What Is Total Body Irradiation?
Radiation therapy uses high-energy rays (called x-rays) to help fight certain kinds of cancer. When radiation is given to the whole body, it is called total body irradiation (TBI). You cannot see, smell, or feel radiation, but you can hear the machine during treatment.

Why Is TBI Used?
TBI is part of the treatment in bone marrow and stem cell transplants. TBI can kill cancer cells. TBI can also weaken the immune system. This helps people who receive bone marrow or stem cells donated from someone else. The body does not reject the donated cells when the immune system is weaker.

How Is TBI Given?
TBI is given in a special room at Huntsman Cancer Institute (HCI). When the machine is on, only the child being treated may be in the room. The doctors can see and hear your child during the treatment with a camera and intercom system. If parents would like to observe the treatment, they should speak to the doctor or radiation therapist.

What Happens During TBI?
Based on age and height, your child will either stand or lie down during TBI:
- Children younger than age six are usually treated lying down.
- Children older than six and younger children who are very tall will stand.
- Children less than three may need sedation to keep them from moving.

Lungs are sensitive to the effects of TBI. They cannot receive the same dose of radiation as the rest of the body. To protect the lungs, doctors place special shields made of thick metal in front of your child during treatment. If he or she moves during TBI, the lung shields will not protect the lungs; therefore, your child should be very still during the treatment. If he or she needs help to keep still, a special team of doctors called anesthesiologists will be there to sedate your child during TBI. Some children need only one treatment. In this case, lung shields are not needed as they are only necessary for more than one treatment.

How Many TBI Treatments Will Be Given?
Most children receive six or seven TBI treatments. However, the number of treatments depends on your child’s cancer care plan, the type of cancer your child has, and the type of transplant he or she will receive. Usually the treatments are given once a day. Sometimes they are given twice in one day, in the morning and the afternoon.

Before TBI
Meeting With the Doctor
Before starting the treatments, you will meet with the radiation oncology doctors at HCI. Doctors will see your child to review his or her medical history and perform a physical exam. They will talk with you about TBI and discuss possible side effects. If you agree with the plan outlined by the doctors, you will be asked to sign a consent form. This visit takes about two hours.

What To Wear During TBI
- The treatment room may be cold. Your child should wear sweat pants or pajama bottoms and a shirt that buttons so the doctor can see your child’s chest and back to place the lung shields.
- Bring slippers to keep your child’s feet warm.
- There should not be any metal on your child’s clothing, and he or she should not wear jewelry or glasses.
**Treatment Planning**

If your child is having more than one TBI treatment, he or she will take part in a treatment planning session (called a simulation) before the actual TBI. This will take place in the Radiation Oncology clinic. Doctors will take X-rays of the chest and back to design special lung shields. During this session, small metal beads and rings will be taped to your child’s skin. These are markers to help with proper placement. Simulation takes about 15-30 minutes.

**Scheduling**

The Blood and Marrow Transplant (BMT) team will make a schedule for your child with the dates for admission to Primary Children’s Medical Center (PCMC), dates to give TBI, dates for chemotherapy, and the date of the re-infusion of the bone marrow or stem cells. Your radiation oncology doctors will give TBI treatments according to this schedule.

**TBI Treatments**

The first treatment takes the longest. On average your child will be in the TBI room for an hour. Before the TBI begins, the staff will position your child, check measurements, and adjust the lung shields. Next, doctors take an x-ray to make sure the shields are in the right place. This procedure is omitted if your child is having only one treatment.

Once everything is ready, all people except for the child will leave the room. The radiation machine will then be turned on. Most often the front side is treated first, which takes about 15 minutes. Your child can then rest for a few minutes before treatment to the backside begins.

The treatments are long; your child may bring music or a DVD to pass the time. The treatment can stop at any time. If your child gets sick, tired, or needs to use the bathroom, he or she may wave to the radiation therapist, who will stop the machine and attend to your child’s needs. Once he or she is ready to continue, the radiation therapists will reposition your child, adjust the lung shields, and restart treatment.

When TBI treatment is completed, your child will go back to the BMT unit at PCMC.

For children who receive anesthesia, parents or family will have to leave the room while anesthesia is in progress. This is a hospital policy. After the TBI treatment is completed, parents are welcome to care for their child while he or she wakes up.

**Side Effects of TBI During Treatment**

Side effects that can occur during the first TBI treatment include nausea, vomiting, diarrhea, and fatigue. Occasionally, mouth sores and mild suntan can occur. Your child’s nurses have drugs to treat these symptoms. The symptoms will go away after all TBI and chemotherapy treatments are finished.

The effects of radiation on the skin depend on a number of factors:
- Number of treatments
- Total dose of radiation
- Prior sun exposure of the radiated skin
- Overall health

Radiation skin reactions occur gradually and may progress for a while after radiation treatments are complete. Most effects are temporary and resolve after radiation treatments end.

After a week or two of treatments, your child’s skin will start to become dry. It may darken, turn pink to red, itch, or feel tender. You should take care of your child’s skin from the first day of radiation, before you notice these changes.

Symptoms may go on after the last treatment. If you have questions, ask your child’s health care provider.

**Skin Care Guidelines**

Here are some ways to help care for your child’s skin:
- Wash skin gently with warm water. Do not scrub. Use your hand rather than a washcloth and pat dry with a soft towel.
- Use a mild soap that is free of perfumes or deodorants.
- Have your child wear loose-fitting cotton clothes. He or she should not wear tight-fitting clothes that can cause friction.
- Do not use adhesive products such as bandages or tape on the skin.
• Avoid extreme heat or cold on the skin. Do not use heating pads, ice packs, or hot water bottles on the skin.

• Avoid exposing skin to the sun; it will be more sensitive. Your child should use a PABA-free sunscreen with at least SPF 30 when outdoors, wear a wide-brimmed hat, and avoid tanning beds.

• Your child should use only an electric razor if he or she shaves.

These suggestions can help manage skin reactions:

• Apply a moisturizing cream, lotion, gel, or oil to radiated skin. Choose products for sensitive skin, and avoid products with perfume or deodorant.

• If a product stings your child’s skin, stop using it.

• If your child's skin becomes tender or itchy, try using an over-the-counter one-percent hydrocortisone cream. If necessary, your child’s health care provider may prescribe a steroid cream.

**Short-Term Side Effects**

After about two weeks, your child will begin to lose hair in the treated area. Hair usually begins to grow back within three to six months after radiation treatment ends. Hair loss may be permanent and depends on the dose of radiation your child receives.

**Long-Term Side Effects**

TBI can cause side effects that may not show up for many years. These are called late effects. The most common late effects are cataracts (clouding of the lens in the eye, which can affect vision) and hypothyroidism (low thyroid, which affects the body’s metabolism). Other possible late effects of TBI that may or may not affect your child relate to growth, fertility, and brain development.

Damage to the heart, lungs, liver, and kidneys is *not* common. Although very unlikely, TBI can impact your child’s risk of getting another cancer later in life. The doctor will discuss each potential side effect of TBI with you and your child so you will be aware of the long-term risks.

**Transportation to TBI Treatments**

The Radiation Oncology clinic is located on the first floor of the cancer hospital at HCI. You and your child will be transported from PCMC to HCI by our Air Med ambulance. A pediatric specialist or nurse from PCMC will go with you and your child for the consultation, simulation, and daily treatments.