OVERVIEW
Your child has been diagnosed with a leg length discrepancy. This means that one leg is longer than the other one. Everyone has some side to side difference, but in your child, the difference goes beyond what might be considered normal. This difference may be slight enough never to cause any difficulty. However, if it is significant, your child will need treatment to prevent an abnormal gait, avoid back problems, or for cosmetic purposes.

BACKGROUND
There are a number of known causes for growth problems, which include injuries, infection, joint problems, malnutrition, and metabolic or renal problems. Occasionally, genetic problems, which may be mild or severe, can cause alteration in growth cartilage, such as achondroplasia. Most of the time a specific cause for a leg length discrepancy cannot be found. Scientists refer to these growth disorders as idiopathic. We assume that something in the genetic make up or the environmental setting of the growth cells on that side of the body, in that leg, or one part of the leg, leads to decreased growth potential. Often these slight differences in growth do not result in a significant difference that is noticed until adolescence or later.

A leg length difference is usually not painful and small leg length differences are often unrecognized. A study of military recruits, who were obviously young, healthy, and active individuals, showed that 32% had a slight differences up to 15 mm (a half inch) and did not know it and 4% had a bigger difference without knowing it or having problems from it.

Children generally compensate for a leg length difference better than adults do. Children have more energy and can tolerate less efficiency in their gait patterns. They will make subtle changes to their gait to minimize asymmetry; such as walking up on the toes on the short side or slightly bending the knee on the long side. Adults do not compensate as well and will usually walk with some asymmetry, with what is called a vaulting pattern, going up on the long side and down on the short side. There are some scientific reports that leg length discrepancy can cause premature arthritis or chronic back pain problems. Other studies show that individuals with back pain can get better by wearing a shoe lift. However, there are also other studies which contradict these findings. Gait studies show that leg length differences less than 2 cms result in little if any
changes in gait. Larger differences lead to increased joint stresses on the short limb. These increased forces may lead to arthritis in the long run.

**DIAGNOSIS**
The diagnosis of a leg length discrepancy is done with physical examination and imaging studies. It is important to rule out other causes of side to side differences with a careful physical exam. The physician will observe gait and stance, and also check the motion and alignment of the joints. Measurements can be made with a tape measure, but these measurements are not very accurate. Another test, called a Galeazzi test, compares the height of the knees while lying flat on the examination table. It is easy to compare the shin height and the thigh height for a direct comparison of leg length differences.

Imaging studies are used to get more accurate measurements of leg length discrepancy. The most common method is a special xray called a scanogram. It is actually 3 xray exposures on one film, with each exposure looking directly down on each joint. This technique minimizes magnification and distortion on the xrays pictures. It is important to stay still while the exposures are being taken. A more accurate means of getting a leg length measurement is to use a CT scanner, but many CT scanners are not equipped or programmed for this option.

Your physician will measure the current leg length discrepancy and make an estimate of your child’s growth remaining. The child’s age provides one means of doing this. Girls usually grow until age 14 and boys usually grow until age 16, but there is wide variability. Another way to look at this is to get an xray of the right hand and comparing it to typical findings for hand development. It may be that your child skeletal maturity is more or less than the average child his or her age. Using the bone age for growth predictions significantly improves accuracy for estimating what a leg length discrepancy will be at maturity.

**TREATMENT OPTIONS**
The decision to treat a leg length discrepancy depends on how much difference there will be when the child stops growing. Not all leg length discrepancies need to be treated. The amount of difference determines what type of treatment is required.
Small leg length discrepancies that are less than 2 cm (less than 1 inch) require no treatment. If desired a small shoe lift can be placed in the shoe to reduce or normalize the side to side difference. A small shoe lift is generally expensive and well tolerated, but they do add some weight to the shoe and they can be inconvenient to move casual shoes to dress shoes, etc. Equalizing leg lengths has a theoretical benefit of decreasing stresses on the joints of that leg and the lower back, and may reduce the risk of arthritis in the long run. However, the benefit for small differences is not proven and 30% of the population has a small leg length discrepancy, most have no problems.

Moderate leg length discrepancies in the range of 2 to 5 cm (1 to 2 inches) should be treated to more closely equalize the leg lengths. The easiest means of treatment are shoe lifts or shoe modifications. Up to 2 cm (1 inch) can usually be corrected with an in shoe lift. Partial correction of small discrepancies with a shoe lift may be adequate. Complete correction can be accomplished by having a shoe maker remove the sole and add height to the shoe. The picture shoes an example which is easy to see. Most shoe makers can do this with a solid color which matches the shoe and is not so obvious.

For a growing child with a moderate leg length discrepancies, a good option is a growth slowing operation on the long leg. It is a fairly reliable, minor operation which is done on the long leg. Basically, the growth areas above and/or below the knee are removed. Removing these growth areas slows down the growth of the long leg and lets the short leg catch up. It is important for this surgery to be timed correctly relative to estimates of the growth remaining. Most of the time it is possible to time the surgery to get the leg lengths nearly equal. If the surgery is done to soon, the short leg may grow longer than the long leg. If the surgery is done to late, there may not be enough growth remaining in the short leg to catch up to the long leg. Most of the time, the estimates of growth remaining are pretty good and results of surgery are usually leg lengths with less than 2 cm difference. After maturity it is possible to shorten a long leg, but this is a larger operation.

Large leg length discrepancies obviously have more serious issues and are generally managed surgically. Options generally focus on lengthening the shorter leg. A technique known as distraction osteogenesis has been used over the last 15 years with great
success for lengthening bones up to 15 cm. It is often a difficult treatment process with small or big complications, which must be managed. However, almost always it is possible to achieve the treatment goals. It is possible to shorten a long leg, but this can lead to some temporary or permanent weakening of the muscles. Huge leg length discrepancies are often managed with a prosthesis (an artificial limb). This can be done without surgery, but often the prosthesis fit and function can be better with a surgery to stabilize a joint or remove the foot. Children with prosthesis generally function very well, including participating in high level sports.

EXPECTED OUTCOMES
Most of the time, children with leg length discrepancies do just fine. Activities, including sports and future occupation choices, are rarely limited by having a leg length discrepancy. Most leg length discrepancies are small and either requires no treatment or simple treatment with a shoe lift. Larger leg length discrepancies are often corrected with surgery and sometimes with prostheses.

ANSWERS TOO COMMONLY ASKED QUESTIONS
1. Discrepancies under 2 cm are generally well tolerated and do not need treatment.
2. Discrepancies up to 5 cm can often be improved with a small surgery to slow the growth of the long leg. It is important for the family to follow through with treatment for the right surgical timing to achieve a goal of equalizing leg lengths within 2 cm.
3. Larger leg length discrepancies are generally managed with surgery and will often require more than one surgical procedure.
4. Children with leg length discrepancies are generally active and healthy. It is uncommon for a small leg length discrepancy to limit participation in activities. Leg length discrepancies should not affect your child’s lifespan or ability to have children.

MORE INFORMATION
Further information can be obtained on the internet. Your local public library can help you explore these sources if you are interested. Two good sites for expert and peer reviewed information are the American Academy of Orthopedic Surgeons at www.aaos.org and www.emedicine.com.

FEEDBACK
If you have questions or comments, please contact the office or submit them to the web site at www.pedorhoto.com.