By Jay Lewis AABB MANAGING EDITOR

ONGOING PROGRESS in Umbilical Cord Transplantation As medical breakthrout options for patients an

As medical breakthroughs continue, new options for patients and their families emerge.

In 1988, a five-year-old boy from North Carolina with Fanconi anemia needed an additional intervention to treat bone marrow failure, a life-threatening complication of his therapy. When his mother became pregnant again, the results of tests showed that the fetus was not affected by the same condition and would be a matched donor. The patient's family was willing to undergo what was at the time an experimental treatment. When the patient's sister was born, her UCB was collected and frozen. Six months later, the family traveled to France, where the five-year-old patient became the world's first recipient of an umbilical cord blood (UCB) transplant.¹ The experimental treatment was a success; today, the patient is an

Only a few years prior to this landmark procedure, UCB was still widely considered medical waste. Today, UCB represents an important medical resource. In recent years, significant medical breakthroughs have been made regarding UCB transplantation. Cells derived from UCB are now regularly used to treat a variety of medical conditions. Research into further therapeutic applications for UCB-derived cells is ongoing and epitomizes one of the most dynamic and promising fields of medicine.

adult living a typical healthy life.

The number of parents who choose to bank their newborn's UCB—either in a public bank or a private bank—continues to increase every year. Worldwide, more than 600,000 UCB units have now been banked and more than 30,000 UCB transplants have been performed.²

But advocates say more work must be done to increase awareness about the importance of UCB banking. Additionally, there are ongoing concerns regarding costs of UCB-related treatments.

Significant potential

Joanne Kurtzberg, MD, chief scientific officer at the Robertson Clinical and Translational Cell Therapy Program at Duke University School of Medicine, has been involved with UCB transplantation since its early stages. She treated that first patient to receive



the UCB transplant; she was instrumental in confirming

that his sister would be a match and in facilitating the procedure in France. In 1993, Kurtzberg performed the first UCB transplant from an unrelated donor.³ She has since performed more than 2,500 UCB transplants and has become a leading voice for the therapeutic potential of UCB-derived stem cells. In 2005, Kurtzberg and her colleagues published the results of the groundbreaking Cord Blood Transplantation (COBLT) study, which helped to develop standard operating procedures for UCB donation recruitment and banking.⁴

Kurtzberg saw the therapeutic potential for UCB early in her career. "UCB represents a huge potential for regenerative medicine and cellular therapies," she said. "It appears that these cells have the ability to aid in the repair of damaged cells and, thus, may offer a benefit for patients with a wide variety of medical conditions."

Kurtzberg said the advantages of utilizing UCB for therapeutic purposes are numerous. UCB is comprised of mature blood cells, as well as hematopoietic stem and progenitor cells. Additionally, the T lymphocytes found in cord blood appear to be more tolerant of a new host compared with T lymphocytes derived elsewhere. Finally, when UCB is collected, no intervention is required and there is virtually no risk to the mother or the newborn.

A plethora of clinical trials in recent years, many of which are still ongoing, have examined the use of UCBderived stem cells to treat various medical conditions. One area of medicine that has shown particular promise with these therapeutic applications is neuroscience. "It appears that stem cells derived from UCB may have a unique ability to aid in the reparative process in brain cells," Kurtzberg said. Many of the patients that she has treated successfully at her center have been pediatric patients with brain injuries, including cerebral palsy.

There is currently ongoing research to assess the potential of stem cells derived from UCB to treat various other neurologic conditions, including leukodystrophies, amyotrophic lateral sclerosis, multiple sclerosis and Alzheimer's disease. "All of this is very early but the potential may be there," Kurtzberg said. She added that patients with certain metabolic disorders could also potentially benefit from UCB transplantation. Many other therapeutic applications are also currently the subject of scientific research.

Awareness

Although UCB banking has been the subject of increased media attention in recent years and the number of parents who choose to donate or bank their newborn's UCB continues to rise, a lack of awareness is still common. In many cases, parents are not informed that UCB banking is an option and are not educated about its importance or potential benefits. Most public donation programs have requirements that expectant parents must express interest in UCB banking prior to the 34th week of pregnancy, so it is essential that information be presented earlier in the pregnancy. Waiting until delivery is typically too late.

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overwhelmed with decisions to make; sadly, many parents still do not think to prioritize cord blood," said Charis Ober, founder and executive director of Save the Cord Foundation, a nonprofit organization dedicated to promoting and advocating for UCB education, awareness, research and legislation globally. Ober said more work needs to be done to better educate parents, health professionals and the general public about UCB donation.

In many cases, UCB is discarded following delivery. "Our first priority is to encourage parents to do everything can they do in order to save their child's cord blood, either publicly or privately," Ober said. "Ultimately, no amount of funding can replace the missed opportunity of collecting this vital medical resource at birth."

Assisting patients and parents

As advancements in therapeutic applications related to UCB have continued to expand, the number of parents seeking information about potential treatments for their children has also increased. In many cases, parents with limited medical knowledge and an infant with a critical medical condition require assistance in navigating their options.

Frances Verter, PhD, founded the nonprofit organization Parent's Guide to Cord Blood in 1998 to further educate parents about UCB banking and about medical therapies related to UCB. The organization now helps connect patients to medical care and to analyze and inform the public about new developments in medical research or public policy that may expand the therapeutic applications of UCB.

Verter said her organization often fields inquiries from parents regarding treatment options for their children. Verter said the foundation relies on its panel of medical experts to advise parents seeking medical advice and adheres to policies protecting patient privacy. "The very first issue to determine is whether their child is eligible for some form of UCB-related therapy," Verter said. "I have had many inquiries from parents who have a child with a rare disorder and want to know if it can be treated with UCB. The second issue, for families who could benefit from UCB therapy, is to help them determine where they can go for treatment. Typically, if parents are searching the Internet for therapy options, it is because their child's diagnosis is unusual or treatment options are limited in their country."

Verter said she strives to connect patients and their families with a treatment center. However, this sometimes requires travel to another country or enrollment in a clinical trial.

Financial concerns

In many cases, the medical costs associated with UCBrelated therapies can be high. Since this is a relatively new area of medicine, and many of the treatments are not considered standard of care, financial coverage either by private insurance companies or national health services—varies greatly.

Kurtzberg said that typically, the costs are covered for more established uses, but this is not necessarily the case for more experimental applications. "There is no established precedent for insurance companies reimbursing costs for these treatments," said Kurtzberg. "There is no law or regulation governing insurance coverage. It is typically decided on a case-by-case basis."

Verter said that some families have taken to alternative means to raise money to cover costs associated with treatment. "Many families rely on some form of crowdfunding to raise money for unconventional stem cell therapies, including cord blood therapy that is not covered by medical insurance," she said.

Advocates often encourage patients and their families to consider enrollment in a clinical trial. Generally, when a patient is enrolled in a clinical trial, all costs, including medical costs and transportation to and from the study site center, are covered by the clinical trial's funding. However, for patients who are unable or unwilling to enroll in a clinical trial, the costs can be significant.

Lizette Dunay is the co-founder of Cure CP, a nonprofit advocacy organization promoting funding for cerebral palsy research. With advancements in UCB-related therapies for cerebral palsy, Dunay has also become an advocate for UCB transplantation. Dunay said she advises parents to try to enroll their child into a clinical trial if the child

could potentially benefit from treatment. "In the United States, clinical trials are generally funded so that patients enrolled in the trial do not incur any medical expenses associated with the treatment," she said.

Outside of clinical trials, costs vary. Dunay has researched the costs typically incurred by families when their child undergoes UCB transplantation as treatment for cerebral palsy. "If the patient's own UCB, or a sibling's UCB, is being used, the cost of transporting that unit from the storage lab to the research facility is usually incurred by the families," Dunay said. "In my research, I interviewed approximately 50 families and found that the cost of shipping the product ranges from \$800 to \$3,000, depending on the distance from lab to research institution. For the treatment of cerebral palsy, most private insurance companies are picking up the cost of the cord blood infusion, though this can still leave parents financially responsible for a co-pay or a deductible."

Outside of the United States, the financial situation for families undergoing UCB-related treatments can vary greatly. "Much depends on the insurance scheme in their particular country, the existence—or lack thereof—of a national insurance program, the availability of private insurance and whether the procedure is considered experimental or a necessary, accepted method of treatment," Ober said. "For example, in the United Kingdom, the National Health Service will cover most of the costs associated with an UCB transplant, assuming it is a necessary procedure within the protocols of the system. Patients also have the option to obtain additional private insurance to assist with costs, allow them more freedom in choosing their doctors and treatment options. However, these options do not necessarily exist in other European countries; public health systems can vary greatly from one country to the next."

In situations where costs are not covered by traditional insurance or a national health service, families may have to pay for treatment and all related costs themselves. Though overall costs would vary on a case-by-case basis, this could be tens of thousands of dollars.

Insurance option

The insurance industry is now getting involved. For example, a new form of insurance has recently been developed to help cover costs associated with UCBrelated therapies that may not be covered by other means. Amnon Pelz, CEO of Taburit, an Israel-based insurance company, devised an insurance policy for parents who bank their newborn's UCB at a private bank. They can choose to buy an insurance policy at the time the UCB is banked; the insurance will cover potential costs that may arise if their child requires UCB-related therapy.

Pelz said when he first learned about UCB banking, it reminded him of insurance. "Having spent my career in the insurance business, I immediately connected the idea to insurance," Pelz said. "The decision parents make to save their child's UCB is like having insurance; it can provide peace of mind and can offer the option of a potential therapy in the future if needed."

Pelz said after talking with several doctors and studying the issue, he saw that in many cases, high medical costs that are not otherwise covered are often incurred when patients require UCB-related therapies. He developed the idea of an insurance product that would fill this gap in coverage. The insurance covers the costs of hospital stays and procedures involved with transplantation; it also covers a wide variety of auxiliary expenses, including transportation and accommodation, tutoring, home help and child care.

"The out of pocket expenses for families can become a major challenge," Pelz said. "Parents are taking responsibility to save their child's UCB. But if its use is required in the future, they may face significant health costs. This insurance is designed to ease this burden." Pelz partnered with Miller Insurance Services LLP, an insurance broker, based in the United Kingdom, to offer the insurance throughout the world. The insurance policies are underwritten by Lloyd's and are tailored, based on the needs of the client and the UCB bank.

"This is a growing market for insurance," said Andrew Catton, specialist life sciences broker at Miller. "We are working with UCB banks to provide this insurance as an added benefit to their clients."

This is a burgeoning market for insurance and other patients insurance products are likely available.

Future possibilities

As advancements in medical research of UCB-related therapies continue to expand, it is likely that UCB will garner more interest in the future. The number of parents who opt to bank their newborn's UCB is expected to increase and novel therapeutic applications are likely. "Ten years from now, UCB will be playing a major role," Kurtzberg said.

In the meantime, Kurtzberg said it is important to educate healthcare providers about the potential benefits of UCB; they, in turn, can inform expectant parents. "Healthcare providers should be proactive about collecting UCB and collecting as much as possible," she said.

Kurtzberg added that she strongly encourages parents to bank their children's UCB and expects that doing so will become more routine in the future. "All parents should have the option to bank their child's UCB," she said. **B**

ENDNOTES:

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