

Celebrating Life Through City of Hope's Bone Marrow Transplant Program

BY STEPHEN J. FORMAN, MD



City of Hope's bone marrow transplant (BMT) program has performed more than 16,000 transplants and continues to be one of the largest and most successful programs in the nation.

But how did we get there?

Forty-three years ago, a young college student from Indiana became the hospital's first successful BMT patient. In October of that year, the 27-year-old received news from his physician that he had acute myeloid leukemia. In those days, an acute myeloid leukemia diagnosis was grim—most would say hopeless. Bone marrow transplantation as a cancer treatment was primitive at the time and not widely practiced. City of Hope was one of only six medical centers in the United States that offered the procedure.

The student's doctor advised him to get his affairs in order and he broke the devastating news to his family. His cousin, a doctor in Los Angeles, Calif., said she knew of a cancer treatment center in nearby Duarte, Calif., that had launched a BMT program.

A Historic First

Trusting his cousin's advice, the young man came to City of Hope for a BMT and his eldest brother was his match. He underwent a BMT as a patient of Karl Blume, MD, who established the BMT program at City of Hope in 1975 with Ernest Beutler, MD. Back then, the standard protocol for bone marrow transplantation required that the young man endure very high doses of chemotherapy followed by a three-hour treatment of total body radiation. Following the transplant, the student spent a month in isolation.

With his cancer in remission, the young man returned to school to complete a degree in computer science. He was one of City of Hope's longest-surviving BMT patients—35 years. He would remain in remission for the rest of his life, passing away in 2011.

Since that first patient, City of Hope's laboratory and clinical researchers have led the way for more effective and safer transplants with fewer side effects. Having performed more than 15,000 transplants—6 in 1976 and more than 800 in 2019—our program is now one of the largest and most successful in the world. Today, City of Hope performs, on average, 720 transplants each year.

In 1978, I joined City of Hope to work with Dr. Blume to help grow the new BMT program. I had the privilege of leading our Department of Hematology & Hematopoietic Cell Transplantation for more than 30 years, and Dr. Eileen Smith recently became the new chair in November of 2019.

Refining the Technique

The advent of bone marrow transplantation marked an important step forward in the battle against leukemia, lymphoma, and other diseases of the blood and immune system. City of Hope has played a crucial role in the advancement of these procedures. In early procedures, stem cells were collected exclusively from a matched family donor's bone marrow. As medicine advanced, two different sources for stem cells were discovered: peripheral blood (from the bloodstream) and umbilical cord blood. An autologous transplant uses stem cells from the patient's own blood.

With the advent of non-related and partially matched donors, BMT is saving more lives than ever before. One of the biggest innovations derived from research is the ability now to do transplants from half-matched family donors. This development has greatly expanded the pool of people who are eligible to receive BMTs.

When our program started, because of the physically challenging nature of the procedure, transplants were rarely performed in patients over the age of 30. Now, with refinement of the technique, age is no longer a barrier.

City of Hope was also one of the first institutions to do BMTs in patients over the age of 50 and now many patients over the age of 70 are undergoing successful transplants to cure their disease. We did this by approaching the procedure based on the idea of a reduced intensity, or "mini" transplant. This breakthrough method relies less on heavy doses of chemotherapy and radiation and more on the antitumor effects of the graft (called the graft-versus-tumor effect).

Patients ranging in age from 4 months to more than 80 years old have received BMTs at City of Hope.

In addition, City of Hope was one of the first hospitals to prove that BMTs can be done safely in patients with HIV. We performed the first transplant for AIDS-related lymphoma in 1998. Today, BMT is also used to treat numerous nonmalignant diseases, including sickle cell disease and autoimmune diseases.

Based on analysis by the Center for International Blood and Marrow Transplant Research, City of Hope's bone marrow



transplantation program is the only one in the nation that has had one-year survival above the expected rate of 15 consecutive years.

Looking forward, our program is focused on minimizing the side effects of the procedure, increasing its effectiveness, and expanding its reach. An outgrowth of the success of our BMT program has been the development and growth of our immunotherapy program. Chimeric antigen receptor T-cell therapy is a gene therapy that trains a patient's immune system to fight cancer. City of Hope has treated more than 500 patients with these therapies, and that number will keep growing.

City of Hope has also developed a vaccine, and tested it in clinical trials, for cytomegalovirus, a common and potentially deadly infection following transplant. Even before current vaccine trials, City of Hope's program was one of the first to develop a

treatment for prevention of cytomegalovirus infection after transplant, which has nearly eliminated this threat.

"What has really differentiated our program is that all of this is wedded to a deeply humanistic vision of delivering care to the patient," says my colleague Joseph Alvarnas, MD, associate clinical professor in the Department of Hematology and Hematopoietic Cell Transplantation. He notes that we have a system in which we not only have hematologists caring for patients, but they also partner with members of supportive care medicine, from palliative care physicians to social workers to psychologists. All of these services create a much more grounded, human-centered vision of care delivery.

Celebration of Life

In 1998, City of Hope established a formal long-term follow-up program to maintain communication between patients, families, and physicians and to track outcomes so that the cancer center is aware of any problems,

both physical and psychological, that patients may have following their transplant.


In addition, the "Celebration of Life" BMT reunion is an annual highlight at City of Hope, bringing together more than 4,000 attendees each spring. The reunion is a joyous day for everyone in attendance—physicians, nurses, and former patients and their families—as we celebrate the victories attained in fighting cancer. This tradition is in its fourth decade and one that our very first BMT patient (the young student) attended regularly.

Each year, City of Hope selects two patients who can celebrate life because an unrelated donor selflessly donated their stem cells or bone marrow. Those donors often come from across the nation and around the world to meet the patient whose life they helped save. For patients and

donors who meet for the first time at City of Hope's BMT reunion, and kick off a day of festive activities, it is a moment they will never forget and one that often leads to lifelong and close friendships. Hugs, tears, and many heartfelt "thank yous" are exchanged as television cameras capture the reunions and those in the audience wipe away tears. After that first meeting, patients, donors and their families eagerly ask each other questions about the transplant and donation process and share details about their lives. After those patients and donors meet, City of Hope hosts a festive picnic and entertainment for thousands of patients who have had BMTs, their donors, and family members. Patients wear buttons that proudly display how long it's been since their transplant, or second birthday, took place. We've had Los Angeles Dodgers players and a manager, as well as Los Angeles Lakers players and cheerleaders, come out to meet our patients and pose for photos. At the end of the day, a massive group photo is taken, one that we are proud to say keeps growing year after year.

The annual reunion also enables physicians and researchers to further advance the science of stem cell transplantation through the sharing of the findings and advances at the Karl G. Blume-Gerhard Schmidt Memorial Lecture, which is held in conjunction with the event.

It can be somewhat overwhelming if you think about it: more than 16,000 transplants! I only stop and think about that number when someone asks me about it, because our focus is on saving one life at a time. I often forget how long it has been and how much we have accomplished.

My focus continues to be the same as it was in those early days of our BMT program: What does this patient need today, and how can our research help them achieve cure of their disease and return to life? There is a thrill when you see the possibilities of what you can do for someone that you could not do before. It is what we all believe here at City of Hope. 

Stephen J. Forman, MD, is the director of City of Hope's Hematologic Malignancies Research Institute and director of its T Cell Therapeutics Research Laboratory, Duarte, Calif.