 2009
- 78) Towheed TE, Maxwell L, Anastassiades TP, Shea B, Houpt J, Robinson V, Hochberg MC, Wells G. Glucosamine therapy for treating osteoarthritis. In: The Cochrane Library, Issue 2, 2005. Chichester, UK: John Wiley & Sons, Ltd.
- 79) Towheed T, Catton M, Judd M, Maxwell L, Wells G. Acetaminophen for osteoarthritis. In The Cochrane Library, Issue 1, 2006. Chichester, UK: John Wiley & Sons, Ltd.
- 80) Truluck, J.E., Courtenay, B.C. Learning Style Preferences Among Older Adults. Educational Gerontology, 25: 221-236, 2005.
- 81) Tugwell PS, Wells GA, Shainhouse JZ. Equivalence study of a topical diclofenac solution (pennsaid) compared with oral diclofenac in symptomatic treatment of osteoarthritis of the knee: a randomized controlled trial. J Rheumatol. 31:2002-12, 2004.

WEBSITES

- 1) Aging Database: <http://www.aarpinternational.org/database/>
- 2) Alliance for the Canadian Arthritis Network (ACAP): <http://www.arthritisalliance.ca>
- 3) The Arthritis Society of Canada: <http://www.arthritis.ca/arthritis%20home/default.asp?s=1>
- 4) Arthritis Canada: www.arthritis.ca
- 5) Arthritis Canada: <http://www.arthritiscanada.com/>
- 6) Arthritis Foundation: <http://www.arthritis.org/>
- 7) Arthritis Research Centre of Canada: <http://www.arthritisresearch.ca/>
- 8) Arthritis-Treatment-and-Relief: <http://www.arthritis-treatment-and-relief.com/types-of-arthritis.html>
- 9) Canadian Arthritis Network: <http://www.arthritisnetwork.ca/>

- 10) Health Canada: <http://www.hc-sc.gc.ca>
- 11) MD Consult: Stitik, TP, Foye, PM, Ciolino, I. Osteoarthritis: Overview. Emedicine, updated Nov 21, 2008. <http://emedicine.medscape.com/article/330487-overview>
- 12) National Centre for Health Statistics: <http://www.cdc.gov/nchs/>
- 13) Public Health Agency of Canada: <http://www.phac-aspc.gc.ca/ccdpc-cpcmc/topics/musc-arthritis-eng.php>
- 14) Public Health Agency of Canada-Division of Aging and Seniors: http://www.phac.gc.ca/seniors-aines/pubs/info_sheets/arthritis/arthritis_e.htm

PAMPHLETS AND BROCHURES

Arthritis Foundation

- a) Arthritis Answers
- b) Arthritis and Diabetes
- c) Arthritis Today: Supplements and Vitamins
- d) Exercise and Your Arthritis

The Arthritis Society

- a) Arthritis Medications
- b) Nutrition and Arthritis
- c) Osteoarthritis
- d) Top 10 Exercises

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