

Fertility Preservation Financial Cost- Female

Oocyte Cryopreservation /

 Embryo Cryopreservation

UC Center for Reproductive Health

 Professional service for Oocytes Only	Costs
Consult	\$300*
Cycle Monitoring	
Blood work for Cycle	
Retrieval for Oocyte	\$5,500
<ul style="list-style-type: none"> • Medications 	\$5,000- \$7,000 (Philanthropic funds available for oncology pts)
Storage at UC	No charge for storage at UC will ship out to long term storage asap.
Long Term Storage	\$75.00 per year with 2 year commitment of front with Cryopoint
Freezing	Cryopreservation is included.
Shipping	\$150 (Price maybe reduced dependent on shipment)
FDA labs and Screening (available at request)	\$500 (not billable to insurance)
 Professional service for Embryos	
Consult	\$300*
Cycle Monitoring	
Blood work for Cycle	
Retrieval for Oocyte	\$5,500
<ul style="list-style-type: none"> • Medications 	\$5,000-\$7,000 (Philanthropic funds available for oncology pts)
Storage at UC	No charge for storage at UC will send to long term storage asap.
Long Term Storage	\$75.00 per year with 2 year commitment of front with Cryopoint
Freezing	Cryopreservation is included.
Shipping	\$150 (Price maybe reduced dependent on shipment)
FDA labs and Screening (available at request)	\$500 each (patient and partner) (not billable to insurance)

- * Typically covered by insurance
- Some insurance may provide variable fertility coverage; this can be discussed with a financial counselor at the REI office.

Fertility Preservation Financial Cost- Female

● Ovarian Tissue Cryopreservation

1) Procedure Fees : ~\$ 5,000

Hospital Fee	\$3,000
Anesthesia	\$700
Surgeon	\$800
Labs *generally covered by insurance	\$ 300
Future Costs	Unknown

2) Annual Fees

ReproTech

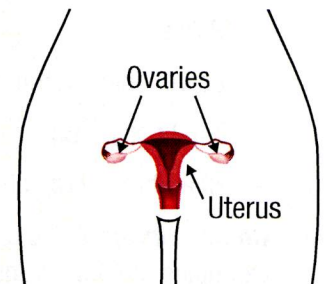
	Transfer	Storage / yearly
Cancer Patients	\$215	\$275 (\$ 75 quarterly storage)
Cancer Patients Financial Aid Verna's Purse <75,000 Single <100,00 Married Based on 1040 Tax	\$ 95	\$75
Non-Cancer Patients	\$ 215	\$275
Non- Cancer Patients Financial Assistance Verna's Purse <75,000 Single <100,00 Married Based on 1040 Tax	\$215	\$175 (\$50 quarterly storage)

Female Health Issues after Treatment for Childhood Cancer

The effects of childhood cancer therapy on female reproductive function depend on many factors, including the girl's age at the time of cancer therapy, the specific type and location of the cancer, and the treatment that was given. It is important to understand how the ovaries and female reproductive organs function and how they may be affected by therapy given to treat cancer during childhood.

The female reproductive system

At birth, the ovaries contain all the eggs they will ever have. When the time comes to begin puberty, the pituitary gland in the brain signals the ovaries by releasing two hormones (FSH and LH). The ovaries secrete the female hormones estrogen and progesterone, which are necessary for reproductive function. Normally, during a monthly menstrual cycle, one egg matures and is released from the ovaries. If the egg is not fertilized, menstruation begins. The cycle then repeats itself about every 28 days. With each menstrual cycle, the supply of eggs decreases. When most of the eggs are depleted from a woman's ovaries, menopause begins. During menopause, the menstrual cycles stop, the ovaries stop making hormones, and the woman is no longer able to become pregnant.



How does cancer therapy affect the ovaries?

Certain chemotherapy drugs, radiation therapy, and surgery can sometimes damage the ovaries, reducing the reserve supply of eggs. When the ovaries are not able to produce eggs or hormones, this is called ovarian failure.

What are the causes of ovarian failure?

Chemotherapy of the "alkylator" type (such as cyclophosphamide, nitrogen mustard and busulfan) is most likely to affect ovarian function. The total dose of alkylators used during cancer treatment is important in determining the likelihood of ovarian damage. With higher total doses, the likelihood of damage to the ovaries increases. If treatment for childhood cancer included a combination of both radiation and alkylating chemotherapy, the risk of ovarian failure may also be increased.

Radiation therapy can affect ovarian function in two ways:

Primary (direct) failure of the ovaries can be caused by radiation that is aimed directly at or near the ovaries. The age of the person at the time of radiation and the total radiation dose can affect whether or not ovarian failure occurs. Generally, younger girls tend to have less damage to the ovaries than people who received equal doses but who were teenagers or young adults at the time of radiation.

However, higher doses usually cause the ovaries to stop functioning in most females regardless of age.

Secondary (indirect) failure of the ovaries can occur as a result of radiation therapy to the brain. The pituitary gland, located in the center of the brain, regulates the production of two hormones (FSH and LH) needed for proper ovarian function. Radiation to the brain at higher doses can damage the pituitary gland, leading to low levels of these hormones.

Surgery. If both ovaries were removed (bilateral oophorectomy) during cancer therapy, this **always** results in ovarian failure. This type of ovarian failure is sometimes called “surgical menopause.” If one ovary was removed (unilateral oophorectomy), menopause may occur earlier than it otherwise would have (“premature menopause”).

What types of cancer therapy increase the risk of ovarian failure?

Females who received the following therapy may be at risk for ovarian failure:

- **Radiation therapy** to any of the following areas:
 - Whole abdomen
 - Pelvis
 - Lower spine (lumbar and sacral areas)
 - Total body (TBI)
 - Head/brain (cranial)—if dose was 30 Gy (3000 cGy/rads) or higher
- **Chemotherapy**—the class of drugs called “alkylators” can cause ovarian failure when given in high doses. Examples of these drugs are:

Alkylating agents:

- Busulfan
- Carmustine (BCNU)
- Chlorambucil
- Cyclophosphamide (Cytoxan®)
- Ifosfamide
- Lomustine (CCNU)
- Mechlorethamine (nitrogen mustard)
- Melphalan
- Procarbazine
- Thiotepa

Heavy metals:

- Carboplatin
- Cisplatin

Non-classical alkylators:

- Dacarbazine (DTIC)
- Temozolomide

- **Surgery:**
 - Removal of one or both ovaries

What are the effects of childhood cancer therapy on the female reproductive system?

- 1. Failure to enter puberty.** Pre-pubertal girls who received cancer therapy that results in ovarian failure will need hormonal therapy (hormones prescribed by a doctor) to progress through puberty. If this occurs, referral to an endocrinologist (hormone doctor) should be made for further evaluation and management.
- 2. Temporary cessation of menstrual cycles.** Many females who were already menstruating will stop having monthly periods during their cancer therapy. In most cases, menstrual cycles will resume sometime after cancer treatment ends, although the timing of this is unpredictable. In some cases, it may take up to several years to restart menstruation. Since eggs are released before the menstrual cycles, pregnancy can occur before the menstrual periods resume. If pregnancy is undesired, birth control (contraception) should be used, even if the menstrual cycles have not resumed.
- 3. Permanent cessation of menstrual cycles (premature menopause).** Menopause (the permanent cessation of menstrual cycles) occurs at an average age of 51. Females who were already menstruating prior to their cancer therapy sometimes develop ovarian failure as a result of their cancer treatment and never resume menstrual cycles. Others may resume menstrual cycles, but then stop menstruating much earlier than would normally be expected. If a woman is currently having menstrual periods but received chemotherapy or radiation that can affect ovarian function or had one ovary removed, she may still be at risk for entering menopause at an early age. ***If a woman at risk for premature menopause desires to have children, it is best not to delay childbearing beyond the early thirties, because the period of fertility may be shortened after having cancer therapy.***
- 4. Lack of female hormones.** Females with ovarian failure do not make enough estrogen. Estrogen is needed for functions other than reproduction—it is very important for maintaining strong healthy bones, a healthy heart, and overall well-being. Young women with ovarian failure should see an endocrinologist (hormone specialist) for hormone replacement therapy, which will be necessary until they reach middle age.
- 5. Infertility.** Infertility is the inability to achieve a pregnancy after at least one year of unprotected intercourse. In women, infertility occurs when the ovaries cannot produce eggs (ovarian failure), or when the reproductive organs are unable to sustain a pregnancy. Infertility may be the result of surgery, radiation therapy, chemotherapy, or any combination of these. *There may also be other reasons for infertility that are unrelated to cancer therapy.*
If a woman has regular monthly menstrual periods and normal hormone levels (FSH, LH and estradiol), she is likely to be fertile and able to have a baby. If a woman does NOT have monthly menstrual periods, or if she has monthly menstrual periods ONLY with the use of supplemental hormones, or if she had to take hormones in order to enter or progress through puberty, she is likely to be infertile.
Girls who had surgical removal of both ovaries will be infertile. Girls who had surgical removal of the uterus (hysterectomy) but still have functioning ovaries can become mothers with the use of a gestational surrogate (another female who carries the pregnancy to term). Women who are infertile should discuss their options with a fertility specialist and their oncologist. The use of donor eggs may be an alternative for some women. Additional options may include adoption of a biologically unrelated child or child-free living.
- 6. Pregnancy risks.** Certain therapies used during treatment for childhood cancer can sometimes increase the risk of problems that a woman may experience during pregnancy, labor, and childbirth. The following women may be at increased risk:
 - Women who had radiation to the whole abdomen, pelvis, lower spine, or total body (TBI) may have an increased risk of miscarriage, premature delivery, or problems during labor.

- Women who received anthracycline chemotherapy (such as doxorubicin or daunorubicin), and women who received radiation to the upper abdomen or chest may be at risk for heart problems that can worsen with pregnancy and labor (see related Health Link: “Heart Health”).

Women with these risk factors should be followed closely by an obstetrician who is qualified to care for women with high-risk pregnancies.

Fortunately, in most cases, there is no increased risk of cancer or birth defects in children born to childhood cancer survivors. In rare cases, if the type of cancer in childhood was a genetic (inherited) type, then there may be a risk of passing that type of cancer on to a child. You should check with your oncologist if you are not sure whether the type of cancer you had was genetic.

What monitoring is recommended?

Females who have had any of the cancer treatments that may affect ovarian function should have a yearly check-up that includes careful evaluation of progression through puberty, menstrual and pregnancy history, and sexual function. Blood may be tested for hormone levels (FSH, LH, and estradiol). If any problems are detected, a referral to an endocrinologist (hormone specialist) and/or other specialists may be recommended. For women with ovarian failure, a bone density test (special type of x-ray) to check for thinning of the bones (osteoporosis) may also be recommended.

Written by: Marcia Leonard, RN, PNP, Long Term Follow Up Clinic, Department of Pediatric Hematology-Oncology, University of Michigan Medical Center, Ann Arbor, MI.

Reviewed by Charles Sklar, MD, Julie Blatt, MD; Daniel Green, MD; Melissa M. Hudson, MD; Wendy Landier, RN, PhD, CPNP, CPON®; Smita Bhatia, MD, MPH; and Peggy Kulm RN, MA.

**Additional health information for childhood cancer survivors is available at
www.survivorshipguidelines.org**

Note: Throughout this *Health Links* series, the term “childhood cancer” is used to designate pediatric cancers that may occur during childhood, adolescence, or young adulthood. Health Links are designed to provide health information for survivors of pediatric cancer, regardless of whether the cancer occurred during childhood, adolescence, or young adulthood.

Disclaimer and Notice of Proprietary Rights

Introduction to Late Effects Guidelines and Health Links: *The Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers* and accompanying *Health Links* were developed by the Children's Oncology Group as a collaborative effort of the Late Effects Committee and Nursing Discipline and are maintained and updated by the Children's Oncology Group's Long-Term Follow-Up Guidelines Core Committee and its associated Task Forces.

To cancer patients (if children, their parents or legal guardians): Please seek the advice of a physician or other qualified health provider with any questions you may have regarding a medical condition and do not rely on the Informational Content. The Children's Oncology Group is a research organization and does not provide individualized medical care or treatment.

To physicians and other healthcare providers: The Informational Content is not intended to replace your independent clinical judgment, medical advice, or to exclude other legitimate criteria for screening, health counseling, or intervention for specific complications of childhood cancer treatment. Neither is the Informational Content intended to exclude other reasonable alternative follow-up procedures. The Informational Content is provided as a courtesy, but not intended as a sole source of guidance in the evaluation of childhood cancer survivors. The Children's Oncology Group recognizes that specific patient care decisions are the prerogative of the patient, family, and healthcare provider.

No endorsement of any specific tests, products, or procedures is made by Informational Content, the Children's Oncology Group, or affiliated party or member of the Children's Oncology Group.

No Claim to Accuracy or Completeness: While the Children's Oncology Group has made every attempt to assure that the Informational Content is accurate and complete as of the date of publication, no warranty or representation, express or implied, is made as to the accuracy, reliability, completeness, relevance, or timeliness of such Informational Content.

No Liability on Part of Children's Oncology Group and Related Parties/Agreement to Indemnify and Hold Harmless the Children's Oncology Group and Related Parties: No liability is assumed by the Children's Oncology Group or any affiliated party or member thereof for damage resulting from the use, review, or access of the Informational Content. You agree to the following terms of indemnification: (i) “Indemnified Parties” include authors and contributors to the Informational Content, all officers, directors, representatives, employees, agents, and members of the Children's Oncology Group and affiliated organizations; (ii) by using, reviewing, or accessing the Informational Content, you agree, at your own expense, to indemnify, defend and hold harmless Indemnified Parties from any and all losses, liabilities, or damages (including attorneys' fees and costs) resulting from any and all claims, causes of action, suits, proceedings, or demands related to or arising out of use, review or access of the Informational Content.

Proprietary Rights: The Informational Content is subject to protection under the copyright law and other intellectual property law in the United States and worldwide. The Children's Oncology Group retains exclusive copyright and other right, title, and interest to the Informational Content and claims all intellectual property rights available under law. You hereby agree to help the Children's Oncology Group secure all copyright and intellectual property rights for the benefit of the Children's Oncology Group by taking additional action at a later time, action which could include signing consents and legal documents and limiting dissemination or reproduction of Informational Content.



THE HORMONE
FOUNDATION®



SaveMyFertility.org



CHILDREN AND CANCER Protecting Your Child's Fertility and Healthy Puberty

Why is it important to think about your child's future fertility now?

When your child has cancer, life-saving treatment is, of course, your first priority. Today most children survive childhood cancer. But future fertility—the ability to conceive a child or maintain a pregnancy—can become impaired from some cancers or cancer treatments. Many parents want to improve their children's chances of having children of their own one day. Often the best time to do so is before cancer treatment begins. Ask your child's doctor about **fertility-saving options** as soon as possible after your child's cancer diagnosis.

How does cancer treatment affect future fertility?

Chemotherapy can damage eggs and sperm, as well as cells in the ovaries and testicles that produce sex hormones.

Radiation can harm fertility when treatment is directed at the ovaries or testicles, the nearby pelvis or belly, or the whole body. Future infertility also can result from radiation to the brain and pituitary gland (a hormone-producing gland at the base of the brain). The brain works with the pituitary gland to start the process of puberty.

In girls, high-dose radiation treatment to the pelvis may harm the uterus, making it harder to get pregnant and to carry a baby.

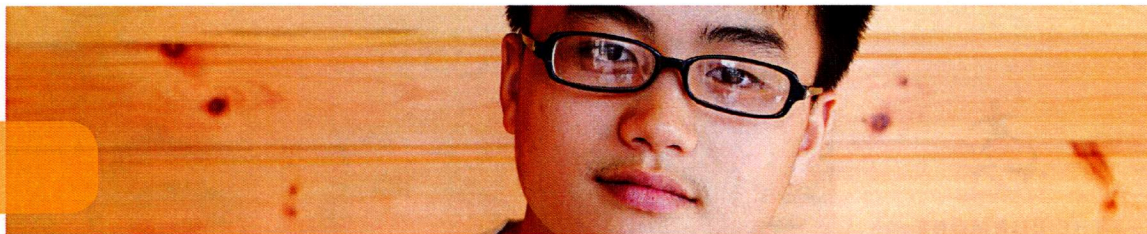
Many parents want to improve their children's chances of having children of their own one day.

What is the chance of infertility?

Not all children become infertile after cancer treatment. The impact that cancer treatment may have on **fertility depends on many factors**. These include:

- Type and dose (amount) of chemotherapy
- Dose and location of radiation therapy
- Site of surgery
- In girls, puberty status (infertility may be less likely when treatment is before puberty)

Some cancer drugs are more likely to cause infertility than others. So are multi-drug treatments, which are common in treating childhood cancers. Having radiation treatment plus chemotherapy also raises the risk. Because the chance of infertility varies so much, **talk to your child's doctors** about his or her risks.



What are the options for fertility preservation?

Your child's doctor may refer you to a fertility specialist to discuss fertility-saving treatments. Treatment options depend on whether your child has gone through puberty. Children who have reached puberty have more **options to save their fertility**. Most girls start puberty between ages 8 and 13 years. Most boys start producing sperm by age 13.

Options for boys after puberty include:

- **Sperm banking.** Freezing (cryopreservation) of sperm is the most successful way to preserve fertility before cancer treatment. The most common way to collect the semen (the fluid carrying sperm) is through masturbation. Boys who cannot ejaculate (eject semen from the penis) may have vibrational or electrical stimulation to help them do so. The sperm stay frozen, or "banked," until needed. Freezing—even for many years—does not damage sperm.
- **Testicular sperm extraction.** Even if a boy's semen has no sperm, he may still have sperm in the testicles. In testicular sperm extraction, a surgeon removes small pieces of testicular tissue while the boy is sedated or under local or general anesthesia. If the tissue contains sperm, the sperm are removed and frozen. This technique may be an option before or after cancer treatment.
- **Shielding of testicles during radiation therapy.** It is sometimes possible to shield the testicles to protect them from radiation during treatment.
- **Testicular tissue freezing.** Some clinics are testing this experimental method. It involves removing and freezing small pieces of testicular tissue before cancer treatment. This tissue may be re-implanted in the future, but so far, no children have been born using this method.

Your child's doctor may refer you to a fertility specialist.

Options for girls after puberty include:

- **Pelvic shielding during radiation therapy.** It may be possible to shield one or both ovaries to protect them from radiation during treatment.
- **Ovarian transposition.** Before radiation treatment to the pelvic or spinal region, a surgeon moves one healthy ovary, or both, to another spot in the girl's body outside the treatment field.
- **Egg banking.** This experimental method involves freezing and storing unfertilized eggs. It usually requires fertility drugs and monitoring with ultrasounds and blood work for about 2 weeks. This could delay the start of cancer treatment and may not be an option for some girls. Banking embryos (fertilized eggs) is an option if a girl is willing to use sperm from a partner or a sperm donor to fertilize the eggs. However, this not a common treatment for adolescent girls. It also requires about 2 weeks of fertility drugs.
- **Ovarian tissue banking.** This experimental method involves removing small pieces of an ovary and storing the tissue frozen. A surgeon may be able to re-implant the tissue after cancer treatment. This may not be a safe option for girls with leukemia because there could be cancer cells in the tissue. The tissue might also be used to mature the follicles and enclosed eggs and fertilize the eggs outside of the body, but no children have been born using this technique yet.

Before puberty, children have fewer options because they do not yet make sperm or mature eggs. Their only options to preserve fertility are shielding during radiation therapy, freezing tissue from the reproductive organs (ovaries or testicles), or ovarian transposition for girls.



How does cancer treatment in young children affect puberty?

Because of cancer treatment, children may be at risk for early or delayed puberty.

Early, or “precocious,” puberty is any physical sign of **sexual maturity** before the age of 9 in boys and age 8 in girls. This may occur after radiation to the brain. Radiation can cause early release of hormones from the brain that signal the body to start puberty.

Puberty is delayed when it has not started by age 14 in boys or 13 in girls. This may also occur from radiation to the brain, or if treatment harms the testicles or ovaries so they cannot produce sex hormones.

Being ahead of or behind their peers in sexual maturity may cause some children to have emotional or social adjustment problems.

What are the treatments for early or late puberty?

To treat early puberty, medicines can stop the release of sex hormones. Treatment most often is stopped when the child reaches the normal age of puberty.

Children with delayed puberty may receive treatment with estrogen (girls) or testosterone (boys) to help bring about normal signs of puberty.

What should you do with this information?

Your child’s doctors may not raise the topic of fertility preservation or how cancer treatment can affect puberty. You should raise the issue if you have concerns. Here are some questions to ask the doctor:

- How quickly does my child need to start cancer treatment?
- Will cancer or its treatment affect my child’s future fertility?
- What are my child’s options to preserve fertility?
- What are the success rates for each option?
- Will my medical insurance cover the cost of these procedures?
- Is my child at risk for early or delayed puberty?

Resources

Save My Fertility
SaveMyFertility.org

Fertile Hope
www.fertilehope.org

Find-an-Endocrinologist
www.hormone.org/FindAnEndo/index.cfm

American Society for Reproductive Medicine
www.asrm.org/patient_resources

The Hormone Foundation
www.hormone.org

KidsHealth
kidshealth.org

Oncofertility Consortium
myoncofertility.org
oncofertility.northwestern.edu or call
1-866-708-FERT (1-866-3378)

EDITORS:

Jill Ginsberg, MD
Dorothy Shulman, MD

© 2011 The Hormone Foundation®
and the Oncofertility Consortium®



The Hormone Foundation®, the public education affiliate of The Endocrine Society®, serves as a resource for the public by promoting the prevention, treatment, and cure of hormone-related conditions through outreach and education.

The Oncofertility Consortium® is a national, interdisciplinary initiative designed to explore the reproductive future of cancer survivors.

The development of this fact sheet was supported by educational grants from Merck and EMD Serono.