

SETTING THE STANDARD OF CARE

When cancer strikes, it touches not only patients, but families, friends, employers, insurers and health care providers, too. Recovery from cancer requires the coordinated efforts of all those affected by the disease.

New treatments, and new ways of administering them, make complete remission a possibility for an ever-increasing proportion of patients with certain types of cancer. One of the many challenges facing patients dealing with a cancer diagnosis is finding the appropriate health care setting to access these treatment options. Baptist Centers for Cancer Care provides that setting.

Since 1989, Baptist Centers for Cancer Care-Memphis' Stem Cell Transplant Center has focused on innovative cancer treatment using high-dose chemotherapy with stem cell support within a standardized, integrated system dedicated to transplantation by leading cancer physicians.

Delivering the most appropriate care for a specific malignant disease requires the highest level of knowledge, planning and commitment by cancer treatment physicians and their team. When that care can be given in an outpatient setting, health care costs can be substantially reduced.

Baptist Centers for Cancer Care Stem Cell Transplant Program has positioned itself to bring quality care or transplant care to the Memphis area by obtaining FACT (Foundation for the Accreditation of Cellular Therapy) Accreditation in November 2004. BCCC/SCTP was the first adult autologous transplant facility accredited in Memphis.

What is Stem Cell Transplant?

First, you need to know what a stem cell is. It is the new cell that has not yet decided what it wants to be when it grows up. When stem cells mature they are either a red blood cell that carries oxygen from the lungs to the rest of the body, a white blood cell which fights infection, or a platelet which helps blood to clot when needed. New blood cells or stem cells are produced by the bone marrow.

When patients are first diagnosed with a disease such as multiple myeloma, leukemia, lymphoma, Hodgkin's disease, breast cancer and/or testicular cancer, they are given several cycles of chemotherapy in the physician's office. Then when indicated, a stem cell transplant is performed. There is an autologous transplant—when a patient receives his or her own stem cells which have been collected and frozen, and an allogeneic transplant—when a patient receives stem cells from a related or unrelated donor.

The process of stem cell transplant begins by administering certain chemotherapy drugs and/or growth factors called moderate dose chemotherapy or mobilization to promote the growth of bone marrow stem cells and their release into the blood stream. Stem cells are then collected by a process similar to dialysis where stem cells are harvested from the blood, evaluated and if necessary, frozen until needed.

The patient is then ready to receive high-dose chemotherapy. High-dose chemotherapy is designed to destroy cancer cells and consists of one to six days of intensive chemotherapy administration after which the stem cells are thawed and infused into the patient. This is needed to replace the bone marrow damaged by the high dose of chemotherapy. After infusion, the stem cells migrate to the bone marrow and begin the process of producing replacement blood cells. During transplant, patients are managed in an outpatient setting and admitted to the inpatient myelosuppression unit only when medically appropriate.

Stem Cell Transplant Program

Diagnoses Treated

Lymphoma

Lymphomas are divided into two general types: Hodgkin's disease and non-Hodgkin's lymphoma. Lymphoma is a disease that occurs when cancer cells are found in the lymph system. The lymph system is made up of thin tubes that branch, like blood vessels, into all parts of the body. Lymph vessels carry lymph – a colorless, watery fluid that contains white blood cells, called lymphocytes. Along the network of vessels are groups of small, bean-shaped organs called lymph nodes. Clusters of lymph nodes are found in the underarm, pelvis, neck and abdomen. The lymph nodes make and store infection-fighting cells.

Because lymph tissue is found in many parts of the body, non-Hodgkin's lymphoma can start in and spread to almost any organ or tissue in the body, including the liver, bone marrow, spleen and nose. It also can spread into other systems, such as the digestive system and respiratory systems. The chance of recovery and choice of treatment depend on the stage of the cancer, whether it is in one area or throughout the body and the patient's age and overall condition.

Leukemia

Leukemia is a disease in which cancer cells are found in the blood and bone marrow. The bone marrow is the spongy tissue inside the large bones in the body. The bone marrow makes red blood cells, which carry oxygen and other materials to all tissues in the body; white blood cells, which fight infection; and platelets, which make the blood clot. Normally, the bone marrow makes cells called blasts that develop into several different types of blood cells that perform specific jobs in the body. Leukemia affects the blasts that are developing into white blood cells called granulocytes. In leukemia, the blasts do not mature and they reproduce quickly. These immature blast cells are then found in the blood and the bone marrow. Leukemia can be acute, progressing quickly with many immature blasts, or chronic, progressing slowly with more mature-looking cancer cells. Leukemia is a complex disease with many different types and subtypes. The kind of treatment given and the outlook for leukemia patients vary greatly according to the exact type, age and general health.

Multiple Myeloma

Multiple myeloma is a type of cancer formed by malignant plasma cells. Normal plasma cells are an important part of the immune system, and the immune system comprises several types of cells that work together to fight off infections and diseases. Lymphocytes, or lymph cells, are the main type of cell in the immune system. There are two types of lymphocytes: T-cells and B-cells. When B-cells respond to an infection, they mature and change into plasma cells. Plasma cells produce and release proteins

called immunoglobins, or antibodies, to attack and help kill disease-causing germs, such as bacteria.

When plasma cells grow out of control, they can produce a tumor. These tumors can grow in several sites, particularly in the soft, middle parts of the bone called the bone marrow. When these tumors grow in multiple sites, they are referred to as multiple myeloma.

Testicular Cancer

Cancer of the testicle, a rare type of cancer in men, is a disease in which cancer cells are found in the tissues of one or both testicles. Testicular cancer is a very treatable, usually curable form of cancer. The testicles contain several types of cells, each of which may develop into one or more types of cancer. More than 90 percent of testicular cancers develop in certain cells known as germ cells. Most invasive testicular germ cell cancers begin as a noninvasive form of the disease called carcinoma in situ or intratubular germ cell neoplasia. Researchers have estimated that it takes about five years for CIS to progress to the invasive form of germ cell cancer. When a cancer becomes invasive, its cells have penetrated the surrounding tissues and may have spread through either the blood or the lymph nodes to other parts of the body.

Breast Cancer

Breast cancer is a disease in which cancer cells form in the tissues of the breast. The breast is made up of lobes and ducts, and each breast has 15 to 20 sections called lobes, which have many smaller sections called lobules. Lobules end in dozens of tiny bulbs that can produce milk. The lobes, lobules and bulbs are linked by thin tubes called ducts.

Each breast also contains blood vessels and lymph vessels. The lymph vessels carry an almost colorless fluid called lymph. Lymph vessels lead to organs called lymph nodes. Lymph nodes are small, bean-shaped structures that are found throughout the body. They filter substances in lymph and help fight infection and disease. Clusters of lymph nodes are found near the breast under the arm, above the collarbone and in the chest.

The most common type of breast cancer is ductal carcinoma, which begins in the cells of the ducts. Cancer that begins in the lobes or lobules is called lobular carcinoma and is more often found in both breasts than any other type of breast cancer. Inflammatory breast cancer is an uncommon type of breast cancer in which the breast is warm, red and swollen. When breast cancer cells reach the under arm lymph nodes and continue to grow, they cause the nodes to swell. If cancer cells have reached these nodes, they are more likely to spread to other organs of the body, as well.

The definition of diagnoses was taken from the American Cancer Society and National Cancer Institute Web sites.

STANDARD TREATMENT APPROACH

Stem Cell Transplant Phases of Treatment:

- *Evaluation* for transplant determines patient eligibility. A medical history is discussed and reviewed. The patient must have adequate organ function and the patient's cancer must be responding to standard-doses of chemotherapy. Diagnostics used for evaluation include PET and CT scan, MRI, EKG, PFT, CXR and many different blood tests.
- *Induction* usually consists of three to four cycles of standard-dose chemotherapy administered at the oncologist's office. Evaluation for transplant may also be initiated at this time.
- *Mobilization* causes stem cells to "mobilize" or move from the bone marrow to the circulating blood. This is usually done with combined moderate-dose chemotherapy (doses higher than those used for standard-dose therapy) and neupogen or high-dose neupogen alone. Treatment is given in the Stem Cell Transplant Center but may require hospitalization on the myelosuppression unit for chemotherapy-related complications. After receiving moderate-dose chemotherapy, blood counts will nadir (decline). The WBC will be at zero for two to four days, and both platelet and RBC counts drop. Platelet and packed red blood cell transfusions are usually necessary. Stem cells in the bone marrow produce massive numbers of cells to replenish the lowered blood counts. These massive numbers of cells "spill over" into the circulating blood stream where they are captured or "harvested."
- *Collection* is also called apheresis, leukopheresis or stem cell "harvest." Harvesting begins with count recovery as the stem cells spill over from the marrow into the circulating blood. Stem cells are removed from the bloodstream via a central line that passes the patient's blood through a machine designed to separate the stem cells from the other blood components. All other blood cells are returned to the patient. Harvest (five to six hours daily) continues until enough stem cells, based on body weight, have been collected. Once harvested, stem cells are shipped to a specialized lab for *processing*. Stem cells are preserved in dimethyl sulfoxide or *DMSO*. *DMSO* keeps the water in the cells from forming ice crystals that would damage the cells during the freezing process. Once processed, the stem cells are frozen and stored as long as necessary.
- *High-dose chemotherapy* can be given in the outpatient setting but usually requires hospitalization for complications. The purpose is to eliminate disease, but chemotherapy doses and drug combinations severely damage or destroy the bone marrow as well as other "normal" cells.
- *Infusion* of stem cells is also called "stem cell rescue." After the chemotherapy is out of the patient's system, stem

cells are thawed at the bedside and infused through a central IV line. The day of stem cell infusion is called *Day 0*. Once the stem cells have been infused, they must find their way into the bones and finish the process of maturing which takes approximately 10 to 12 days. The day after infusion is called *Day + 1*, the next day is *Day + 2*, and so on. Temporary side effects of infusion are commonly related to *DMSO*, the preservative used in the cell freezing process. These side effects can include nausea and vomiting, chilling, an unusual odor and taste of garlic, low blood pressure, a fast heart rate and shortness of breath.

- *Short-term Recovery* after high-dose chemotherapy requires close monitoring, supportive care and side effect management. Blood counts will begin to drop drastically, and the side effects of chemotherapy increase in severity. The WBC will be zero for six to eight days. Declining rbc and platelets will require transfusion support. Other side effects include, nausea, vomiting, anorexia, mucositis and fever/infections. The patient may require hospitalization on the myelosuppression unit for 10 to 14 days while waiting for blood count recovery and chemotherapy toxicities to resolve. After discharge, the patient is followed as an outpatient in the Stem Cell Transplant Center until they are directed back to their oncologist's office.
- *Engraftment* occurs when the stem cells begin to grow and produce mature blood cells, usually *Day + 11*. The patient's blood counts begin to normalize.
- *Long-term recovery* can last six to 12 months although most patients feel better within 3 to 4 weeks after transplant. Most major side effects have either resolved or are improving, but some side effects, such as fatigue, may linger for months. During long-term recovery, the patient is at risk for pneumonia and other infections, especially herpes zoster (shingles). SCT patients will require a flu and pneumonia vaccination annually. Childhood immunizations are repeated beginning one year after transplant.

Peripheral Blood Stem Cell Support

Studies show that high-dose chemotherapy can result in significantly improved survival rates for certain types of cancer. However, intensive chemotherapy can cause serious damage to bone marrow and immune system function. New techniques to promote bone marrow and immune system recovery are reducing the risks inherent in high-dose chemotherapy.

PBSC support is an alternative to standard surgically harvested bone marrow transplantation. Nonsurgical stem cell rescue restores the patient's immune system more quickly, thereby reducing the length of time the patient is at risk of infection and other complications. In combina-

tion with the outpatient support services provided by the transplant center staff, this approach to intensive chemotherapy offers both patient safety and health care cost advantages.

General Eligibility Criteria for Autologous Stem Cell Transplants:

1. Ages 18–65; Less than 70 years old for multiple myeloma.
2. Negative for HIV
3. Negative for hepatitis
4. Patients either are fully active and able to do everything they could do before being diagnosed, or are restricted by the disease, but able to walk, do light housework and office work (Eastern Cooperative Oncology Group (ECOG) performance status of 0–1)
5. No history of prior incurable cancer within the last five years
6. No evidence of active infection
7. Adequate lung, liver, heart and kidney function
8. Minimum of two weeks following major surgery and all wounds healed
9. Access to a companion or caregiver 24 hours a day for aid and assistance throughout the treatment process
10. Signed informed consent
11. No history of substance abuse or psycho-social complication, which in the opinion of the medical director would jeopardize successful participation

Physicians

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Services

How To Make An Appointment

Oncologists may refer patients by contacting the transplant center coordinator at 901-226-5151. Transplant center staff will work with patients to obtain medical records, discuss additional testing and provide educational information. The transplant case manager can assist patients with insurance issues, preauthorization and financial obligations.

Managing The Standard of Care

Since 1989, Baptist Memorial Health Care has helped ensure continuity and quality of care by managing a multidisciplinary health care program that provides:

- A dedicated transplant team
- Clinical protocols and publication
- Standard practice guidelines
- Quality and performance review
- Case management
- Outcomes and data management
- Physician credentialing

Outpatient, professional and inpatient services include:

Outpatient

Transplant Unit
Pharmacy
Lab
Radiology
Cardiology
Pulmonology
One-Day Surgery

Professional Services

Oncology Nursing
Medical Director
Specialty Consults

Inpatient

Myelosuppression Unit

The transplant center is as an extension of Baptist Memphis' oncology program, which is committed to providing excellence. Services include medical/diagnostic screening, administration of moderate-dose chemotherapy, collection and preparation of stem cells, high-dose chemotherapy, infusion of stem cells and delivery of broad-based supportive care in both the outpatient and inpatient units. The center educates patients and families, so they can better assist the center's staff in monitoring patients' progress upon returning home. Extensive educational materials are given to patients and are accessible on computer. Our personnel are available 24 hours a day, seven days a week for patient care needs. The advantages of this system include:

- Enhanced quality of care by participating in a transplant center that is refining and defining patient selection criteria
- Access to specially trained, dedicated staff
- Continuity of care throughout the treatment plan
- Family and local support system remains intact

Setting the Standards for the Future

The National Cancer Institute estimates that about 8.9 million Americans have a history of cancer, and that three of every four American families will have at least one family member diagnosed with the disease. According to the American Cancer Society, more than 30,000 new cancer cases will be diagnosed in Tennessee this year.

In the past, physicians had to direct their transplant patients out of the community to large medical treatment centers and away from the needed support of family, friends and co-workers. Baptist Center for Cancer Care-Memphis' Stem Cell Transplant Center offers a safe and viable option, allowing patients to receive care closer to home.

Patients, oncologists and reimbursers alike need a health care provider, like the BCCC-Memphis stem cell transplant center, that is capable of combining advances in cancer treatment with an emphasis on disease management. Baptist Memorial Health Care intends to be that provider by continuing to enhance its cancer services to maximize efficiency while maintaining a commitment to high-quality care.

References: Atkinson, Champlin, Ritz, Fibbe, Ljungman, Brennar. Clinical Bone Marrow and Blood Stem Cell Transplantation. Cambridge, United Kingdom. Cambridge University Press.

<http://bioweb.wku.edu/courses/biol328/hematopoiesis.html>