



The Arthritis
Society

Osteoarthritis

KNOW YOUR OPTIONS



ARTHRITIS  **FIGHT IT!**

Osteoarthritis

DID YOU KNOW?

- Osteoarthritis (OA) is the most common type of arthritis; it affects 1 in 10 Canadian adults.
- It affects women and men equally (past 60).
- Anyone can get OA, but it usually starts in the 40's to 50's and is more common as we continue to age.

There is no cure for OA, but when you are diagnosed early and start the right treatment, you can take control of your disease and avoid severe damage to your joints.

Most people with OA can lead active and productive lives with the help of the right medication, surgery (in some cases), exercise, rest and joint protection techniques.

WHAT IS OSTEOARTHRITIS (OA)?

Can you believe that there are over 100 different types of arthritis? To keep things simple we will divide arthritis into two general types – inflammatory and degenerative. The root cause of degenerative arthritis is the breakdown of cartilage whereas inflammation of the lining (synovium) of the joint is the root cause of inflammatory arthritis.

Cartilage is the tough elastic material that covers and protects the ends of bones. In healthy joints, cartilage acts as a shock absorber when you put weight on the joint. The slippery surface of the cartilage allows the joints to move smoothly.

When a joint “degenerates”, the cartilage gradually becomes rough, begins to wear away, and the bone underneath thickens. This is typically how osteoarthritis starts. Most people notice OA as they get into their 40's or 50's, however, in some people it can start earlier. It

tends to affect the joint at the base of the thumb, the end joints or middle joints of the fingers, the hips, the knees, and the joints at the base of the big toe (bunion).

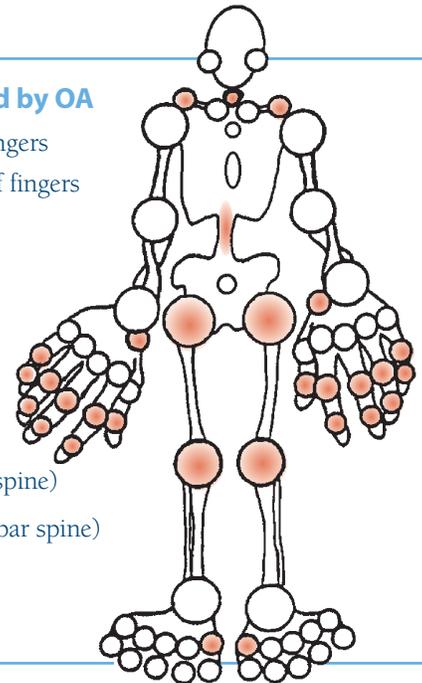
OA will usually cause the affected joints to become stiff in the morning but the stiffness usually lasts about 15-20 minutes. However, as the day progresses and joints are used the pain and discomfort usually gets worse. Resting the joints tends to provide relief. Movement of the joint can sometimes cause a “creaking” sound or feeling (crepitus). Painless cracking of joints (like when you crack your knuckles) or painless snapping sounds (like your ankles when you walk down stairs) is not a feature of OA.

The joint may become inflamed with pain, warmth, and swelling. Although we see signs of inflammation in degenerating joints it is usually not a major part of the problem. Naturally, all of the pain and stiffness causes the joints to be used less often and the muscles surrounding the joint weaken.

Over time, as the cartilage wears down, the joints may slowly become bigger (boney) as the body tries to heal itself. With severe OA, the cartilage may wear away entirely, and the bones may rub together (“bone-on-bone”). When this happens the joints become more painful.

Joints Affected by OA

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



WHAT ARE THE WARNING SIGNS OF OA?

Remember that OA usually progresses slowly over a period of months to years.

- You start to feel the gradual onset of pain in joints typically affected by OA.
- This pain is usually worse after you use the joint and improves as you rest it. The joint may be stiff after you rest it or when you wake in the morning but this stiffness is usually short-lived lasting only 15-20 minutes.
- The pain can be with you (to some degree) most of the day even causing discomfort while you try to sleep at night.
- You may notice some swelling in the joints and a loss of flexibility or strength. The joints may have a “creaking” sound when you move them.

WHAT TO DO IF YOUR FAMILY DOCTOR THINKS YOU HAVE OA?

If your family doctor believes that you have OA, it is important to educate yourself about the disease. Your family doctor may ask you to see allied health professionals such as physiotherapists, occupational therapists, and dieticians to provide you with tools to better manage your osteoarthritis. If your family doctor is unsure about the diagnosis or is uncomfortable with some aspects of the management a referral to a rheumatologist may be made. A rheumatologist is a doctor who is an expert in arthritis. If your arthritis gets to the point where your family doctor feels surgery is needed then you will be referred to an orthopedic surgeon.

HOW DOES THE DOCTOR DIAGNOSE OA?

There is no single test for osteoarthritis. If you have signs and symptoms of osteoarthritis, your doctor will likely discuss your symptoms, examine your joints, and perform x-rays to help with the diagnosis.

WHY IS TREATMENT FOR OA SO IMPORTANT?

Unfortunately, osteoarthritis is a disease that tends to get worse over time as the cartilage continues to wear away. Although there is no cure for OA, with the right treatment you can take control of your disease and keep your joints as healthy as possible for as long as possible. The main goals of treatment include:

- Controlling your pain
- Improving your ability to function
- Slowing down the progression of the disease.

WHY DO PEOPLE GET OA?

It is important to realize that there are two types of osteoarthritis: primary and secondary. **Primary osteoarthritis** occurs when there is no obvious reason for the arthritis, although you may have risk factors (see below and page 6). Generally, primary osteoarthritis occurs in many joints such as the fingers, base of the thumbs, spine and bunions. It is often inherited so parents and siblings may have some features of it with various degrees of severity.

Secondary osteoarthritis occurs when there is a likely cause for the OA. The most common cause of secondary OA is a prior injury to the joint although there still may be other risk factors (see below and page 6). Secondary OA is very common in professional athletes (football and hockey players) but can occur in anyone.

The risk factors for developing OA include the following:

Age: As we get older so do our chances of developing osteoarthritis. As OA is a degenerative condition, the natural “wear and tear” on the joints does play a part in the development. If we live long enough, most of us will experience osteoarthritis, but age alone doesn’t mean that OA is inevitable.

Family History: It is becoming clear that genetics plays a role in the development of osteoarthritis. This seems to be more of a factor with arthritis affecting the small joints in the hands (nodal OA). Researchers are not sure how genetics plays a role but it may be due to the shape of your bones and the way they fit together or your ability to make and repair cartilage.

Excess Weight: If you weigh too much, your feet, knees and hips have to carry more weight than they should. The good news is losing weight, even just 10 pounds (4.5 kilograms), can help prevent osteoarthritis in your knees. Even if you have osteoarthritis in your knees, losing weight can make you feel better and prevent the need for surgery in the future. Less body weight means less stress on your joints.

Joint Injury: Osteoarthritis can occur in joints which have been “damaged” by a previous injury. The initial injury may have damaged the cartilage or affected the way the joint moves resulting in secondary OA.

Complications of Other Types of Arthritis:

Osteoarthritis can occur in joints which have been “damaged” by other types of arthritis. For example, people with rheumatoid arthritis or gout can develop secondary osteoarthritis in those joints in which the inflammation has caused damage.

Wear and Tear: Wear and tear on the joints can play a role in the development of OA but it doesn't explain everything. For example, why do some people, with similar jobs and lifestyles, develop OA in the small joints of the hands and others not? *Research now shows that normal wear does not actually cause the joints to degenerate. Normal activity and exercise is good rather than bad for joints and does not cause osteoarthritis.*

Inflammatory OA

Just to confuse the issue, there is a rare type of OA that is called ‘inflammatory OA’. This is a more severe, rapidly progressive, multiple joint OA that is associated with more stiffness in the morning and swelling in the joints with warmth and redness. This type of OA is

more difficult to diagnose because it is often confused with Rheumatoid Arthritis. A rheumatologist can help make the correct diagnosis and suggest treatment for inflammatory OA.

We do not yet know the causes or the cure for osteoarthritis, but researchers in Canada and around the world are trying to learn why cartilage starts to wear away. In fact, The Arthritis Society funds many leading edge research projects that bring vital new insights and lead to new and better treatments for osteoarthritis. For example, Canadian researchers have identified some of the enzymes that damage the cartilage in osteoarthritis. Blocking these enzymes may be one way to slow down the progression of the disease.

HOW CAN I MANAGE OA?

Once your diagnosis is confirmed there are many treatments that can help decrease your pain and increase your movement. Non-medication therapies such as physiotherapy, occupational therapy, education, exercise, and relaxation techniques are a very important part of the treatment of OA. However, the typical treatment plan is usually made up of several components including:

- Medication
- Healthcare support (physiotherapy, occupational therapy etc.)
- Daily-living adjustments



A WORD ABOUT PAIN

Pain from osteoarthritis can be so intense and constant that it dominates your every waking moment (and can cause many sleepless nights). Due to pain, you may be unable to continue with your routine daily activities and you may become less active in an attempt to keep your joints as comfortable as possible. Unfortunately, this inactivity can then have negative effects on your muscles and joints. This can then lead to a loss of strength, reduced flexibility, and more pain. Therefore, good pain control is essential in the treatment of arthritis.

Persistently severe pain from arthritis requires a combination of therapies as no single management technique is powerful enough to provide non-stop pain relief. You need to discover what works for you. This often means trying many different therapies or combinations of therapies for prolonged pain relief.

In order to decrease your pain and maintain movement and function, it is essential that you become actively involved in developing your prescribed treatment plan.

NON-MEDICATION THERAPIES

Non-medication therapies are a very important part of the treatment of osteoarthritis.

Exercise

When done properly, exercise can help to decrease OA symptoms and make you feel better overall. If done improperly, exercise can “flare” your arthritis. Therefore, an exercise program should be done under the guidance of a trained physiotherapist. There are different types of exercises that you can do to lessen your pain and stiffness:

- **Range of motion exercises** reduce pain and stiffness and keep your joints moving. To achieve the most benefit these exercises should be done daily.
- **Strengthening exercises** maintain or increase muscle tone and protect your joints.

- **Moderate stretching exercises** help to relieve the pain and keep the muscles and tendons around an affected joint flexible. Your physiotherapist can guide you on what strengthening and stretching exercises are best and when they are appropriate.
- **Endurance exercises** strengthen your heart, give you energy, control your weight and help you feel better overall. These exercises include things like walking, swimming and cycling. It is best to avoid high impact exercises like step aerobics, jogging or kick boxing.

Heat and Cold

Heat is one of the oldest treatments to provide relief from muscle and joint pain. When heat therapy is used it can reduce joint pain, stiffness and muscle spasm.

Heat promotes blood circulation, which nourishes and detoxifies muscle fibers. You can purchase “hot packs” made of silicate gel, beans, or corn (i.e. magic bags) or use a hot water bottle. Place a damp towel on the skin to improve heat conduction and apply the “hot pack” for 10-15 minutes. Heat should be comfortably warm. The heat should not feel like it is burning your skin. If heat is too hot, add one or two towels between the heat source and body part, or remove heat. Continuously inspect the area that is being heated. The area will appear red and possibly sweaty. If, however, the heat has caused pain in the area, it should be removed and discontinued until you consult with your physiotherapist. Heat can be re-applied after leaving it off for the same period of time for which it was applied. All redness should be gone before re-applying. In order to avoid making symptoms worse, heat should not be applied to an already inflamed joint.

Cold applied to inflamed joints reduces pain and swelling by constricting blood flow. Gel packs, a bag of frozen vegetables, or crushed ice in a bag are good “cold packs”. Place a moist towel between the pack and the skin to improve conduction of cold and apply the cold pack for 10-15 minutes. The skin underlying the cold pack will redden; check the skin frequently for signs of over-cooling (blanched, white skin). Leave at least two hours between cold applications. You should not use ice if you have circulatory problems such as Raynaud’s disease.

Protecting your Joints

You should always use your joints in ways that avoid excess stress. This allows you to experience less pain, perform tasks more easily, and protect your joints from damage. Techniques to protect your joints include:

- **Pacing** by alternating heavy or repeated tasks with lighter tasks. Breaks or frequently changing positions reduces the stress on painful joints and conserves energy by allowing weakened muscles to rest.
- **Positioning joints wisely** promotes proper alignment and decreases excess stress. For example squatting and kneeling may put extra stress on your hips or knees. When lifting or carrying heavy items, keep items at waist height and avoid carrying them up and down stairs.
- **Adapting your daily activities and using helpful devices** can help to conserve energy and make daily tasks easier. Raise seat levels to decrease stress on hip and knee joints. Use a reacher to pick up items from the ground. Use a cane to decrease stress on hip and knee joints. Enlarge grips on utensils such as spoons or peelers to decrease stress on delicate hand joints. Other devices to consider include carts for carrying objects, and jar/tap openers.
- **Talk to your doctor** about seeing an occupational therapist or physiotherapist who may prescribe splints, braces, or orthotics (shoe inserts), to help align and support your joints.

Relaxation & Coping Skills

Developing good relaxation and coping skills can help you maintain balance in your life giving you a greater feeling of control over your arthritis and a more positive outlook. Relaxing the muscles around a sore joint reduces pain. There are many ways to relax. Try deep breathing exercises. Listen to music or relaxation tapes. Meditate or pray. Another way to relax is to imagine, or visualize, a pleasant activity such as lying on the beach, or sitting in front of a fireplace. For more information on these skills, you can participate in the Arthritis Self-Management Program or see a psychologist, social worker or arthritis therapist.

Diet

There are many claims about diets which help or “cure” arthritis. Most of the information is confusing and claims made are usually not supported by scientific evidence. Simply put, there is no diet that has been proven to significantly improve osteoarthritis. Until there is more conclusive evidence, use a common sense approach by eating a well-balanced diet aimed at maintaining a healthy weight.



Massage

Massage is widely used for pain relief, but its results are open to question. At best, massage may relieve muscle ache or tension by increasing blood flow, but that benefit is relatively short-lived. Massage should be avoided when joints are especially tender or inflamed, since it can actually worsen your condition at such times. If you're having a massage done by a professional, make sure he or she understands that, because of your arthritis, you want only the gentlest procedure.

WHAT MEDICATIONS ARE USED FOR OA?

The general approach to treating OA with medications is to reduce your pain, increase your function, and slow down the progression of the disease. Unfortunately, there is no medication that has been shown to consistently slow down the progression of OA. For the most part, the goal of medications in OA is to reduce pain.

NON-PRESCRIPTION MEDICATIONS

Acetaminophen

Acetaminophen is an effective medication for pain relief which can be used for both short and long-term pain control. If your pain is present most of the time, your doctor may recommend that you take acetaminophen (Tylenol®) regularly – every four to six hours. When the pain is there all of the time, there is no point in waiting for it to become unbearable before taking your medication. Then you have to wait for the effects of the acetaminophen to “catch up” to the pain.

Although acetaminophen is safe, it does have its limits: you can take two regular strength tablets (325 mg each) to a maximum of 12 tablets in one 24-hour period, or two extra-strength tablets (500 mg each) every six hours up to a maximum of eight tablets in a 24-hour period, or two extended-release tablets (650 mg each) every eight hours up to a maximum of six tablets in a 24-hour period. Acetaminophen is found in other over-the-counter preparations such as cough and cold formulations. You must be careful to look at the ingredients of all of the over-the-counter medications you are taking to ensure that you are not taking too much acetaminophen. The maximum daily recommended dose is 4 grams (4000 mg).

Ibuprofen & ASA

Acetylsalicylic Acid (ASA, Aspirin®) and Ibuprofen (Advil®, Motrin®) are Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) which can be purchased over-the-counter. You can learn more about NSAIDs in the section below. You must be careful to avoid taking ibuprofen with other NSAIDs your doctor may prescribe as it increases your risk of developing stomach problems.



Topical Medications

There are a number of over-the-counter creams and rubs available to help with the symptoms of arthritis. Some of these products contain salicylate (ASA) as the active ingredient whereas others contain capsaicin or menthol. Salicylates work by decreasing pain and inflammation while products containing capsaicin or menthol are able to relieve pain by tricking the body to feel the coolness or heat of these agents.

PRESCRIPTION MEDICATIONS

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are a class of medications used to treat the pain and inflammation of arthritis. They do not contain steroids, hence the name “Non-Steroidal”. NSAIDs are a very large category of medications, some of which you can obtain without a prescription, such as ASA (Aspirin®, Entrophen®, Novasen®) and ibuprofen (Advil® or Motrin®). The list of NSAIDs is long with over 20 currently available today.

It is important to remember that NSAIDs work to improve symptoms and have no proven long term benefits in OA. As such, these medications can be taken on an as needed basis and do not need to be taken regularly. That being said, some patients find it helpful to take their NSAID on a regular basis to control their symptoms.

Indigestion, heartburn, stomach cramps, and nausea are the most common side effects of NSAIDs. NSAIDs can affect the protective lining of the stomach making you more susceptible to ulcers and bleeding. If you develop signs of stomach bleeding, such as vomit that looks like it has “coffee grounds” in it, vomiting blood, or black, tarry bowel movements, while taking NSAIDs, stop the NSAID and see a doctor immediately. COXIBs are NSAIDs that have been custom-designed to reduce the risk of stomach side effects.

Health Canada has reviewed all of the available studies on NSAIDs and COXIBs and found that NSAIDs and COXIBs are both associated with an increased risk of cardiovascular events (angina, heart attacks, & strokes). The risk is greatest in those patients who use these medications for long periods of time and have risk factors for, or a history of, cardiovascular disease. Please discuss this with your doctor.

Topical Medications

In Canada, diclofenac (1.5%) is available in a topical NSAID preparation sold under the brand-name of Pennsaid®. When applied as directed to the skin over a joint, very little of this medication is absorbed into the body which significantly reduces the usual side effects associated with NSAIDs. The common side-effects of Pennsaid® include dry skin and rash at the site of application. Please note that Pennsaid® is indicated for use on OA of the knee only.

Corticosteroid Injections

Steroid injections, also referred to as cortisone injections, are used to help the pain and swelling with many types of arthritic conditions. Injecting a steroid in or around the joint is an effective way to locally reduce pain and swelling.

Most injections typically take 24-48 hours to take full effect. If local anesthetic (“freezing”) was given with the injection you may feel improvement quite quickly. After the injection it is normal to feel a transient increase in discomfort in the joint which should resolve within 24 hours. You can treat this by applying a cold pack or by using medications such as acetaminophen (Tylenol®) or Non-Steroidal Anti-Inflammatory Drugs (check with your doctor). If possible, it is best to rest the joint for 24 hours after an injection as studies have shown this may improve the effect of the injection. 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.

If a significant benefit is achieved after the first injection then an argument can be made for a repeat injection. There is some controversy that too many injections may weaken tendons, ligaments, and cartilage but other studies have found that injections can slow joint damage. As a general rule a reasonable approach is to limit the frequency of injections to 3-4 to each joint per year.

Most joint injections result in no side-effects. One of the very rare (1 in 15,000) risks of a joint injection is



infection. If the injected joint becomes very painful, red, or swollen seek medical attention immediately as the joint may be infected.

Hyaluronan Injections (Viscosupplementation)

Viscosupplementation is the injection of a clear gel-like substance called hyaluronan into the knee. Hyaluronan is a normal part of healthy cartilage. Injecting it into the joint is thought to lubricate the cartilage (much like oil lubricates an engine), reducing pain, and allowing greater movement of the knee.

Although these medications can be purchased without a prescription; it is necessary to see a physician for the injections. For more information on viscosupplementation, speak with your doctor.

Opioid Analgesics

Sometimes simple painkillers and NSAIDs are not strong enough for your pain or you may not be able to take NSAIDs. Your doctor can help by prescribing stronger pain medications such as Opioids. Opioids are a class of pain medication which includes codeine, morphine, and tramadol. These medications should be taken under the direct supervision of your physician to monitor side effects. Common side-effects of opioids include nausea, constipation, dizziness, drowsiness, and a dry mouth. Because these medications slow down digestion (constipation), be sure to drink six to eight tall glasses of water throughout the day.

COMPLEMENTARY THERAPY

It's important to remember that alternative approaches to manage OA aren't meant to replace your treatment plan, but rather complement them. You should always discuss your selection of supplements and complementary therapies with your doctor.

Glucosamine

Glucosamine sulfate is a normal component of cartilage and a very popular supplement taken by patients with OA. Although many people with OA use this medication there is conflicting evidence as to whether it actually works. As it is typically made from the shells of shellfish such as shrimp, lobster, and crab, anyone with a shellfish allergy should be careful using this supplement. The typical dose of glucosamine used in medical research is 500 mg three times per day. If you don't feel any benefit after three months it probably isn't going to work and you should stop using glucosamine.

Chondroitin

Chondroitin is another popular supplement and another component of human cartilage, bone, and tendon. Chondroitin is usually found combined with glucosamine in a single tablet. There is conflicting evidence as to whether chondroitin actually works to reduce pain in OA. The usual dose is 400 mg three times per day. If you don't feel any benefit after three months it probably isn't going to work and you should stop using chondroitin.



A WORD ABOUT MEDICATION SAFETY

The need to effectively monitor new drugs once they have been approved and introduced into the market has been a key advocacy issue for The Arthritis Society for several years. This advocacy helps to ensure that unfavourable side effects are reported, documented, and addressed. **For regular updates on medications available in Canada, visit www.arthritis.ca/tips/medications.**

All medications have potential side effects whether they are taken by themselves or in combination with other herbal, over-the-counter and prescription medications. It is therefore important for patients to discuss the benefits and potential side effects of all their medications with their doctor.

Health Canada's Marketed Health Products Directorate operates the MedEffect program, which provides centralized access to new safety information about health products in an easy to find, easy to remember location. MedEffect was developed to help build awareness about the importance of submitting adverse reaction reports to identify and communicate potential risks associated with certain drugs or health products. MedEffect aims to make it as simple and efficient as possible for health professionals and consumers to complete and submit adverse reaction reports. To find out more or to report an adverse reaction visit: www.healthcanada.gc.ca/medeffect or call toll-free 1.866.234.2345.

Surgery

When osteoarthritis becomes severe and medical therapies are not working, surgery may be considered. The most common surgical procedures for OA include hip and knee replacements. However, other surgical treatments are available. It is important to remember that there is no age limit for surgery – you can't be too old or too young. The decision to undergo surgery really depends on the amount of pain and disability your arthritis is causing combined with the risks and benefits of the surgery. This should be discussed further with your doctor.

WHAT QUESTIONS SHOULD I ASK MY DOCTOR?

A recent study found that patients who learned more about their treatment and talked to their doctor about it had fewer symptoms, including less pain, and greater mobility.

You can really help yourself by getting involved in managing your OA. The more you learn about the disease and your treatment options, the better off you will be now and in the future. It's important to get all the information you need to make an informed decision about the right treatment for you.

Be sure to talk with your doctor about your OA, and ask questions about the disease and the different kinds of treatments. Before making a decision, you should understand what you can expect from a medication, what its possible side effects are and other important information. Also, ask what steps you can take to get your disease under control.

To help you get started, here are some common questions you may want to ask your doctor about OA treatment:

- What local resources are available so I can better educate myself about OA?
- Should I be referred to a rheumatologist, physiotherapist, occupational therapist or orthopedic surgeon?

In regards to my medications:

- What are the possible side effects and how often do they occur?
- What should I do to minimize the chances of side effects?
- How will I know if the drug is working, and how long will this take?
- Who do I contact if I have concerns about the medication?
- Will this interact with my other drugs?
- Are there drugs that I should stop taking now that I am beginning this new treatment?

HOW CAN I LEARN MORE?

The Arthritis Society offers a number of services designed to help you live with arthritis.

Arthritis Information Line – 1.800.321.1433

Dial The Arthritis Society's toll-free number to connect with staff or trained volunteers in your province or territory. You can request free information about different forms of arthritis or programs and services that are available. You can also get the names of health professionals in your area who specialize in arthritis.

Website – www.arthritis.ca

Regularly updated educational materials, informative articles, 'ask the expert,' authoritative, expert-reviewed resources and a virtual community in our "Open Forums" of people with arthritis are just a mouse-click away at the official website for The Arthritis Society.

Free Arthritis Registry – www.arthritis.ca/registry

The Arthritis Society can help you understand your disease and what's happening to your body. By joining the free Arthritis Registry you will receive the specific information you need to manage your arthritis and improve your quality of life.

Arthritis Self-Management Program (ASMP)

Managing arthritis means more than just visiting your doctor and taking the right medications. The Arthritis Society's six-week program of two hours per week will help you understand your type of arthritis, its treatments and teach you ways to cope with chronic pain. ASMP also offers a forum to share your personal experiences and challenges of living with arthritis.

Arthritis Friendly Products



The Arthritis Society is proud to be able to recognize manufacturers that have designed products that are easy to use for people living with arthritis. There is quite a list of products that have been commended by The Arthritis Society and deemed "Arthritis Friendly". A full list and more information is available online at www.arthritis.ca/arthritisfriendly.

ARTHRITIS FIGHT IT!

To get the best results, you need to form close ties with your healthcare team and become a full partner in your healthcare treatment.

Learning daily living strategies to manage your arthritis gives you a greater feeling of control and a more positive outlook.

To support arthritis research or to learn more, contact The Arthritis Society:



1.800.321.1433



www.arthritis.ca


**The Arthritis
Society**



Canadian Rheumatology Association
Société Canadienne de Rhumatologie



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