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Oncology

Advances in Stem Cell Transplantation Breakthroughs reduce risk and extend therapy to more patients

by Don Norwood

When physicians at The University of Texas M. D. Anderson Cancer Center performed the first bone marrow transplant in Texas in 1975, they knew the procedure was risky. Experience in the early years proved them right. Although some patients were cured, many others died of complications related to the transplant. In addition, associated chemotherapy regimens often were highly toxic. Even so, because candidates for transplant were not responding to other regimens, many patients took the risk.

Today, however, the risk is much lower. Over recent years, continued work in the Department of Stem Cell Transplantation and Cellular Therapy and elsewhere has resulted in great strides in the transplantation of stem cells. More cancer patients are cured, the mortality rate of the procedure has fallen, there are fewer toxic effects, survival durations have increased, and the procedure is used in a wider array of patients and for more diseases.

Originally, physicians believed that transplantation of bone marrow or stem cells was merely a way to permit administering high doses of chemotherapy
(Continued on next page)



Drs. Sergio Giral (standing, left) and Marcos de Lima (standing, right) visit M. D. Anderson patient [REDACTED] (seated), scheduled for a stem cell transplant, and her sister, [REDACTED] (center), whose stem cells are being harvested for use in the transplant.

Advances in Stem Cell Transplantation

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to eliminate malignant cells, said Sergio Giralt, M.D., professor in and deputy chairman of the Department of Stem Cell Transplantation and Cellular Therapy. However, physicians have since discovered that transplanted stem cells have a graft-versus-tumor effect, in which the transplanted cells actually kill cancer cells, especially in patients with hematological malignancies. This finding, along with new ways to reduce toxicity, opened the door for the expanded use of the procedure.

Stem cell transplantation can replace defective blood and immune cells and holds promise for the treatment of diseases such as sickle cell anemia and autoimmune disorders, as part of vaccinations against melanoma and other cancers, and in the regeneration of organs. However, the most promising result of the evolution of stem cell transplantation is the improvement in survival and reduced toxicity for the traditional population of recipients: patients with hematological malignancies.

"When I started here as a fellow in 1989, the main challenge that we had to overcome was that many patients could not get transplants because they were

told, 'You are too old, too sick,'" said Dr. Giralt. "Many other patients couldn't get transplants because we didn't have a source of stem cells for them. And of the ones who got transplants, many had very poor outcomes because their disease was advanced. We've actually been able to target and make major breakthroughs of all those barriers."

Preparative regimens are now more effective, less toxic

One of these breakthroughs is the development of safer and much more effective preparative regimens that can be used in older and younger patients with better outcomes. Another is the discovery that other sources of stem cells besides bone marrow obtained from matched donors produce good results.

"Before, one out of three patients would die within the first three to six months," said Dr. Giralt. "Now, that has gone down to one out of ten, and we're hoping that it will continue to go down farther."

Historically, patients who underwent stem cell transplants for hematological malignancies often died from the preparative chemotherapy and radiotherapy

regimens rather than the disease itself. But with newer regimens, said Marcos de Lima, M.D., associate professor in the Department of Stem Cell Transplantation and Cellular Therapy, the occurrence of death due to the chemotherapy that precedes the infusion of stem cells from a donor has decreased dramatically. In fact, in some subgroups of patients with acute myelogenous leukemia, it is now down to numbers that are very similar to those seen with chemotherapy before autologous stem cell transplantation, which is traditionally the safest type of transplantation.

"The treatment-related death rate in the first 100 days is below 5%," said Dr. de Lima, and below 10% in the first year, provided a well-matched donor and current best treatments are used. "Of course, people still relapse. We are not curing 100% of the people, but certainly we're causing less toxicity."

In the past, oral busulfan was the preparative regimen of choice for most transplants. Unfortunately, wide fluctuations in absorption from patient to patient led to inconsistent results. Too little absorption compromised engraftment, but complete absorption was often

Clinical Trials in Stem Cell Transplantation

- A Phase II Study of Allogeneic Transplant for Older Patients with AML in First Morphologic Complete Remission Using a Non-Myeloablative Preparative Regimen (BMTCTN05-02). Principal Investigator: Sergio A. Giralt. This trial will investigate if treatment with fludarabine and busulfan, followed by a stem cell transplant from a healthy donor, can help control acute myeloid leukemia better than chemotherapy alone in patients between 60 and 75 years old.
- A Randomized Phase II Trial of Fludarabine/Melphalan 140 vs Fludarabine/Melphalan 100 Followed by Allogeneic Peripheral Blood Stem Cell or Bone Marrow Transplant for Patients with Multiple Myeloma (ID01-518). Principal Investigator:

Sergio A. Giralt. This trial will explore potential differences in outcomes between two different doses of melphalan given in combination with fludarabine, followed by a peripheral blood or bone marrow stem cell transplant from a related or unrelated healthy donor, in multiple myeloma patients up to 70 years old.

- A Randomized Study of Once Daily IV Busulfan with Fludarabine with Hematopoietic Stem Cell Transplantation for AML and MDS (2005-0366). Principal Investigator: Richard E. Champlin. This trial will investigate if giving busulfan in a dose based on blood levels is more effective and causes fewer side effects in acute myeloid leukemia or myelodysplastic syndrome patients, than the standard method of giving a fixed busulfan dose based

on body size. Busulfan will be combined with fludarabine, and patients will receive a stem cell transplant after completion of this preparative therapy.

- Imatinib Mesylate, Busulfan, Fludarabine, ATG and Allogeneic Stem Cell Transplantation for Chronic Myelogenous Leukemia (ID02-901). Principal Investigator: Richard E. Champlin. This trial will investigate if a combination of imatinib mesylate (Gleevec), fludarabine, busulfan, and antithymocyte globulin (ATG) can help control chronic myelogenous leukemia in patients up to 70 years old receiving a bone marrow or blood stem cell transplant.

FOR MORE INFORMATION, visit www.clinicaltrials.org or call askMDAnderson at 1-877-MDA-6789.

lethal. Therefore, Borje S. Andersson, M.D., Ph.D., professor in the Department of Stem Cell Transplantation and Cellular Therapy, developed an intravenous busulfan formulation that is now given in combination with fludarabine as a preparation for stem cell transplants. The new intravenous formulation allows much more precise and accurate dosing and permits close monitoring of drug levels in the body.

Minitransplants extend therapy to older patients

In addition, older patients are now better candidates for stem cell transplantation because of the improvement in preparative regimens. A prime example of this is the median age of patients with acute myelogenous leukemia who undergo this procedure at M. D. Anderson.

In the late 1990s, the median age of patients with acute myelogenous leukemia who underwent stem cell transplantation at M. D. Anderson was in the mid-30s, which is far below the median age of patients who have this disease. “See the catch here?” said Dr. de Lima. “We were selecting heavily toward younger patients who were fitter and in good shape, and the majority of the patients were excluded because they couldn’t survive the procedure. Now, our median age is in the low 50s. So in less than a decade, we went up almost 20 years in median age.”

This increase in the median age of stem cell transplant recipients was a result of Dr. Giralt and his colleagues being “professionally challenged” in 1994 by the Department of Leukemia to provide transplants to patients who need them the most. The response to this challenge was the development of a new procedure in which a patient with a donor who is a good match receives less-intensive chemotherapy before receiving at least one stem cell infusion.

“I think it’s fair to say that we were one of the first, if not the first, group that developed a program specifically dedicated to older and debilitated patients, in whom we would try to exploit a graft-versus-tumor effect using less-intense conditioning regimens,” said Dr. Giralt. “Initially it



Before, one out of three patients would die within the first three to six months. Now, that has gone down to one out of ten, and we’re hoping that it will continue to go down farther.”

– Dr. Giralt

was called the minitransplant program. Now we talk about all of these as reduced-intensity programs or nonablative transplant programs.”

Dr. Giralt and his colleagues got the idea for minitransplants from a faculty member in the Department of Leukemia who had administered fludarabine to a patient as preparative therapy for an infusion of unirradiated white blood cells. The result was engraftment of the cells in the patient, a highly significant finding with crucial implications for patients with leukemias and lymphomas. Physicians learned from this result that transplanting white blood cells after administering fludarabine has an antileukemia effect and that high doses of fludarabine are not required to produce this effect.

Use of fludarabine as a preparative regimen for stem cell transplantation did not require the usual set of clinical trials first, said Dr. Giralt, because physicians in the Department of Leukemia were already using several fludarabine-based regimens for the treatment of acute and chronic leukemias. This experience facilitated use of the drug with transplants of stem cells from matched sibling donors at M. D. Anderson, where physicians were the first to show almost universal engraftment of donor cells, resulting in the potential for exploiting a graft-versus-tumor effect. However, several relapses occurred in these transplant recipients, which resulted in the evolution of the preparative use of fludarabine through intensification and the addition of melphalan or busulfan at doses lower than those used traditionally.

New sources of stem cells improve odds of finding donors

Another major stem cell transplantation breakthrough at M. D. Anderson

has been in cell donation. In the past, physicians had to rely on autologous transplants and bone marrow donations from closely matched siblings: those with two identical sets of blocks of human leukocyte antigen genes on chromosome 6 inherited from their parents. Now, physicians are able to infuse cells from bone marrow donated by siblings who are only haploidentical—those with only one identical set of blocks of these genes—as well as from peripheral blood and umbilical cord blood obtained from unrelated donors.

Dr. Giralt highlighted the role of Richard E. Champlin, M.D., professor in and chairman of the Department of Stem Cell Transplantation and Cellular Therapy, in the advancement of transplanting stem cells obtained from unrelated donors. Upon his arrival at M. D. Anderson in 1990, Dr. Champlin, a pioneer of unrelated donor transplantation, helped build the institution’s unrelated donor program. In fact, M. D. Anderson was the first institution in Texas to perform a transplant using stem cells from an unrelated donor—also in 1990. That patient remains alive and is doing well. In addition, Dr. Champlin was one of the individuals who developed the National Marrow Donor Program in the United States.

Since its inception, the National Marrow Donor Program has grown to more than six million registered donors, and according to Dr. Giralt, the quality of the typing has increased to the point that now the results of transplantation of stem cells from an unrelated donor sometimes are equivalent to the results of transplantation of stem cells obtained from a matched sibling.

“One of the controversies in the field now is that a young, unrelated donor

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might actually be better than a brother or sister who is 60 or 70 years old, particularly in older patients,” said Dr. Giralt. “It’s an unresolved controversy but a very important one.”

As mentioned above, physicians can now perform stem cell transplants using cells obtained from umbilical cord blood. M. D. Anderson recently opened a Cord Blood Bank, providing an additional source of stem cells for those without matching related donors. This is particularly important because of the smaller families of today, which means fewer potential matching related donors.

“Our Cord Blood Bank is growing very fast, and it’s bound to be one of the biggest in the nation if we keep going like this,” said Dr. de Lima. “It’s barely a year old, and it’s already collected more than 1,000 units.”

Dr. Giralt said that the Cord Blood Bank has been beneficial for patients at M. D. Anderson because the infusion of stem cells from cord blood has had results equal to or better than the infusion of cells from bone marrow obtained from unrelated donors. This has been especially true in pediatric patients.

Confidence in therapy grows

The improvements in stem cell transplantation over the past decade have raised confidence in the procedure among both physicians and patients with diseases that can be treated with transplants. This increased confidence is reflected by what Dr. Giralt describes as a drastic change in the outlook for patients who undergo stem cell transplantation.

“Before, I was very hesitant to encourage a patient to proceed with a transplant, particularly if he or she was in remission,” said Dr. Giralt. “Now, I strongly encourage patients to do so because I think, particularly for patients with acute leukemia, this is the most effective therapy for long-term disease control.” ●

FOR MORE INFORMATION, physicians may contact Dr. de Lima at (713) 792-6100.

IN BRIEF

New Drug Enhances Chemotherapy’s Effects in Patients with CLL

An experimental, protein-targeting drug renders chemotherapy more effective in certain leukemia patients, researchers at M. D. Anderson report.

A recent M. D. Anderson–led study found that the agent, oblimersen (Genasense), significantly increased remission and survival rates among chronic lymphocytic leukemia (CLL) patients—primarily those who were sensitive to the chemotherapy drug fludarabine. Results of the phase III trial were published in the March 20 issue of the *Journal of Clinical Oncology*.

Oblimersen is known as an anti-sense drug—by interacting with a particular protein’s messenger RNA, it blocks production of the protein, which ordinarily protects cancer cells from chemotherapy. Drugs such as fludarabine have a better chance of killing these cells when less of the protein is present.

The study included 241 patients whose CLL was refractory or had recurred after at least one prior chemotherapy regimen containing fludarabine, a first-line drug for treating the disease. Half the patients in the study received a combination of fludarabine and cyclophosphamide, while the other half were given oblimersen in addition to the two chemotherapy agents.

Researchers then noted how many patients achieved complete response (CR) or nodular partial response (nPR), which is the same as CR except that persistent nodules are detected in the bone marrow.

CR/nPR was achieved in 17% of the oblimersen group, while the same result was seen in just 7% of the chemotherapy-only control group. The difference is statistically significant, said Susan O’Brien, M.D., professor in the M. D. Anderson Department of Leukemia and lead author of the study.

Patients who went into remission after receiving the experimental regimen had a lower rate of relapse at two years (25% compared to 75% in the chemotherapy-only group). The oblimersen-treated patients also were more likely to live longer—70% were still alive three or more years following CR/nPR, compared to 38% of patients who received chemotherapy alone.

The oblimersen regimen was particularly beneficial to patients whose cancer had gone into remission following prior fludarabine treatment. Among these chemotherapy-sensitive patients, the researchers noted a fourfold increase in the CR/nPR rate. However, outcomes



For CLL patients whose disease has progressed but who are still sensitive to chemotherapy, oblimersen may represent a new treatment option. We think it deserves further study in this population.”

– Dr. O’Brien

did not substantially improve among those with disease previously refractory to fludarabine treatment.

“For CLL patients whose disease has progressed but who are still sensitive to chemotherapy, oblimersen may represent a new treatment option,” Dr. O’Brien said. “We think it deserves further study in this population.”

Collaborators in the study included researchers from other U.S. institutions and investigators in Canada, Poland, Argentina, and Australia.

More Is Better, But How Much Is Enough?

The more lymph nodes removed in a colon cancer resection, the better the outcome is likely to be.

by Dianne Witter



Dr. George J. Chang performs a laparoscopic resection for colorectal cancer, including a complete lymph node recovery.

Two colon cancer patients with similar diagnoses undergo potentially curative colon resections: one remains disease-free five years later; the other survives only six months. George J. Chang, M.D., an assistant professor in M. D. Anderson's Department of Surgical Oncology, wants to know why. Although some variables remain unknown, evidence increasingly points to the number of lymph nodes resected as an important determinant of outcome.

In a recent systematic literature review, Dr. Chang and his colleagues analyzed the results of 17 studies from nine countries and found a surprisingly clear association: in all but one of the studies, the more lymph nodes removed and examined during colon cancer surgery, the better the patient's survival outcome. The study was published in the March 21 issue of the *Journal of the National Cancer Institute*.

One of the studies included in the review showed that when more than 20 lymph nodes were examined, compared

to fewer than 11, there was a 14% increase in the five-year overall survival rate in patients with stage II colon cancers. The survival advantage rose to 23% in patients with stage III cancers when more than 40 nodes were evaluated. The association between lymph node recovery and outcomes is now under study in other cancers as well.

"We don't yet know exactly *why* increased lymph node harvest affects outcome—there are likely to be many different factors involved," said Dr. Chang. "But the fact that there is an

association between node removal and survival is now crystal clear. Simply being very diligent about the number of lymph nodes we recover is one thing we, as surgeons, could do that could have a big impact on outcomes."

More accurate staging is one apparent reason for the improved outcomes seen with the resection of more lymph nodes, but Dr. Chang feels there are other contributors as well. "Perhaps there is a therapeutic benefit associated with removing more nodes, beyond simply improving stage assignment," he said. "It also may be that the number of nodes removed is a marker of the quality of care the patient is receiving—that all the members of a patient's treating team, including the surgeon, pathologist, and medical oncologist, are providing the highest level of care when more nodes are harvested."

Studies have shown that, currently, more than half of the colon cancer

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resections in the United States do not include adequate lymph node removal and evaluation. But Dr. Chang stressed that this does not mean that surgeons should adopt a new way of performing surgery; rather, they should carefully adhere to the fundamental principles of colon cancer surgery. “This doesn’t mean taking out more of the colon—it means performing a thorough exploration, removing the appropriate amount of the colon from around the tumor site, and removing all of the lymph nodes by dividing the primary feeding blood vessels at their origin,” he said.

A number of variables affect how many lymph nodes can be harvested in a given surgery for colorectal cancer, and some of these the surgical team and pathologist cannot control, such as tumor location, patient physiology, and the number and size of lymph nodes in the affected area. “But there are two variables we can control: for the surgeon, the completeness of the surgical resection; and for the pathologist, the thoroughness of the tissue examination, with the goal of recovering all possible nodes,” said Dr. Chang.

Exactly how many lymph nodes should be examined is still a matter of controversy. A panel of experts appointed by the U.S. National Cancer Institute recommended that a minimum of 12 lymph nodes be



Immediately after completing the resection, Drs. George J. Chang (left) and Stanley R. Hamilton, head of the Division of Pathology and Laboratory Medicine, examine the tissue specimen to determine whether clear surgical margins were achieved and to ensure the proper orientation for a thorough evaluation for lymph nodes.

resected in colon cancer surgery, and several organizations have adopted this guideline, including the American College of Surgeons, the American Society of Clinical Oncology, and the National Quality Forum. Although that number is still somewhat arbitrary, and perhaps on the low side, according to Dr. Chang, it’s a good place to start.

“We don’t have all the answers yet, but I think we can begin to make some clinically significant improvements in outcomes with this guideline,” he said. “Resecting and examining a minimum of 12 lymph nodes in colon cancer surgery is a very achievable goal, and it’s probably in the sweet spot where we can see some real population-level improvements in survival.”

To illustrate, Dr. Chang did some quick math: approximately 100,000 people in the United States are diagnosed with colon cancer each year, and about 75% of them have disease that is potentially curable with surgical resection. “If we could increase five-year survival by 10% through improved lymph

node evaluation—and I think it’s highly likely we could—that would impact 7,000 patients every year.”

Dr. Chang hopes the findings about the association between lymph node harvest and outcome will encourage a dialogue among physicians, surgeons, and other medical professionals. The M. D. Anderson study may support further efforts by medical societies to determine the optimum number of lymph nodes to be removed and examined, the relationship between the number of lymph nodes evaluated and the quality of cancer care, and the impact of changing this number.

Dr. Chang added that the more accurate prognostic information made possible by optimum lymph node resection will become increasingly important as treatment options increase and therapies become more individually tailored. ●

FOR MORE INFORMATION, contact the Department of Surgical Oncology at (713) 792-6940.

“Resecting and examining a minimum of 12 lymph nodes is a very achievable goal, and it’s probably in the sweet spot where we can see some real population-level improvements in survival.”

– Dr. Chang



Save a Life by Donating Stem Cells

Here's a guide to what's involved

Stem cell transplantation—also called bone marrow transplantation—is a potentially life-saving treatment for patients with leukemia, lymphoma, and other diseases. Many patients, however, do not receive needed therapy because they cannot find a suitable donor. More donors are urgently needed to increase patients' chances of finding a match.

What is a stem cell transplant?

All blood cells in the human body come from stem cells in the bone marrow, which is the pulpy tissue inside certain bones. Stem cells mature into red blood cells, white blood cells, and platelets—all of which have important functions. If the bone marrow is damaged, it cannot make blood cells properly.

Stem cell transplantation “recharges” the bone marrow. Healthy stem cells are taken from a volunteer donor and infused into a patient’s blood. Ideally, the healthy stem cells will flow to the bone marrow cavities and produce more bone marrow and blood cells.

Traditionally, stem cells have been drawn directly from a needle inserted into the bone marrow in the back of the donor’s pelvis. The most common side effects are soreness in the lower back, tiredness, and difficulty walking for several days or longer.

Stem cells can also be collected from the blood. The donor is usually given a drug called filgrastim that releases immature stem cells from the bone marrow into the blood. The cells are then collected using a filtering machine.

Stem cells are also found in the blood of the umbilical cord. They can be collected after the baby is safely delivered and the cord is cut. The procedure does not affect the baby or mother in any way—the umbilical cord would otherwise be thrown away.

How are donors matched to recipients?

Each person is born with a combination of identifying markers, or antigens, found on the surface of his or her body’s cells. These antigens must be matched as closely as possible between a donor

and a patient, or serious complications will result. A simple blood or saliva test (HLA typing) determines a person’s antigen combination. Because there are thousands of possible combinations, the chance of finding an exact match for a patient is low—especially if he or she is a member of an ethnic minority group.

Many patients who need a stem cell transplant cannot find a matching donor.

Antigens are inherited from a person’s parents, and a patient’s brothers and sisters are the best possibilities for matches. The search for a donor starts there and then expands to more distant relatives. If no match is found among relatives, the patient’s doctor must search in registries of unrelated potential donors. The National Marrow Donor Program (NMDP) runs the largest such registry in the United States. Worldwide, more than 10 million volunteers are registered as potential donors. But despite these high numbers, many patients still cannot find a match.

Who can donate?

To ensure the safety of patients and donors, the NMDP has important guidelines for potential volunteers.

- You must be between 18 and 60 years old with a body weight that is neither too high nor too low.
- Pregnant women can register but cannot donate stem cells until after delivery.
- Having well-controlled high blood pressure, diabetes, or mild asthma is usually allowed, but having severe arthritis, severe asthma (requiring

daily steroids), an autoimmune disease, heart disease, or serious spine problems will probably prevent you from registering.

- If you have been diagnosed with HIV, you cannot register. Other sexually transmitted diseases, such as herpes, human papillomavirus, chlamydia, or syphilis, will not prevent you from registering.
- A history of most forms of cancer will prevent you from registering, but you can register if you have been cured of localized basal or squamous cell skin cancer or in situ cervical, breast, or bladder cancer.
- Having ear or body piercings won’t prevent you from joining the registry, as long as the piercings were done under sterile conditions; but if you recently received a tattoo, you may have to wait a year to register.

If you meet their guidelines, your local NMDP center will handle your registration and HLA typing. You may or may not have to pay for your testing, but all medical costs of donation will be covered if you are matched with a recipient.

By registering to donate stem cells, you could be the life-saving match that a patient has been waiting for. If you are interested in registering, or if you are a soon-to-be parent interested in donating your baby’s umbilical cord after birth, talk to your doctor or contact your local NMDP donor center. ●

For a list of local donor centers, contact the NMDP:

- visit their website at www.marrow.org
- call 1-800-MARROW-2.

For more information, talk to your physician, or:

- call askMDAnderson at 1-877-MDA-6789
- visit www.mdanderson.org.

June 2007

M. Gonzales

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Project FAROS Enrolling Local Hispanics in Study of Health Care Access

M. D. Anderson will soon provide up to 4,000 members of the Hispanic community with information and guidance on health care resources in an effort to identify barriers to and improve the use of services for cancer prevention, early detection, and treatment.

Researchers in the Center for Research on Minority Health (CRMH) in the Department of Health Disparities Research at M. D. Anderson have initiated the Facilitated Assistance, Research and Outreach Services demonstration project, Project FAROS ("faros" means "beacon of light" in Spanish). Project FAROS is funded by a \$5.4 million grant from the Centers for Medicare and Medicaid Services.

"Hispanics are the fastest growing minority population in the United States and Texas," said Lovell A. Jones, Ph.D., director of the CRMH and lead project investigator. "Because many Hispanics face financial and accessibility obstacles in gaining screening and treatment services, we are delighted to provide much needed assistance in the hopes of reducing health disparities in this population."

Project FAROS will recruit participants from a number of sites, including local community centers and M. D. Anderson outpatient clinics. Participants will be asked to complete a questionnaire on cancer screening habits, general demographic information, and cancer history. Participants will then be randomly assigned to one of two groups.

One group will receive printed information on health care resources and be assigned a "navigator," who will contact

them to assess their individual health care needs. These bilingual navigators are trained to simplify the health care process by translating complex medical information into understandable language and providing step-by-step instructions on accessing health care services, including financial assistance and care coordination.

The second group will receive printed information but not navigation services.

"This study will allow us to determine the effectiveness of using a navigator for people who are unfamiliar with health care services and processes," Dr. Jones said. "Previous studies have indicated that providing guided assistance can diminish fears and facilitate a smoother experience." However, few of these studies have been evidence-based.

To be eligible for the study, potential participants must live within the 12 counties that surround M. D. Anderson and be Hispanic, at least 40 years old, and enrolled in both Medicare A and B.

In addition, participants must be cancer-free or, if previously treated for cancer, have been in remission for at least five years. Patients who have been diagnosed with breast, cervical, colorectal, lung, or prostate cancer within the past two months but have not begun treatment may still be eligible for the study.

Physicians who would like to refer a patient to Project FAROS can call Sulema A. Luna, R.N., at (713) 563-2724 or Dr. Jones at (713) 563-2764. Potential participants who are interested in learning more about Project FAROS can call (713) 563-6288 or send an e-mail to faros@mdanderson.org. ●

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