

Let's Talk About...

Spina Bifida and Orthopedic Management

In children with spina bifida, the spine, hips, legs, and feet often do not develop or work properly. This requires orthopedic management, which includes careful assessment and checking of the spine, hips, legs, and feet. The goal is to increase your child's function and independence.

Why do these problems happen?

The nerves of the spinal cord are ordinarily connected to the various parts of the body. In spina bifida the nerves below the spina bifida area (towards the feet) are not formed properly. If the nerves don't work properly, the parts of the body to which the nerves are connected don't work properly, either. The bones and muscles of the spine, hips, legs, and feet are the parts that are most affected. The upper chest and arms are usually OK because the nerves connected to those muscles are usually above the spina bifida (towards the head) so the bones and muscles are normal and balanced. If the spina bifida is higher up on the spinal column, there are usually more bone and muscle problems higher up, too. See Figure 1.

To the lower right, Figure 2, is an example of a problem that could occur if a child has spina bifida in the area of the 4th lumbar bone: The muscles that bring the hips toward the belly would be strong, and the muscles that bring the hips away from the belly would be weak. That child would have problems using the muscles below the knees. As a result, the child would always tend to be in a seated position with unbent knees. Over time, this position would cause hip dislocation and difficulty with walking. With braces and other equipment to help, though, the child would be able to walk.

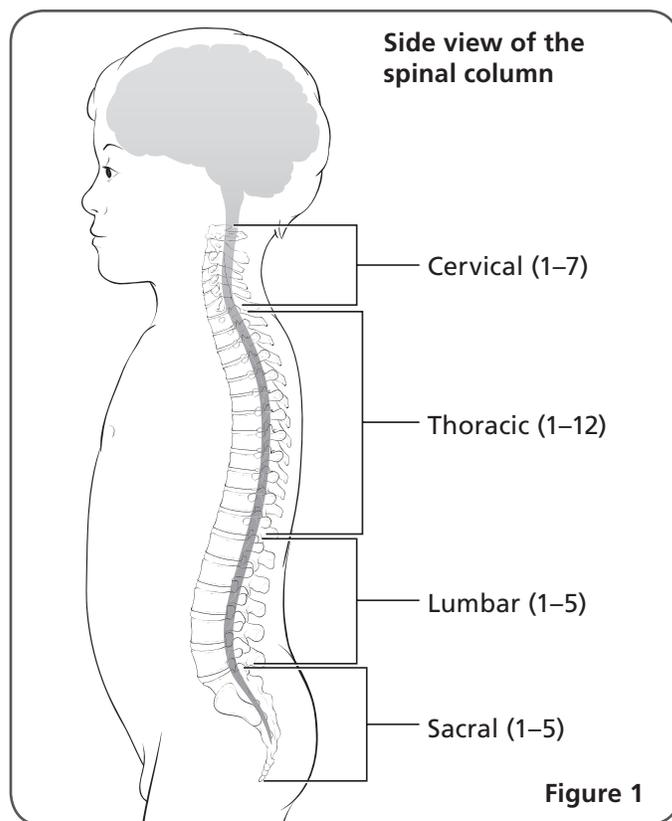


Figure 1

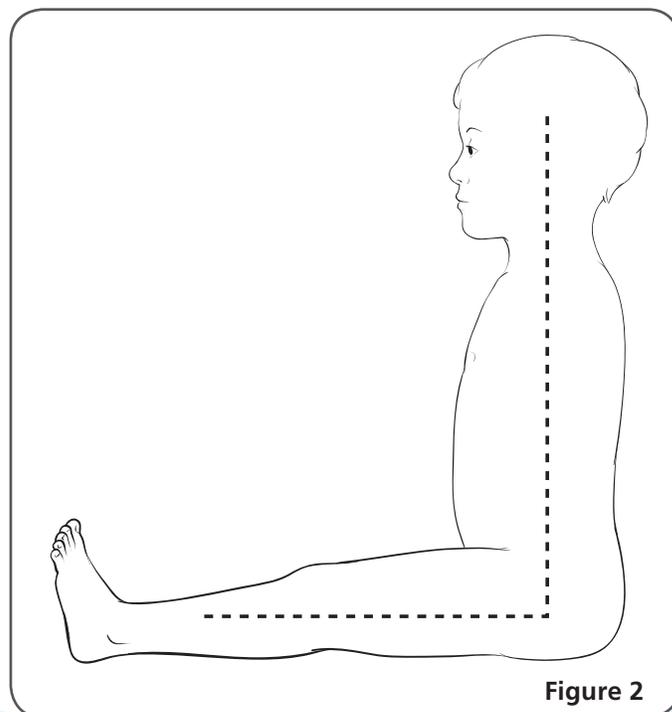


Figure 2

What are some of the orthopedic problems and surgeries that can help these problems?

There are several common surgeries that help children with spina bifida. These include:

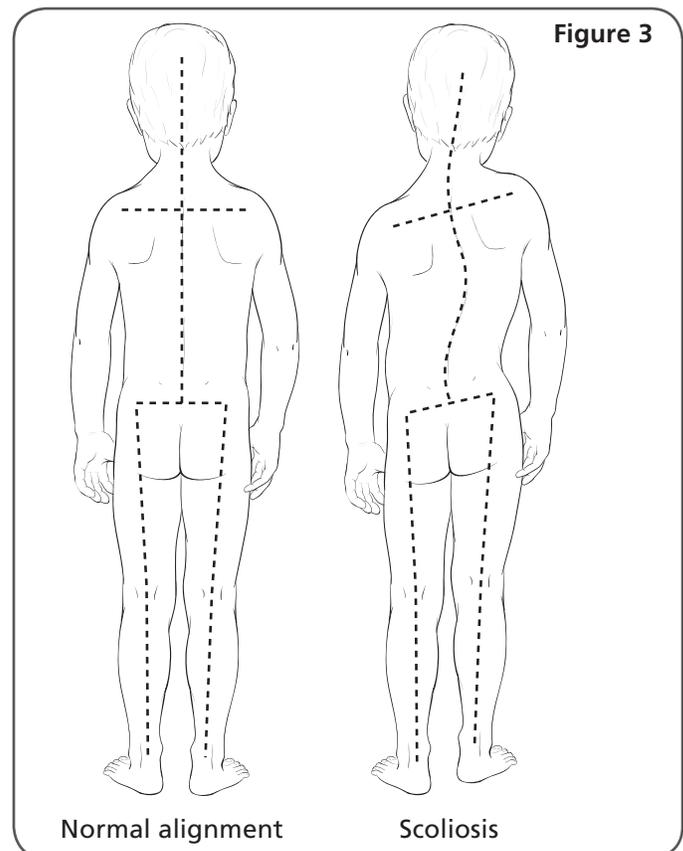
- **Clubfoot.** Children with spina bifida may be born with a foot turned inward. The outer part of the foot is curved, and the ankle is bent downward. Surgery is usually performed after 6 months of age. Clubfoot correction surgery adjusts the position of the foot bones and lengthens or releases the tendons to allow the foot to go back to the correct position. Release is a type of surgery that frees up a part of the body so it has better movement. Children need braces after this surgery.

Some infants with clubfoot have a cast put on their foot, and don't need surgery. This casting happens soon after birth. The orthopedic surgeon changes the cast every 1–2 weeks. This is called serial casting. If your child has this type of cast, you will need to check the skin above and below the cast for sores.

- **Ankle equinus.** If your child's calf muscles (muscles at the back of the lower leg) are weak or don't work at all, the ankle may bend the wrong way. This makes it difficult to brace the leg. If part of the muscle is not needed, it is released with surgery so the foot can support a brace. This is a simple outpatient surgery. Your child will walk in a cast for 4 weeks after surgery.
- **Ankle valgus.** Your child may have ankles that bend the wrong way because the calf muscle is weak or does not work. The inner anklebone sticks out and interferes with bracing. If your child is 7 years or older, the surgeon may place a screw along the inner part of the ankle where it is still growing. This is called a medial malleolar epiphysiodesis (ME-dee-ahl mahl-EE-oh-lahr ep-i-FIZ-ee-oh-DEE-sus). The screw slows growth on the inner side of the ankle. The outer part of the ankle grows normally and the ankle gets straighter as your child gets older. If ankle valgus is corrected early, the child will usually have less bracing problems as they get older.
- **Hip and knee bending (flexion).** Many children who are in a wheelchair develop hip and knee bending problems. These problems rarely interfere with sitting. However, they can become so severe that the child has trouble moving from a wheelchair.

In this situation, the surgeon may recommend release of both hip flexors and knee flexors. This will make it easier for your child to transfer in and out of a chair and perform other activities.

- **Hip dislocation.** Muscle imbalance is a frequent problem, which can dislocate the hips. There are no surgical procedures that can completely restore balance through the hip. A working hip socket and femur does not decide if your child can walk well. Children can walk well with both hips dislocated.
 - In adults with spina bifida, dislocated hips are rarely painful. However, if one hip is dislocated and the other is not, your child may need surgery. Uneven hip dislocation can tilt the pelvis and cause other spine problems. If both hips are dislocated, they are usually not replaced into the socket.
 - Please note that even if the surgeon places the hip back in the socket, the procedure often doesn't work. For this reason, the surgeon has to evaluate your child's symptoms carefully.
- **Scoliosis and kyphosis.** Many children with spina bifida develop serious spine alignment problems (the bones of the spine don't curve normally). The examples, Figure 3 and 4, show a normal spine and spines with scoliosis and kyphosis.



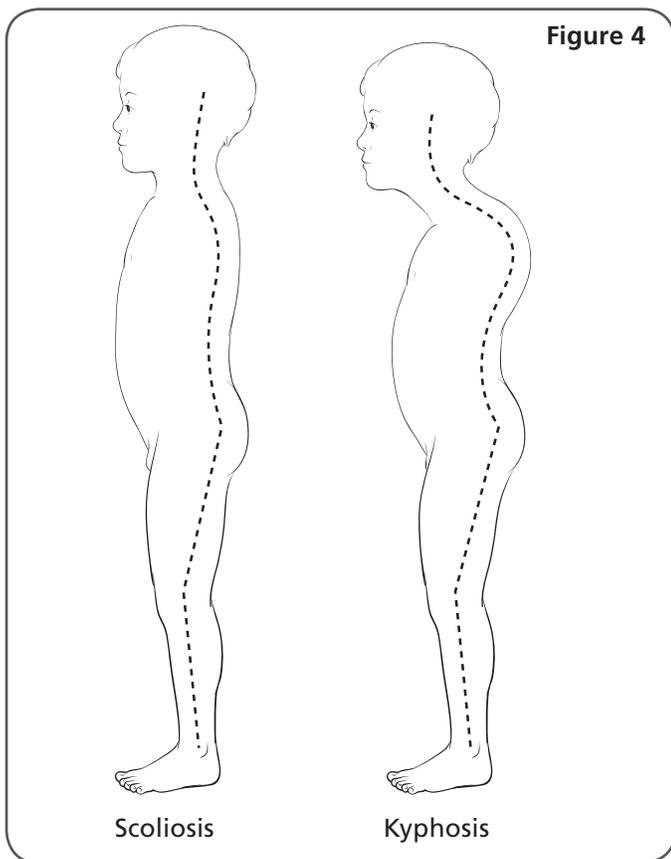


Figure 4

These spine problems can interfere with ability to sit. Kyphosis, or the bulging outward of the back, can produce sores and skin breakdown over the spine. Your child may need surgery to correct the spine and make the upper body stable for sitting. Usually, the surgeon fuses the affected part of the spine and places a series of hooks, bolts, and rods to hold the spine in position.

- **Structural malalignment of the bones.**
Sometimes bones are in the wrong relationship to each other (not angled properly or rotated), there are two surgeries that can help:
 - **Osteotomy** (Oss-tee-AH-toe-me): During this surgery, the surgeon cuts the bone and may take a piece of the bone out. The surgeon inserts something to keep the bone in place, for example a screw, pin, plate or rod. The child may have a cast after surgery. The surgeon removes the screw, pin, or other device after the bone has healed.
 - **Growth arrest or epiphysiodesis** (EP-ih-fizz-ee-ODD-eh-sis): The surgeon put a staple on one side of the bone to slow the bone's growth on that side. The surgeon removes the staple when the bone is corrected and the bone grows normally after that. This is much safer and simpler than the osteotomy procedure.

How would a brace help my child?

Braces support weak muscles or keep the legs in proper position for standing and walking. For example, a child with a spina bifida in the lower part of the back may have a weak calf muscle. An ankle-foot brace (ankle-foot orthosis or AFO) may help support the leg and allow walking. If the spina bifida is higher up the spine, the brace may cover more of the leg (called hip-knee-ankle-foot or HKAF0).

Braces can have some problems. They may be cumbersome, heavy, and big. Some children tire quickly wearing the brace. This reduces the brace's benefits. Bracing is also expensive. Bracing or physical therapy may not prevent bone and muscle problems as your child grows. For these reasons, think carefully about how a brace might help your child and if they should have braces. Instead of braces, you may decide that a wheelchair would be better for your child.

When deciding on braces, consider your child's ability to move, strength, any joint problems, and their personal goals.

What are the different types of braces?

Braces are usually named according to the joints the brace crosses and the location of the brace on the body. The following are the most common types of leg and foot braces.

- **Foot orthosis (FO):** The brace keeps the foot from turning downward, keeps the arch of the foot from flattening, and prevents the ankles from rolling inward.
- **Supramalleolar orthosis (SMO):** The brace extends above the ankle bones to provide increased support to the ankle while allowing the ankle to move.
- **Ankle-Foot Orthosis (AFO):** This brace gives maximum support to the foot and ankle and extends up the calf to just below the knee. The brace can be solid at the ankle, which doesn't allow ankle motion, or hinged at the ankle, which allows some motion.
- **Floor Reaction or Solteil Braces:** These are an ankle-foot brace that help the child not to crouch while walking.

- **Knee-Ankle-Foot Orthosis (KAFO):** This brace supports the knee. It has thigh cuffs and jointed metal supports that extend from the ankle and foot portion of the brace to the thigh cuff. The knee joints are locked or unlocked to allow sitting in the brace.
- **Hip-Knee-Ankle-Foot Orthosis (HKAFO):** Also called long leg braces. This brace come with a pelvic band to support the hips, or with both a pelvic band and a chest strap if more support is needed. Otherwise, it is identical to the KAFO.
- **Reciprocating Gait Orthosis (RGO):** This is an HKAFO-type brace with a chest support, where the two braces work together through a series of cables. This allows for better walking.
- **Dynamic Ankle-Foot Orthosis (DAFO):** This is a molded foot, ankle, and lower leg brace that helps with walking.

Will my child be able to walk?

Walking is usually important for children with spina bifida and their families. A coordinated effort between your child, family, physical therapist, and other healthcare professionals can help your child walk successfully. Whether your child will be able to walk, and how long they continue walking, depends on these factors:

- Your child’s motivation and ability level
- Your family’s motivation and follow-through
- Therapeutic intervention
- Bracing and assistive devices

Keep in mind that walking is only one method of getting around. The most important factor is that your child becomes as independent as possible with whatever method of mobility is used.

What are some of the assistive devices to help my child walk?

Different assistive devices are available to provide proper body alignment, help with balance, and

decrease effort during walking. How much support your child needs during walking will determine which of the following aides to use.

- **Walkers:** There are two different types of walkers available. Reverse walkers allow your child to stand within the support base while pulling the walker while walking. Children usually prefer this walker because they can stand more upright and it provides a broader base of support. With forward walkers, the base of support is in front of the child. The child pushes the walker. This walker is helpful if a child is afraid of falling forward while walking.
- **Forearm Crutches:** These crutches have a cuff, which fits around the forearm, and a hand piece for your child to lean on while walking. Forearm crutches provide balance and can be used to go up and down stairs. A child may start out with two crutches and progress to using one crutch, depending on how much help is needed with balance.
- **Wheelchairs:** Wheelchairs help with proper body alignment and mobility. Your child can be checked for a wheelchair around age 2–3. This can be done even if your child is able to walk. Your child may use walking to get around most of the time but may need a wheelchair for long distances. Walking with an assistive device can be tiring to use all day. A wheelchair will decrease effort, and your child will have more energy to do other things.

The decision to get a wheelchair may be emotional for your child and family. Having a wheelchair does not mean that your child needs to stop walking. That decision needs to be made by your child and family. The wheelchair can help your child keep up with their walking peers. It can also help your child take part in sport and exercise programs that may not be possible with crutches or walkers. A wheelchair is an alternative form of mobility and, as with walking, your child’s well-being and independence is of the utmost concern.

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