**YOUR IDEAL BRACE INTRO**

Whether you are getting a new leg brace for the first time or whether you have been a lifelong brace wearer, getting a new brace can be a life-changing event. With the advent of new materials and increased understanding of how the body works, bracing technology has changed and improved significantly over the past 20 years and brace wearers now have choices that were not available before. The good news is that with thought, research and advocacy, brace wearers can often get braces that better fit their needs, allow for better mobility, and even look good!

Your Ideal Brace

The best/ideal brace weighs nothing, fits against the leg like a sock, holds you up and helps you walk, looks good and costs nothing! You won’t find it anywhere but you can improve the odds of getting a brace that fits your needs best by filling out the attached workbook, by doing the research into the options that meet your needs and standards and by advocating for that brace with your health care professionals (and your insurance company!)



For most people, getting a new brace is more than seeing an orthotist (brace maker), being fitted for a brace and walking out the door and on to a new life. Explore some of the other factors that others have encountered when they are learning to live with a new brace.

**Navigating Transportation Safety Administration (TSA)**

**and Other Security Checkpoints**

Although there may not be any metal in your brace, it may set off security detectors.

The basics of security checks are:

* Allow **time** to go through a thorough TSA/security inspection
* Expect to be patted down and/or to show your brace
* Wear clothes that allow for the inspection to occur:
  + Be able to pull up a pant leg
  + Wear a skirt
  + Wear shorts
  + Install Velcro/hidden zipper in the inseam of your pants on the KAFO side

TSA Regulations change from time to time. As of November 2016, the policy is “All travelers are required to undergo screening at the checkpoint. Passengers with a disability or medical condition or their traveling companion may consult a TSA officer about the best way to relieve any concerns during the screening process. Individuals may provide an officer with a TSA notification card or other medical documentation to describe the condition in a discrete manner. Travelers also may request an accommodation to the security screening process.

If a passenger with a medical device, medical condition or a disability is approved to use TSA Pre✓®, he or she does not need to remove shoes, laptops, 3-1-1 liquids, belts, or light jackets during the screening process. However, everyone is required to undergo screening at the checkpoint by technology or a pat-down. Also, TSA officers may swab an individual’s hands, mobility aids, equipment and other external medical devices to test for explosives using explosives trace detection technology.

Persons with disabilities and medical conditions are not required to remove their shoes if they have a disability or medical condition. However, shoes must undergo additional screening, including visual/physical inspection as well as explosives trace detection testing of the footwear. Travelers may request to be seated during this portion of the screening.”

More details and updates can be found on the TSA web site at [www.TSA.gov](http://www.TSA.gov).

**Wellness**

Getting and wearing an effective new brace encompasses the whole person, not only the parts of the body it touches. Understanding how everything fits together can ease the process of using the new brace.

**Factors to Consider When Making the Decision to Get a New or Custom Brace**

Getting a custom leg brace involves time, commitment and money! The first consideration is:

**Are you physically able to use the brace you want?** The first step is to make an appointment with your local orthotist, to see what options might be available for you. If you do not know of or are unable to locate an orthotist in your area, the American Board for Certification in Orthotics and Prosthetics, www.ABCOP.org, a national organization for orthotists has a list of certified orthotists in your area. At that time, you can then get an idea as to what the range of the cost would be, and then you will be able to proceed to the next steps in making your decision.

Also take into consideration other health conditions and factors that might affect your ability to use a brace.

After determining eligibility, you may want to consider the following factors:

1. **Emotional readiness—**If you haven’t worn a brace at all or haven’t worn one on a daily basis, are you ready to commit to the reality of wearing a brace? Have you come to some acceptance of using this piece of equipment? If you already are wearing a conventional brace, are you ready to commit to wearing a brace that may be unlike any other brace you have used and may require unlearning years of compensatory movement?

1. **What is your ability to commit the time necessary to learning to use the brace?** Successful leg brace wearers have had to commit time every day for months and sometimes, even years to retrain the muscles to work well in some braces.
2. **What is your ability to persevere and to tolerate frustration?** Learning to walk in a different brace effectively and efficiently may requiremultiple repetitive cycles of correct foot, knee, hip and trunk motions. If you 1) have given up easily and/or become bored quickly in other learning situations, 2) have limited ability to deal with frustration or 3) feel you cannot develop the tolerance for the frustration that will occur, you might want to consider your ability to succeed in learning to use a new brace that requires significant learning and practice.

* **Perseverance—New leg brace users may need to be able to persevere over time and in spite of frustrations until they are able to “get it.”** Then they are happy that they persevered.
* **Frustration—**The training regimen for a new brace is a very personal journey. Critical to becoming successful in a new brace, particularly a custom brace, should include continued on-going support and feedback from health care professions such as the orthotist and a physical therapist if you want it. Be prepared for times when you can become frustrated at your apparent lack of progress or accomplishment. If you doubt your tolerance for frustration and feel you cannot develop the tolerance needed, or if you do not have the ability to deal with that frustration, you may be tempted to give up too soon on learning to use your brace. The orthotist, physical therapist, and family may be helpful in encouraging you through the rough spots.

1. **Are you worth it?** Custom brace wearers have had to balance the cost of the brace with how they value themselves and the potential for an improved life style. Those that finally make the decision in favor of that brace have said, “I am worth the cost and the work!”
2. **What is your support system?** Are family or friends or other important persons in your life supportive of your choice? Although getting the brace and using it are ultimately personal choices, the people close to you can affect positively or negatively your ability to proceed with its use. It is helpful to have people on your side.
3. **Recognize that you may come up against unexpected emotions as you proceed with wearing the brace.** Wearers have talked about having to deal with unexpected memories and experiences such as forgotten feelings related to original hospitalizations and treatments.
4. **Priorities and costs—Getting a custom brace involves real money, even if insurance will pay for part of it.** Wearers have had to put priorities on where their money goes. Is it to a custom brace, a new car, a college education, taking money out of retirement funds, a child’s wedding, or from another purpose? Some brace wearers have chosen to take out loans, or apply for grants from charitable groups as ways to finance their brace.
5. **There may be additional costs that need to be factored into your budget, depending on the resources you have at hand.** Transportation costs and lodging costs may be necessary if you are in a remote location from a specific brace facility. Also, many wearers have found it helpful to have a set of parallel bars or handrails in a hallway, a full-length mirror, and some sort of video capability either with a camera phone, a digital camera with a movie mode, a video camera or a web cam to use for getting instant feedback. Other costs could include multiple visits to the orthotist, physical therapists and other therapists, and/or some brace modifications. Some of these costs (including mileage and other transportation costs) may be deductible from income taxes; your tax advisor should be consulted.
6. **A part of the preparation for getting a new brace is researching insurance options.** Some insurance policies allow for getting durable medical equipment from outside of their network, some do not. Some insurance policies will pay more for a brace than others. Some custom brace wearers have chosen to change insurance policies for the year that they bought the brace, sometimes paying more money for premiums for that year in order to be better compensated for their purchase. The important factor is whether the increased premium costs are outweighed by the reimbursement from the insurance company.

Another factor to check out is if the company your orthotist works for has a contract with your particular insurance company that prohibits them from collecting additional money from you except for the established co-pay/deductible.

**Expectations and Reality**

Hearing something is complicated. Often, we will hear something and automatically change it, ignore it or believe it. We will attempt to fast track learning skills. What someone is told and what they hear as it relates to them are often two different things. Or, what they are told, and how they believe it will work in their case, are two different issues.

People with long-term neuromuscular conditions who have overcome so many obstacles in life often underestimate the time required to rewire the brain. It is not just knowhow. It also requires endless good practice cycles in order for the brain to stimulate nerve endings so they start connecting, and it takes time to develop muscle memory and time to maintain that muscle memory. Add into the mix that the learner is fighting all previous **known safety movement strategies** that have gotten one through life. It is a part of human nature to follow the well-known safe path. Even when people are told this, they have no idea of how strong those internal safety mechanisms truly are and what it will take to conquer them.

Cognitively, everyone will understand what needs to be done, and they may say to themselves, “Well it doesn’t look too hard. I’ll show them.” One must understand that **learning to use certain custom braces is not a race or contest**! The person who masters the techniques will soon catch up and far surpass the others who try to take shortcuts.

**About Learning**

Part of a comprehensive bracing system may include training and feedback during the learning process, and some people may not have to learn at all. Ideally if you need training, you should not just be given your brace and then be sent home to figure out by yourself how to walk correctly in the brace. When shopping for a new brace from an orthotist ask whether training and feedback are part of the cost of the brace and get a list of resources to help with the learning process. The experience of many long-term brace wearers is that they have never had anyone take time to teach them how to walk correctly.

Often, a custom bracing system is different because the ability to walk successfully in it takes learning new skills and many hours of practice in order to feel comfortable and competent in using it.

The technical term for what has to happen in learning to use the brace, in addition to teaching the muscles and the body to move correctly, is *neural programming*. Essentially, neural programming is the action of creating pathways in the muscles, spine, and also the brain that, through practice tell the body how to move. Persons with long-term disabilities involving walking have “forgotten” or never learned how to walk correctly and have developed compensatory methods of getting from point A to point B. These may not work with your new brace or are excessively inefficient and fatiguing. So, through the exercises and practice, the brain pathways are retrained and the body learns to walk differently.

This is often the source of frustration for the new custom brace wearer, as many of us feel that we have the skills, and maybe some of us do, to learn quickly to walk in the brace. For those of us whose reality is different from our expectations, this is how learning works:

**How Learning Works**

First of all, every time we do something, we are establishing or reinforcing neural pathways in the central nervous system. If we do it wrong, our body and brain will record the wrong way it was done and the action will be reinforced every time it is repeated. Then, to do the motion correctly, we will have to unlearn that action by establishing and practicing the correct actions. This then takes more time. Therefore, it behooves us to “do it right” as we are learning and practicing. Easier said than done, but it is a goal to work toward.

Another factor in learning that has been in play for some brace wearers is that we have no standard against which to judge if we are moving correctly. If we have no memory of how it was to walk correctly, then we cannot “know” when we are doing it right. This again can be frustrating because we may think we are doing it right, and then get feedback either from the orthotist or the physical therapist that tells us we need to go back to practicing basic exercises.

For many of us, this learning process means that we will have to break down exercises into smaller parts, learning little bits of the motion, before we can do the complete motions. This is where a physical therapist can be of value, in that he or she can assess the actions, and help break down the steps and help put them together for greater success. That person can also give us sensory feedback that helps us learn to feel the new way of moving.

Another frustration that happens with the learning process is that often we seem to be making little or no progress, or going backwards, or standing still in our learning to use the new brace. According to developmental learning specialists, a person goes through a series of expansions, *i.e.*, making progress and moving forward, and plateaus, *i.e.*, consolidating what has been learned. Knowing this is how people learn, and accepting this as normal, can help reduce the frustration and possible discouragement that can come after months of practice without any apparent progress.

Another factor in learning that is talked about in education is the topic of learning styles. Proponents of learning styles state that if a person knows his or her learning style and then can tailor his or her learning to fit with that style, they will learn better and more quickly. Some experts question whether there is such a thing as learning style and also question how many styles there are. Discussion aside, if you know that you learn better by seeing something done than by hearing how it is done, then try to use that in your training. This is where a mirror comes in handy for some, while repeating out loud the motions as you do them might make the learning easier for others. Another modality is the tactile one, where you have to touch or feel to learn. Perhaps the most effective way to learn is to use all of the modalities, seeing, hearing, touching, moving and feeling.

In the long run, it is not so important that you know the name of your learning style, as it is to be able to find the manner and the tools that will help you learn how to walk correctly in your brace. Ultimately, when you can **feel** that you are doing it right **and have feedback** that tells you that you are doing it correctly and safely, you will then be able to move on to the next step in becoming proficient in your brace. By the way, it is also a sign of progress when you can feel (catch yourself) doing it wrong and can correct it.

**Trust**

Trust comes with time and practice. And, it may not even be an issue for some brace wearers, however if it becomes an issue, it cannot be willed to happen nor hurried or rushed!! Trusting enough to walk comfortably and correctly in the new brace involves two factors:

1. **Trusting the brace itself** — If you are wearing a traditional brace or no brace at all and you change to a custom brace, the physical changes that were built into the brace to correct any deformities and the dynamic response component, if they are is part of the brace, can make you unsure about whether the brace will be stable enough to keep you from falling.

Another factor in trusting the brace involves putting full body weight on the brace. This may be something that you may not have done in your previous brace or if you were walking without a brace and “favoring” a disabled limb.

The exercises related to learning to walk in a specific brace will help with trust in using the brace.

1. **Trusting yourself** — This trust may be harder to achieve, because learning to use the new brace may go contrary to everything you have learned previously in order to keep yourself safe.

The mistrust may start the first time you put the new brace on and your center of gravity changes, causing a perceived instability because you no longer have the tried and true means of standing that you have used for years. The mistrust also manifests itself in the fact that many of us watch our feet as we walk, not trusting that we can look farther ahead and not lose our footing and fall down. By holding our heads up and looking farther ahead, a practice that helps with balance when using a brace, your body learns to trust that it can anticipate potential pitfalls and can compensate for them, thus keeping you safe.

Overcoming the mistrust may mean identifying those fears, facing them and then putting security and protection into the learning process. Parallel bars are one of the tools that contribute to safety while learning to use the brace. Constant practice and being successful in walking will reduce the fear and increase the trust.

There can be, however, a deeper trust issue that manifests itself, and that is that our bodies have been trained to walk a certain way to compensate for our disability and the physical habits that have been successful in protecting us need to be unlearned. These behaviors may be so ingrained that we are not cognitively aware that we are doing them. And, unlearning them may be our biggest challenge. Again, practice and feedback from a gait expert will help you become aware of the compensatory patterns that you have. Then, as you practice, you can get the feeling of the correct way to walk, and ultimately your body will “trust” that it is doing it right.

**Communication**

Keeping in communication with your orthotist is part of the support system that makes wearing a new brace successful. Wearing it and learning it is a dynamic process. This means that as you progress, it is helpful to get feedback from the orthotist. Also, as you wear the brace, your leg(s) and your gait may change, which may mean that the brace needs to be modified over time in order for you to walk comfortably and competently.

Your orthotist can also tell you if what is happening with the brace is normal or needs some intervention to fix a problem.

**In other words, your orthotist should continue to be involved in your progress after you get your brace. However**, **you must be the one to initiate the communication.** You have only you to keep track of your progress while the orthotist has many clients. At the same time, the orthotist should be willing and happy to hear from you and will be responsive to your needs. You should not feel reluctant to contact him/her.

Other support persons with whom you can keep in the communication loop are your referring physician and your physical therapist. These people can also give you feedback and advice that will keep you safe and healthy.

**Permission to Follow Rules . . . and Not Follow Rules**

Circumstances will come up when the prescribed routine and a practice schedule that brace wearers have set for themselves have to be modified. These can include everything from physical changes in our bodies to an opportunity to do something that does not put us in an environment where we can practice safely, or just not feeling like practicing that day.

Goals and priorities change with time and with circumstances. One wearer could not change back and forth between her new brace and her old brace without it being very painful so she chose to wear her new brace all of the time, even though she had not learned all of the preliminaries of walking most efficiently in the brace. She consulted with her orthotist before making this decision.

Another user was happy to just be able to walk in the new brace with the use of a cane, even though more practice and training may have given him independence from the cane.

Taking a traveling vacation, going to see family, or taking a business trip where all of the time will be spent at work may make it at least inconvenient, if not impossible, to transport the brace and to practice wearing it.

Practicing and learning to use a brace is a priority in our lives or we would not have made the commitment to have one. At the same time, the brace is only a tool that will help improve the quality of life and we should not have it control our lives.

Constant and consistent practice will help speed the process and following the routine of exercises will help insure that wearers can do it correctly. **Deviating from these two principles can slow down the process.** However, wearers should give themselves permission to do what fits with their lifestyle, their goals and their priorities and not feel guilty about the choices that they have to make in learning to use and wear a brace. The learning process is a long one and if the ultimate goal is kept in mind, then, in spite of and maybe because of the ups and downs that happen along the way, the goal will be achieved.

**Aches and Pains**

Many people who get a brace can notice a marked decrease in pain shortly after putting on their brace or after doing the flexibility exercises. However, if new symptoms occur it is important to address the problem early.

If the ankle or knee is better supported in the brace, and the pain due to abnormal stretching of ligaments, muscles and other tissues is relieved, then the individual may not be able to go back and forth between no brace/their previous brace and their brace. They may need to begin wearing the new brace full time before they are fully competent in the most efficient gait pattern. Your orthotist or physical therapist can guide you in this regard if you experience significant pain when using whatever device(s) you had previously used and no pain or much less pain when wearing the new brace. If you have had back pain, this may be reduced or eliminated when your body is better structurally aligned and you are walking in a more efficient manner.

Others who have not had much back pain may find that parts of their back or pelvis are “sore” after moving their body in ways that they have never experienced or are unaccustomed to moving. This soreness nearly always goes away over time as the tissues stretch and become “used” to the new pattern.

Similar soreness may happen in muscles that are not used to being used in the manner that is necessary for proper walking with a new brace (not unlike the soreness a person experiences when they do some unaccustomed activity – like raking leaves in the fall, or shoveling after the first heavy snowfall). This discomfort can be reduced by application of heat or ice and the use of an over the counter pain reliever, such as acetaminophen (brand name = Tylenol) or ibuprofen (Advil) or naproxen (brand name = Aleve) or aspirin. Your other medical conditions will determine which of these pain medicines are safe for you to take.

A problem that is frequently seen in people who have an abnormal gait (“walk funny”) is sacro-iliac dysfunction or “S-I problems.” The sacro-iliac joints are on each side of the low back (pelvis) and pain from the S-I joint may be located directly over the joint or radiate down into the buttock, or down the leg in various patterns – over the lateral hip, into the knee, into the lower leg. Patients may have no pain in their back, legs, or other parts of their body, but may display a functional leg length difference and adaptive foot position. This may affect how the brace fits and how the wearer walks from day to day.

Some other symptoms reported by patients include a sensation of the leg on the affected side “being too long.” Many medical doctors are unfamiliar with S-I joint problems and tend to diagnose and treat this as a “disc” problem, arthritis, or other condition. Many physical therapists, doctors of osteopathy (D.O.), and chiropractors are more familiar with S-I joint problems. Sometimes, the pain from a S-I problem will spontaneously go away, often as suddenly and inexplicably as it came on.

Chronic S-I dysfunction can be treated with correcting the leg length difference, various forms of manipulation, and specific exercises to attempt to strengthen the muscles around the joint. Acute S-I joint pain may be treated with heat, ultrasound, electrical stimulation, and sometimes a supportive belt low down on the pelvis. In very acute situations, such as severe S-I pain after lifting something with the body twisted, some form of pain medication including prescription pain medication may be needed.

Other modalities of treatment have been reported useful by some wearers. These include, but are not limited to, neuro-muscular injury-oriented massage therapy, homeopathic treatments, acupuncture, and oral and/or topical preparations.

Generally, your orthotist should recommend that you establish a good working relationship with a physical therapist prior to being fit with a brace. This facilitates getting treatment for some of the aches and pains that you might experience as you go through the process.

**Skin Issues**

It is important to pay attention to the condition of your skin especially in areas where the brace applies pressure to correct positioning of joints in your leg. In some custom braces pressure is needed to align your leg and foot to the best possible position. But too much pressure can cause severe redness, numbness and/or pain, and if left unattended, blisters, sores, and skin breakdown can occur. Gradual build-up of wearing time in the brace will allow the skin to toughen and, perhaps, build up a small amount of callous. Compression stockings can help control swelling and may prevent development of skin breakdown or irritation. Thin under liners, such as Comfort Sleeves (http://comfortsleeves.com/), Body Glide and other products are available to reduce skin irritation. Knee socks or thigh high socks that extend beyond the top of the brace or can be folded over the top of the brace can be used with short leg braces or AFO’s. Wearers of a long leg brace or KAFO can use tights or panty hose type stockings under the brace. For more details, see the sections on **Stockings, Socks and Under Liners.**

There is a small group of people who may experience extreme sensitivity. These people may need to consult a dermatologist to determine the cause and to seek relief.

Closely examine your skin after wearing the brace, especially initially or after modifications have been made, including areas that cannot easily be seen. A mirror can be helpful to see areas on the back of your leg or on the sole of your foot. Some redness at the site of pressure is normal, but it should completely fade or nearly so within 15-20 minutes of taking the brace off. If the redness does not fade or you have tender areas after 15- 20 minutes, you need to contact the orthotist to determine if other adjustments need to be made.

If you develop a blister or skin breakdown, frequently you will need to stop wearing the brace until the skin heals. However, prevention is better than treatment because, even after the sore heals, the new skin will not be as strong as your original skin was.

If you do develop a sore spot or blister, you need to contact the orthotist and be evaluated for what adjustments need to be made in the brace to modify the pressure at that spot. To prevent further damage to your skin and allow the skin to heal, a gel or silicone pad can be applied over the damaged skin. One such product is made by Band-Aid and is called “Advanced Healing Blister Ampoules” and is available at most pharmacies or large grocery stores in the first aid section.

**Supplemental Equipment for Training Success**

* **A carrying bag for transporting the brace(s) and the shoes** at the time of delivery, to and from physical therapy and when traveling, until the wearer uses the brace(s) full time as a primary brace. The brace may not fit in a suitcase easily, so it is helpful to have a bag that is dedicated for the DBS brace. Sports bags often accommodate a KAFO. It is also helpful if it can be carried on the back, as a backpack, especially if one walks with a cane or crutches.
* **Parallel bars** 
  + Some kind of parallel bars or rails in the home will facilitate the learning process because they are always available and you don’t have to leave home to practice.
  + They can be purchased or home-made.
  + Homemade bars can be constructed out of either PVC pipe or aluminum conduit and a 4 x 8 sheet of ¾ inch plywood. In the case of the conduit, the uprights and bars can be welded.
  + Some users have been able to make parallel bars by custom fitting photographic lighting pole systems that can be purchased for relatively little cost from photographic supply stores, either on-line or from retail.
  + In order to use a brace properly, it is necessary to stand totally upright. To achieve this, the height of the bars needs to be adjusted to take this into account. A rule of thumb is that when using a brace it might be advisable to have the bars an inch or so above the handles of your crutches, canes or walkers. This may feel awkward in the beginning. Or for persons who do not utilize upper extremity walking aids, as your arms hang from your side, measure the height from the floor to one or two inches above the crease in your wrist. To determine the width between the bars, figure a comfortable reach but include room to do the side-by-side exercises without hitting the bars. Depending on your reach, about 30-36 inches apart will allow the flexibility of use.
  + Put the bars in a comfortable place in the house. As you will probably be spending hours using them, a comfortable, pleasant location will motivate you to practice more.
* **Handrails in a hallway**
  + An alternative to parallel bars is mounting handrails in a hallway in the home. Again, place them at a comfortable height using the directions above. They should be long enough that you can take at least a few steps in them, the more steps in one direction the better.
  + They can be made using stair railing and brackets screwed securely into the wall. Conduit or PVC pipe are other alternatives.
* **A full length or closet mirror**
  + This invaluable tool allows you to get visual feedback as you practice. It need not be costly. There are freestanding mirrors as well as door or wall mounted ones. It is helpful to attach a plumb bob with a suction cup hook or a strip of blue painters’ tape down the middle of the mirror to visually help keep your body centered.
* **A video camera or alternative**
  + Recording your work on a video gives you the ability to get visual feedback and analyze your progress.
  + It is the tool that allows you to communicate remotely with your orthotist and get feedback.
  + It allows you to track your progress and can help with the motivation to keep working.
* **Notes, posters, other aids**
  + At least one wearer has made a poster with reminders on it and placed it in her exercise area so she can refer to the written word as she practices.
  + Colored painters’ tape applied to your walking surface either as a solid line along your path and/or as individual blocks to identify where to place each foot to achieve equal step length.
* **Phone numbers** of your orthotist, your doctor and your physical therapist.



**Shoes & Socks**

**Shoes**

Any bracing system has three integral components: the brace, the shoe, and the foot/ankle/leg, all of which must work together. The use of proper shoes, especially during the training phase, is very important! The shoe, the brace and the foot/ankle/leg need to function as one solid unit! The sole of the shoe needs to be as flat as possible to allow the “ground reaction” forces to maximally support the knee and allow the wearer to feel that, when standing and moving forward, he/she is totally supported and stable. When the wearer becomes proficient in the techniques of walking with the new brace, the toe of the shoe can have slightly more curve upward (called the toe spring). To keep the shoe tight on the foot and decrease any wobble in the shoe, the shoe generally should either be a tie shoe or have an adjustable strap across the instep. It would be helpful if the tongue is padded and the insole is removable.

If the bracing system includes a SACH heel, a closed heel shoe allows the SACH heel (the foam pad that goes under the heel of the brace) to stay in place and later be transferred from shoe to shoe. If a person wants to wear open back shoes/sandals then the SACH heel may need to be attached to the brace or the shoe so that it will stay in the correct position and not slip out. A shoe with laces that go well down toward the toe allows you to open the shoe wide to get the brace in when putting on the brace. This allows you the most ability to control looseness/tightness of the shoe and also at various places across your foot.

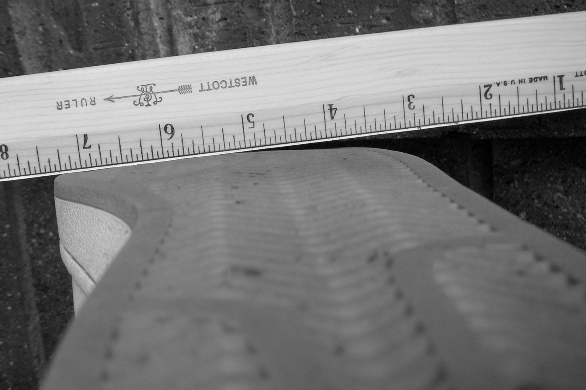
As fashions change the amount of curve of the sole frequently changes. In the past, the shoes that had the flattest soles were “court shoes,” or tennis shoes as used for playing tennis, or “boat shoes.” In the early 21st century the flattest shoes tend to be the “skateboard” shoes. All of these shoes are designed to give the wearer the maximum surface in contact with the ground – the tennis court, the deck of the boat, or the surface of the skateboard-- for the maximum stability of the person wearing this shoe. This design trend is also desired for brace wearers. An “earth shoe,” rocker bottom shoe, or a shoe with a pronounced upward curve of the toe usually does not work well with an orthosis.

One way to check to see if a shoe meets this requirement is to take a ruler or other straight edge and place it on the shoe across the ball of the foot to test if the shoe is flat side to side and then along the length of the shoe (from heel to toe) and check how much distance there is between the flat edge and the sole of the shoe – see photos below:





Flat surface side to side on sole of shoe Flat surface from toe to heel with minimal toe spring



Not acceptable - shoe canted to one side Less desirable - sole not flat into heel – and heel not flat side to side and moderate toe spring from ball of foot to toe

The less open space between the straight edge and the sole of the shoe the better! If you are unable to find shoes that are flat enough in the toe, they can be “filled in” by a shoe repair person – see example in the following photo:



Note: The bottom of the shoe and the tip of the toe, resulting in the flat sole.

The life of the shoe may not be as long as you think (hope) it might be, so be aware that excessive wear can occur with the upper part of the shoe as well as the sole. In order to work optimally, the shoe and brace must function as one solid, stable unit! Shoes can change in the support they provide after cleaning, exposure to water, or with wear. Some signs that the shoe has lost some of its integrity and support are: new pains when wearing the shoe/brace combination; “turning over” of the shoe upper portion; excessive wear on one side of the sole; or new inability to correct one’s gait.

One way to prolong the life of the shoe, if the back of the brace wears down the heel cup is to have an orthotist or shoe repair person make a leather liner for the cup of the heel. Or line it with duct tape.

**Stockings, Socks, Under liners**

Some individuals’ skin can tolerate being in direct contact with the brace or the padding lining the brace, but many cannot, at least not for extended periods of time. Standard knee-high length stockings may work if your lower leg from ankle to knee joint is a bit shorter than average. However, these are frequently too short and the socks just work their way down below the front (pre-tibial) cuff of the brace and leave the skin in direct contact with the padding. During hot or humid weather when a person’s skin perspires there is more friction as the leg moves slightly up and down with each step.

Brace wearers are a creative lot; some of the solutions others have discovered are:

1. Finding and buying “over the knee,” “boot socks,” tights, or thigh high stockings, including thigh high nylon hosiery. Two layers of nylon hosiery can make the surfaces glide and slide over each other effortlessly and quietly. Wearers have been able to find “over the knee” stockings on the Internet. Some other department stores intermittently have over the knee stockings for women to wear with knee high boots or mini-skirts. Comfort Sleeves, liners for orthotics, are also available from www.comfortsleeves.com. They can be folded over the top of the brace to stay in place.
2. Dusting your skin and the inside of the brace with talcum powder or corn starch.
3. Lycra or spandex form fitting pants, leggings, or “compression” hose worn under the brace.
4. Cutting the toe out of a sock and using the “tube” to pull over your knee and fold over the cuff of the brace to put a layer between the parts of the leg that are irritated by contact with the inner portion of the brace.
5. Long underwear or leggings especially in the winter; some long underwear is made of silk or similar thin materials.

Persons with a tendency to have swelling of the ankle and foot (edema, fluid retention) may need to use compression hose of some type in order to control the swelling. Compression hose will also provide a buffer between the skin and the brace. Control of swelling is essential with a well fitted brace because there are very limited ways to adjust the circumferences of the brace at the knee or foot. The swelling does not have to be totally eliminated but it must be fairly consistent on a day-to-day basis and from morning to evening.

**Physical Therapy**

Physical therapy will help you get the best out of your new brace by guiding you in the walking process, and helping trouble-shoot any issues that come up.

**The Learning Process in Physical Therapy**

The value of working with a physical therapist is that the PT will be able to assess the readiness of the wearer to do the actual learning exercises that will help one function in the new brace. The PT may suggest lead up exercises to improve strength and flexibility in combination. The PT will help break down all exercises into smaller components (incremental steps) as one proceeds through the learning process. Also, the continuing assessment of the wearer’s progress by the PT can guide the wearer in relearning the skills that are needed as one moves forward. Sometimes this needs to be repeated many times during training*.*

**Selecting a Physical Therapist**

Working with a physical therapist during the process of learning how to walk with a new custom brace has been identified by clients as one of their more valuable resources. Many wearers have found that their physical therapist is not only a mentor but also is their sounding board through both the physical rehabilitation and the emotional journey that wearers go through.

Qualifications and characteristics of physical therapists that some brace wearers have identified as helpful are:

* Select a physical therapist that works in a clinic that does long term or outpatient PT as opposed to a hospital-based PT whose primary job is to get people to transfer home or to another facility after a trauma or surgery.
* Select a physical therapist that has skill and understanding in working with gait rehabilitation. It may be helpful to the physical therapist to let him/her know that the training for some braces is similar to rehabilitation for prosthetic (artificial leg) wearers as opposed to brace wearers. Some wearers have sought out physical therapists that specialize in gait training for amputees.
* Select a physical therapist that is open to learning about the unique features of the custom brace methodology. Adapting training to the individual wearer’s needs and abilities is important. Be aware that some therapists say they know about your neuromuscular condition or about this brace (or something similar), but over time the client and/or therapist discover that individual learning is unique not only to the person but to how the brace works.
* For persons with long-term neuromuscular problems, the PT’s knowledge of the disability and the emotional impact, *i.e.*, the issues of relearning and trust that come up, is an asset. Then, the PT can help find ways around the barriers that may arise in the process.
* Look for a PT who is willing to work with you over the long haul. Your relationship can last for years.
* Lastly, a sense of humor on the part of the physical therapist and on the part of the brace wearer helps, especially when the going gets tough.

**Goals for Brace Wearers and Physical Therapists**

* Improved strength
* Increased specific functional gains/Activities of Daily Living (ADL)
* Improved gait pattern/normalized gait pattern
* Improved balance
* Decreased number of falls
* Improved endurance
* Increased range of motion in some areas
* Decreased fatigue with activities

**Considerations for Physical Therapists**

* It can be challenging to learn to use the custom braces for persons who have longstanding atypical gait patterns – with practice and time these will improve.
* It is important for the PT to work within recommendations of orthotists to train in the use of the brace.
* PT may need to slow down therapy to allow the wearer’s emotional response to the brace to catch up with the physical progress, especially when decreasing use of other assistive devices.
* Be very cautious to not fatigue the patient with gait training—start with shorter sessions and increase duration as progress occurs.
* Encourage home program emphasis of 3 to 4 sessions per day of 10 to 15 minutes – include functional skills into this program – kitchen, bathroom, indoors, outdoors.
* Utilizing sensory feedback in all modalities helps patients with long- term atypical gait patterns to learn new movements and to recognize prior movement pattern.
* Note new pain—intensity, precipitating events, and location.
* Try walking/hiking sticks to encourage fully upright posture and to bring knees forward into the knee cuff of the brace.
* Consider raising parallel bar height and/or crutch height about an inch so that person stands straighter and allows the weight to go into the knee cuffs.
* Help reduce hip flexion contracture, if present, being careful to not overstretch anterior hip capsule that could lead to instability.
* Teach patient to get down to/up from the floor.
* Teach use of stairs and inclines.
* Re-assess 24-hour ADL skills
* Never forget the trunk – may need additional work.
* Sacroiliac (SI) joint might be destabilized and need balancing.
* Videotape patient at regular intervals and review with patient.
* Schedule periodic re-visits to prevent bad habits after initial training.
* Recognize that training could last for years.

It is important to train a **support** person in what to look for and how to help break habits. At times, just a word from the support person can bring the wearer’s gait pattern back on track. They are also a good resource in preventing fatigue while practice and in the general daily living.

**Some Helpful Practice Hints**

Observing how people walk can be helpful in facilitating imitation.

* View a John Wayne western and watch how he walks.
* Watch the ballroom dancing competitions on PBS TV or Dancing with the Stars on the networks as models of how to move. Observe how their upper bodies do not move while they get movement in the hips and pelvis. Also look at how they hold their bodies in an upright position.
* The honor guards at the Tomb of the Unknowns in Arlington National Cemetery have the desired walk down perfectly. It is beautiful to watch and a great inspiration.
* Watch how toddlers walk. They raise their arms to help their hip movement and improve their balance. Raising one or both arms while practicing may help with hip movement and balance.
* If having difficulty performing some of the exercises in the brace, try doing them with the brace off (using parallel bars as needed for safety) and then transferring this knowledge/ability to doing the exercises while wearing the brace.
* Music can help. It facilitates a rhythm and can help reduce stress and boredom. Select music with a steady beat of about the tempo you are able to walk.
* Practice in the water, if the brace is water safe. The buoyancy can make it easier to move and facilitate the feeling of the correct way to move the hips. Also, falling in water is a lot safer! Various types of “water shoes” or sneakers designed to be worn when hiking in and out of water or along bodies of water can be worn in the water to keep the brace in place on the foot and give a non-slip surface on the sole. Remember to insert the SACH heel, if the bracing system requires one, into the water shoe. Be aware that if the brace has metal joints, it will not stand up to being in the water.
* Set goals based on skill accomplishment rather than time! Celebrating the ability to do the preparatory exercises correctly can reduce the chances of frustration and discouragement that can come from setting the goal of being able to master the brace in a specified time frame.

**Pre-Preparation for a New Brace**

In your initial visit with an orthotist and or your physical therapist, discuss with them if it would be useful for you to pre-prepare for you brace.

***Physical:*** People who have weakness or instability of their legs/feet develop walking patterns that work to provide them with the maximum sense of stability/security/safety possible. Over the years, the progression of the disability may be related to bad habits, or progression of weakness such as in Post-Polio Syndrome. Some of these maneuvers, many unconscious and automatic, can include hyperextension of the knee (back-knee), trunk lean to one side or the other or leaning forward or backward at the waist/hips; short steps on one side or with both legs, slower walking speed, and/or abnormal compensatory movements with one or both arms. Many individuals have learned to move their shoulders, trunk, and pelvis all as one unit, and/or not put all of their weight on the affected leg.

Some brace wearers have found that starting physical therapy before they actually get their brace allows them to progress more easily. This may give an individual a “jump start” on achieving flexibility, learning to move the pelvis separate from the shoulders and upper body, and begin to develop muscle memory and change the neural programming.

The most effective and efficient use of some braces require putting 100% of the body’s weight on the affected leg for the “stance” phase of gait (that part of walking when the foot is on the ground and the other foot is partially or totally off the floor). In order to do this, the wearer must move the pelvis over and a bit to the outside of the braced leg while at the same time leaving the shoulders and head centered.

Some people can self-monitor effectively and correct their old habits/patterns and learn to do this by practicing in front of a mirror; others benefit from an observant physical therapist, orthotist or support person.

Some techniques that professionals can use to help an individual increase the flexibility of the hips, pelvis, and low back and begin the process of developing new “muscle memory” are:

* Manual stretching
* Use of a “therapy ball” with the client moving the hips in all directions (forward/backward, to the left and to the right, in circles, and in diagonals) while sitting and balancing on the ball
* Watsu (a form of passive movement in the water combined with massage)
* While holding on to parallel bars, a walker or a counter, stand in front of a mirror. Practice the movements of the pelvis forward and backward, to the left and to the right, and in forward diagonals to the left and to the right. At the same time, keep the shoulders and head in one position and move only with the lower body. These movements may feel very foreign to you, weird and contorted at first. Before you get the brace(s) you may not be able to do these activities completely. You may only be able to move the pelvis a tiny distance when you first begin, but with practice and stretching of the tissues, you should be able to move the pelvis several inches in all directions and still be balanced!! **Doing these activities without adequate support in the beginning can be dangerous!**
* Use Wii Fit, a Nintendo Wii game console application, to analyze center of gravity and weight shift patterns. Initially it may be difficult to do these with the feet so close together on the Wii Fit platform. Hold on to some form of support, such as the back of a chair or counter!

Prior to having the brace delivered to you, the initial training begins. Stretching, increasing range of motion, and learning to move the pelvis independent of the shoulders and head can begin. In fact, the time spent working on these maneuvers prior to getting the brace may decrease the time spent doing it after you get the brace and allow you to move forward faster!

**NEW BRACING HINTS**

Some Hints for being successful with a new brace

1. Any leg bracing system has three components: the leg, ankle and/or foot of the wearer, the brace itself and the shoes that you wear. The better they work together, the better you will walk.
2. The ideal shoe to wear with a brace fits closely around the brace and the foot, holding you snugly and comfortably within it, and has a sole that sets flat on the ground, including around the edges, in order to provide maximum stability when standing and walking.
3. Newly acquired braces, no matter how perfectly they are made, may need some modification starting immediately. Don’t leave the orthotist’s office without getting it tweaked and comfortable and, go back as often as necessary to make sure the brace fits correctly.
4. Braces should not hurt and should not chafe the skin. Work with the orthotist as soon as and as frequently as needed to make the modifications necessary to prevent and/or alleviate the problem.
5. Wearing a new brace changes how your body works. Generally, most people require time and practice to get comfortable wearing it. Get used to it gradually, starting out wearing it an hour or two at a time and then increasing the time over a few days or weeks until it becomes a comfortable part of your daily life. Often, prescribed exercises from the orthotist and/or a physical therapist when you get the brace can help the learning process.
6. A physical therapist can often help with the transition to a new brace, providing insights and practices that they can see and guide you through in order to stand and walk better.
7. Every pair of shoes is different, and people usually adjust to those differences without any thought. Brace wearers can be more sensitive to the subtle differences and may need to “break in the shoes” every time they get new ones or change to a different pair. This may require doing the old prescribed exercises and practice to regain and improve stability.
8. The body and the braces change over time and the brace may need to be modified throughout its life, so keep your orthotist’s phone number handy!

**INSURANCE**

**General Insurance Information**

Generally, your orthotist office will confirm your insurance coverage and the process needed for reimbursement. Sometimes, the insurance company may not allow you to pay the difference between a basic brace and what you would like. Then, you can use some of the strategies below to change possible outcomes.

Dealing with insurance companies regarding custom braces can be daunting, so here are some quick tips to help maximize the chances of having the claim paid. Some individuals have almost had to sell their firstborn to get reimbursement! The battle is not for the fainthearted! Many of these tips are also discussed in more detail in the following section.

* Before even beginning to get a custom brace, know what kind of insurance you have, and if it is a HMO, a PPO, Medicare, etc. Each type of insurance has its own rules, procedures and restrictions. Determine if you have a maximum benefit amount for orthopedic braces or Durable Medical Equipment (DME).
* Consider changing insurance companies in the policy year that you get the brace if the increased cost of insurance can (or might) mean that they will pay more for the brace.
* Talk to your insurance customer service department more than once to find out what the insurance will cover and how to appeal if necessary. See if you get the same answer from different customer service representatives.
* Consider the prior authorization route first, and if you can get that, have them send you a written copy of the authorization. If denied, be prepared to appeal, or ask for reimbursement after you get your brace. Upon first contact with the insurance company, find out about how to do appeals and reimbursements so you have all the documents, procedures and information that you will need if you have to appeal.
* During the whole process write everything down, including the dates, times and names of the persons you talk with.
* Ask for their information in writing.
* Know the difference between prior authorization and prior certification.
* **Be precise, concise, accurate, and to the point in anything you send to the insurance company.** Claims agents probably only spend about 3-5 minutes on any claim, so fewer words that make the pertinent points are better.
* Use bullets, bold type, and highlighters to emphasize the most pertinent information.
* Introduce your claim with a short cover letter using bullets and phrases, not long sentences listing what is in the claim, and print it on colored paper. The claims agent will remember your claim when you call to check on its status.
* In the cover letter include a sentence about how this brace will prevent or delay future costs to the insurance company for wheel chairs, shoulder replacements or surgeries due to using crutches or other upper extremity assistive devices and documenting what the current insurance company has already spent on devices that haven’t worked.
* Use before and after photos, *i.e.*, without a brace, in the conventional brace (if you have one), and in the custom brace — front, back, and side views. Have each view showing the differences on a page (3 pages total) with perhaps one quick phrase as to what to look at in the transformation.
* Don’t bother with a long history of your disability, how many times you have fallen, or how many bones have been broken when you fell, ***unless*** your current insurance company has paid for the treatment of these injuries, because it probably won’t be read or will interfere with the main point—the custom brace is the best/only correction for your disability.
* Call frequently to keep track of the status of your claim and keep notes.
* Health Saving Account (HSA), Flexible Savings Account (FSA), or taking a medical deduction on your income tax could affect the timing of when you are casted for your brace and when you are fit with it. Be aware of your benefit year and then look at how to make maximum use of your benefits. This could mean either paying for the brace in one benefit year or paying for the first half of the brace in one benefit year and the second half in the next benefit year.

**Notes on Filing a Medicare Claim**

**Medicare policy does not allow payment of claims outside of Medicare certified Durable Medical Equipment (DME) providers. The initial claim must be submitted by the Medicare certified orthotist and cannot be submitted by the patient.**

**There are several Medicare Regions in the United States and each has a different fiduciary agent and each may have somewhat different policies for handling claims. If Medicare pays the claim then the supplemental insurance(s) should also pay their share.**

**Theft and Loss Insurance**

Some custom brace wearers have added a rider to their homeowner’s policy to cover theft and/or loss of the brace at a very low yearly rate. This might be something to consider.

# I. Kinds of braces (orthoses) and where they fit on the body

A health service provider usually prescribes braces. Braces may look different from each other based on the materials used and their ability to stabilize the limb.

### A. Orthosis

An orthopedic appliance or apparatus used to support, align, prevent or correct deformities, or to improve function of moveable parts of the body. For example, a leg brace.

B. FO—Foot orthosis

An insert in a shoe to address some foot alignment problems.

### C. AFO—Ankle Foot Orthosis—Short leg brace

A brace that supports/controls the ankle and foot, helps prevent foot drop and provides side-to-side support. It may come up to just below the knee.

### D. KAFO—Knee Ankle Foot Orthosis—Long leg brace

A brace that supports/controls the knee, ankle and foot and may come up to just below the hip.

### E. HKAFO – Hip Knee Ankle Foot Orthosis

A brace that controls and supports the hip, knee, ankle, foot and may come up as high as the waist.

### F. SMO—Supra Malleolar Orthosis

A brace that encompasses/supports/controls the ankle joint and part or all of the foot and just comes up above the ankle bones.

### G. KO—Knee Orthosis

A knee brace that just goes around the knee and has no support from the foot or ankle. One type of KO is a called a knee cage. KO’s are most often used by athletes. They usually are not effective if the calf muscle is reduced in size, thus allowing the brace to slip.

1. Ankle brace

Either an AFO or an SMO.

1. Knee brace

Either a knee cage, a KO or a KAFO.

### J. RGO—Reciprocal gait orthosis

A brace that encompasses both hips and provides stimulation for one leg to move forward when the opposite leg is in stance phase

### K. Powered exoskeletons

A device that provides support on the outside of the body and uses motorized assist powered by a system of motors or hydraulics.

# II. Parts of a brace (orthosis)

### A. Materials used

1. Plastic
2. Leather
3. Carbon

Black light-weight rigid graphite fibers (cloth) used in the lamination process.

1. Poly-pro

Carbon infused plastic

1. Fabric or Neoprene Orthosis

Orthoses fabricated of cloth fabrics or neoprene as the primary materials in the design of the device.

### B. Uprights

Usually made with plastic, various metals, carbon fiber or a combination of the materials.

1. Medial-on the inside of the leg.
2. Lateral-on the outside of the leg.
3. Posterior-on the back of the leg.
4. Anterior-on the front of the leg.

### C. Straps

Secure the brace to the body, have flexible closures that are usually made of Velcro, leather, and/or fabric and can have laces or buckles above or at the ankle, the knee and/or the hip.

### D. Joints

Allow or control motion at the ankle, knee, and/or hip joints. May be on the inside of the leg or the outside or both. Some are electronically triggered; some can be set at a certain angle to move/not move; some are lockable; some are free motion.

### E. Footplates

Support the foot inside the shoe. They are of various lengths under the foot and may help keep the brace on the limb. May be made of plastic, carbon fiber, or various metals.

### F. Power sources

Such as batteries (usually lithium) or hydraulic assist mechanisms—Designed to assist the wearer to move when walking.

# III. Ways that braces are made and sold

### A. Off the Shelf—OFS (Pre-Fabricated Orthosis)

Fabricated for the average sized person and are usually only minimally adjustable. Can come in sizes small, medium, and large and for left or right foot.

### B. Custom Fitted (Semi-Custom)

A premade sized device that is fit and/or modified to a patient. Semi-custom may be an off the shelf brace used as the basic structure with specific parts added that are custom made.

### C. Custom Designed

An individually designed, crafted, and fitted brace, made specifically to meet the unique needs of an individual. A custom brace usually requires casting and fitting before the brace is manufactured.

### D. Electronic

A custom-made brace that can include a motor, hydraulics, and other mechanical devices. Frequently use computer sensor input to assist with the wearer’s functioning.

### E. Mechanical Assist

Uses various mechanical principles, mechanical devices and energy storing/releasing materials, such as graphite and carbon fiber, to accomplish desired functions.

### F. Stance-Control

Device with an adjustable brake mechanism to add stability to an orthotic knee joint.

### G. Tri-planar control

Controls the movement of a limb in all three directions or “straightens out the leg/foot”. Sometimes this requires corrective pressures at multiple places on the foot, ankle, leg to correct this movement:

* Up and down/forward (sagittal plane) – Example: the foot is in a dropped or not dropped position
* Side to side (coronal plane) – as in the ankle turning in or out or the knee bending in (valgus or knock-knee) or out (Varus or bow legged)
* Twisting toward or away from straight ahead (rotary) -- Example: foot/toes turning in (pigeon toed) or foot/toes pointing out, or the kneecap pointing inward or outward when the person is putting weight on that leg

When orthotists say they practice “tri-planar control,” they mean they use a three-point pressure system. They may usually do this to correct a problem only at one site, not at multiple sites simultaneously. Patients are encouraged to get clarification about which sites are addressed with tri-planar control.

### H. Dynamic Response

A function of the leg brace that allows it to store energy and later release that energy to help “propel the wearer forward”. Part of this is also called “floor reaction” or “ground reaction” forces—this is why the main control at the knee should be in front of the leg instead of behind it.

One mechanism that makes this dynamic response possible is a carbon fiber graphite construction that allows the brace to flex (bend) when weight is applied to it and then actively recoil back to its original position when the weight is released (the foot is lifted off the ground).

# IV. Professionals related to the bracing industry

Please note that some states have licensure for orthotic and prosthetic professionals, and some do not.

1. CPO
   1. prosthetist/orthotist that has board certification.
2. CO

An orthotist that has board certification

1. CP
   1. prosthetist that has board certification

### D. C.Ped

A pedorthist that has board certification

E. Neurologist.

An M.D. or D.O. who specializes mostly in diagnosis and medical treatment of problems related to the nervous system.

### F. Orthopedic surgeon

An M.D. or D.O. whose specialty is the treatment of the musculoskeletal system using surgery as a means for doing so.

1. Orthopedist

An M.D. or D.O. whose specialty is the treatment of the musculoskeletal system.

1. Orthotist

Professional trained to design and fit braces for leg, arms, trunk, neck.

### I. Pedorthist

Professional who focuses on interplay between the foot and footwear, and usually can make foot orthoses. Specializes in modifying footwear and employing supportive devices to address conditions which affect the feet and lower limbs.

### J. Physiatrist

An M.D. or D.O. who specializes in the non-surgical treatment of the musculoskeletal system involving rehabilitation and physical medicine, including pain treatment.

### K. Physical therapist

Professional trained in treatment of many conditions of the body’s neuromuscular systems which may include strength, balance, range of motion and other functional skills.

### L. Podiatrist/DPM

A physician who specializes in medical and surgical treatment of the ankle and foot—usually treating nothing above the ankle.

M. Prosthetist

Professional trained to make artificial legs, arms.

# V. Medical terms related to bracing

1. Lower extremity

Includes hips, legs, knees, shins, ankles, feet, and toes.

1. Upper extremity

Includes shoulders, arms, elbows, forearms, wrists, hands, and fingers.

1. Muscle tone

Innate tension of muscles.

### D. Common abnormal muscle tones

1. Spasticity

Excessive tone due to a neurological condition causing increased muscle resistance to movement.

1. Flaccidity

Decreased tone and decreased resistance to movement often described as “floppy.”

E. Contracture

Limitation of normal joint motion.

### F. Positions of the lower extremities

1. Abduction

Movement of a part of the body away from midline—at the hips, the thighs are spread apart causing the “splits.”

1. Adduction

Movement of a part of the body toward the midline, for example, squeezing the thighs together rather than moving apart.

1. Dorsiflexion

Position of the foot and ankle relative to the heel being lower than the toes in such a way that the toes point upward and toward the leg.

1. Equinovarus

The foot turns inward and down in Varus and plantar flexion causing a “club foot.” (Has both plantar flexion and Varus.)

1. Extension

The act of straightening an extremity or joint

1. Flexion

The act of bending a limb or joint

1. Hyperextension

Movement of the joint beyond straight so that it is beyond 180 degrees

1. Plantar flexion

Bending the ankle in a downward position

1. Pronation

The arch of the foot presses down and inward commonly called “flat foot.”

1. Recurvatum

Hyperextension of the knee, also called “back knee.”

1. Rotation
   1. circular or turning movement of a body part around its axis.
2. Supination
   1. twisting of the foot so the body weight is on outside of the foot resulting in a high arch.
3. Valgus
   1. condition that can apply to any joint but commonly applied to the ankle and the knee. In the knee, it often results in a “knock kneed” appearance.
4. Varus
   1. condition that can apply to any joint but commonly applied to the ankle and the knee. In the knee, it often results in a “bow legged” appearance.

# VI. Commonly used insurance terms

### A. DME Durable medical equipment

Insurance Company term that denotes medical equipment that can withstand repeated use, is expected to last a certain period of time and generally is not useful to a person with the absence of an illness or injury. Braces may be included as DME or can be categorized separately, depending on the insurance company.

### B. Prosthetic/orthotic items

Medicare category that covers braces and their replacement parts when ordered by a doctor or other health care provider enrolled in Medicare. The supplier must also be eligible to accept payment from Medicare.

### C. Preauthorization\*\*

Insurance company process that identifies an item that is covered by the insurance contract, in which it **agrees** to the medical necessity of that item and pays **some** portion of the cost.

### D. Precertification\*\*

Insurance company process in which it **guarantees** the payment of a **certain amoun**t toward the purchase of an item.

\*\*Note: Preauthorization and precertification are usually obtained by the provider. You may need preauthorization, precertification, or both.

# VII. Some diagnoses that could benefit from bracing

|  |  |  |
| --- | --- | --- |
| Cerebral Palsy | Charcot-Marie Tooth | Guillain-Barre Syndrome |
| Multiple Sclerosis | Muscular Dystrophy | Nerve damage from injury or illness |
| Neuropathy | Painful joints | Peripheral neuropathy |
| Polio and its after-effects | Spina bifida | Stroke |
| Structural damage from injury or illness |  |  |

**Driving with a Brace**

Wearing a solid ankle brace on the left leg usually does not cause any problems with driving unless a person drives a car with a clutch (standard transmission). Most clutches require enough pressure to depress the pedal, which often requires drivers to use the upper leg and hip to use the clutch.

However, there can be issues related to wearing a brace on the right leg, and they can have safety implications.

When using a brace on your right leg for the first time, be aware that the “feel”/sensation of how much pressure your foot is applying to the accelerator or brake pedal will likely be altered (usually diminished). Therefore, it is prudent to practice driving in a safe environment such as an empty parking lot while wearing the brace until you feel confident that you will be able to drive safely in your usual driving conditions.

 Also, some change in the sensations can occur when changes are made in the design of the brace or the shoe (thicker or thinner foot plate, thicker or thinner lift on the shoe, change in the type of ankle joint or the angle of the ankle joint).  Similar challenges to your ability to drive using the right foot can occur if you have or develop a medical condition that results in decreased sensation in your foot or an impairment of your ability to detect changes in the position of your foot, ankle or lower leg.  In these cases, it also is important to test or re-test your ability to drive safely and confidently.

Another possible issue is that any brace, particularly a solid ankle brace design, may make it hard or impossible to depress the accelerator because the ankle portion does not bend. In some cases, then, depressing the brake can be accomplished using the entire leg and pushing from the knee or hip or by braking with the left leg.

Again, it is highly recommended that one practice driving in a safe environment such as an empty parking lot.

There are a number of techniques that can be used to overcome the difficulty of driving with a brace on the right leg:

1. Taking the brace off when driving and putting it back on when not driving. With a right long leg brace (KAFO) it might be helpful to have hook and loop tape (Velcro) or a hidden zipper put in the inseam on the pant leg. This eases removal of the brace for driving.

2. Using hand controls on the vehicle for the brake and/or accelerator. For people who lack sensation (especially touch and proprioception) in their leg(s) it might be best to use hand controls.

3. Placing the right foot next to the accelerator and rotating (turning) the foot and leg onto the accelerator as needed and pushing on and pulling away from the accelerator using the upper leg/hip. In this scenario, most people use their left leg/foot for the brake.

4. Using the left foot on the brake and the accelerator if the left ankle/foot is stronger.