

Educational Guide

for Fertility Preservation
and Family Planning
for Female Cancer Patients



SAMPLE



**Miami Cancer
Institute**

BAPTIST HEALTH SOUTH FLORIDA

More than ever, cancer patients are surviving their disease and can look forward to the future. The ability to have children and raise a family is important to cancer survivors. Many therapies that improve survival for cancer patients have side effects that include the loss of fertility. There are several ways to preserve fertility before cancer treatments and there are options available for having a family after treatment.

Women starting cancer treatment may not need or want to consider fertility preservation measures. However, regardless of a patient's choice to preserve fertility or not, it is important to have all the knowledge and the opportunity to make an informed decision based on her personal situation and future family planning desires.

The information within this brochure will help you understand female reproduction, the impact and effects of cancer treatment on fertility, options to preserve your fertility before treatment, considerations after treatment and answer common questions about fertility preservation.

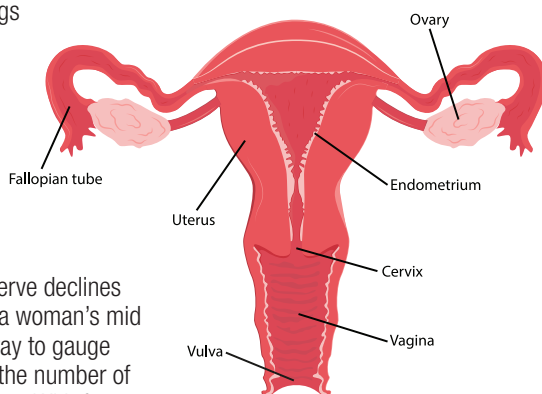
Female Reproductive System

A woman's ovaries contain many thousands of follicles. An ovarian follicle is a fluid-filled sac that contains a single immature egg (oocyte).

During each menstrual cycle, a few immature follicles begin to grow but only one goes on to mature and release its egg. Only one egg is released from the ovary each month in a process called ovulation. After the egg leaves the ovary, it is swept up into the fallopian tube where it can be fertilized by sperm. If the egg is fertilized by sperm and implants into the lining of the uterus (womb), pregnancy is achieved. If the egg is not fertilized, the woman will have her menstrual cycle.

The ovaries contain a fixed number of eggs and follicles at birth. This is called the "ovarian reserve". The ovarian reserve refers to the ability of the ovaries to respond to hormones and to the quality and number of eggs in the ovary at any given time in a woman's life. During a woman's lifetime, no new follicles or eggs are formed.

The number of follicles in the ovarian reserve declines naturally with age, decreasing sharply in a woman's mid 30s until menopause. While age is one way to gauge a woman's fertility, it's actually based on the number of follicles and eggs left in her ovarian reserve. With fewer eggs, it is harder to become pregnant. Eventually, there are so few eggs that women become infertile (unable to get pregnant), monthly menstrual periods stop and menopause begins.



Impacts on Female Fertility During Cancer Treatment

Cancer treatments like chemotherapy and radiation can destroy the follicles in the ovary, which speeds up the natural decline of the ovarian reserve. This can cause temporary or even early menopause. Surgical interventions in cancer treatment may require the removal of some or all reproductive organs. Although not all treatments will result in infertility, these effects may become barriers in building a family after cancer treatment is completed.

Chemotherapy effects on fertility

Chemotherapy drugs target rapidly growing cells, like cancer cells. However, chemotherapy can also effect the cells of the female reproductive system by destroying healthy eggs which can stop the ovaries from working properly.

Because follicles grow rapidly in the ovaries, they are very sensitive to chemotherapy. Some chemotherapy only affects mature follicles and the eggs inside them. This means that a woman could lose her menstrual cycle during treatment, but because she still has immature follicles left in her ovarian reserve, she may start having her period again once treatment is over.

Other kinds of chemotherapy can also damage the immature follicles in the ovarian reserve. These therapies can cause early menopause even in young women and girls. Whether infertility is temporary or permanent depends partly on the chemotherapy drug, dose and age of the woman at the time of treatment. Older women have fewer eggs when they start treatment and are more likely to become infertile after treatment.

Radiation Effects on Fertility

Radiation therapy can affect a woman's fertility depending on which part of her body is treated. Radiation to the abdomen or reproductive organs can damage follicles in the ovarian reserve. Radiation treatment can also damage the uterus, causing fibrosis, or scarring of the tissues. These problems can limit the growth and expansion of the uterus during pregnancy, and increase the risk of miscarriage, low-birth-weight infants and premature births. Occasionally, it is possible to move the ovaries out of the treatment area with surgery before radiotherapy begins. Radiation to hormone-producing areas of the brain may also impact fertility by blocking normal hormonal signals that trigger ovulation.

Surgical Effects on Fertility

Surgery on certain parts of the female reproductive system can affect fertility. For patients who want to have a child after such treatment, ask your surgeon how much of your reproductive function can be preserved to increase the likelihood of having children in the future and/or prevent the effects of menopause (e.g., hot flashes, night sweats and vaginal dryness).

The removal of the uterus (called a hysterectomy) as part of the cancer treatment will result in a woman's inability to carry a child. Surgery which removes the ovaries (called an oophorectomy) will result in infertility or the inability to become pregnant.

Sometimes surgery may also cause scarring in the fallopian tubes. These scars may block the tubes and prevent eggs from traveling to meet the sperm. This means the eggs can't become fertilized and travel on to the uterus to implant in the lining.

Conventional Fertility Preservation in Women With Cancer

Standard fertility preservation options for women include:

- Embryo freezing, oocyte freezing, or both
- Ovarian transposition

Experimental fertility preservation options for women include:

- Ovarian suppression
- Ovarian tissue freezing

Oocyte and Embryo and Egg Freezing (Cryopreservation)

Egg freezing is a procedure in which mature eggs are removed from your ovary to be frozen and stored for possible use in the future.

Embryo freezing includes removal of mature eggs from the ovary that are fertilized with sperm and then frozen as embryos. This is called in vitro fertilization (IVF). The process generally takes two to three weeks and requires several steps.

Reproductive endocrinologists (RE) are gynecologists who specialize in fertility. We do not have REs at Miami Cancer Institute but can make a referral for you. At your first visit, your RE will review your medical history and perform a physical examination. He or she will also obtain blood tests to measure the levels of hormones related to fertility and perform a transvaginal ultrasound. This test will allow your RE to examine your ovaries and count the number of large, growing follicles in the ovaries.

Before beginning egg or embryo freezing, talk with your oncologist to be sure that you can delay treatment to have your eggs mature and receive the medications needed to stimulate egg production.

Steps for Oocyte or Embryo Cryopreservation

Ovarian stimulation: Collecting the eggs typically takes several weeks. Hormones can be used to ripen several eggs at once. In most women, this means self-administering a combination of hormone pills, patches, and/or injections for approximately two to three weeks until many eggs are mature.

Some women might not be able to follow the schedule of medication schedule that is recommended by the RE. This could include women who have fast-growing cancers (who cannot wait two to three weeks to begin treatment) and women with breast cancer, who might be at risk of their tumors growing because of the high levels of estrogen caused by the hormone shots. One option for these women is to follow the natural cycle of the maturing egg. To do this, ultrasound is used to follow the progress of normal ovulation, and one or sometimes two eggs can be collected. Another option for women with breast cancer is to use drugs, such as aromatase inhibitors, during the hormone stimulation to keep the estrogen from helping cancer cells to grow. More studies are needed, but results so far do not show that this has any harmful effects on women's breast cancer treatment or survival.

Egg retrieval: This is an outpatient procedure done under anesthesia. Using ultrasound to help guide a needle inserted through the vagina, the doctor will retrieve the mature eggs from the ovary. This procedure is quick, minimally invasive and can usually be done in a doctor's office. Once egg retrieval is completed, a woman can begin her cancer treatment. All eggs collected are brought to the laboratory to be examined and processed.

Fertilization (if you are freezing embryos): After the eggs are retrieved they are placed in a dish and sperm from your male partner are added to fertilize the eggs. After fertilization, the egg develops over the next two to three days to form an embryo.

Freezing (cryopreservation): The unfertilized eggs or embryos will be frozen and stored until the patient is ready to build a family. If you have frozen eggs or embryos, it's important to stay in contact with the cryopreservation facility to be sure that any yearly storage fees are paid and your address is updated. Once a couple is ready to have a child, the frozen eggs are sent to their fertility specialist.

Surgical Measures to Preserve Fertility in Female Cancer Patients

Ovarian transposition: Ovarian transposition means moving the ovaries away from the target zone of radiation treatment. It's a standard option for girls or women who are going to get pelvic radiation. It can be used either before or after puberty.

This procedure can often be done as outpatient surgery and does not require staying in the hospital unless it is being done as part of a larger operation. Surgeons will usually move the ovaries above and to the side of the central pelvic area.

It's usually best to move the ovaries just before starting radiation therapy because they often shift back into their original location in the body over time.

Fertility sparing surgery (for ovarian cancer): This type of surgery might be an option in young women with ovarian cancer in only one ovary. The cancer must be one that is slow-growing and less likely to spread.

In this case, the surgeon can remove just the ovary with cancer, leaving the healthy ovary and the uterus in place. Studies have found that this does not affect long-term survival, and allows future fertility. If there's a risk of the cancer coming back, the remaining ovary may be removed after the woman has finished having children.

Eligibility for these surgeries depends on the size and location of the tumor. For this reason, this is not an option for all women. To determine whether you are a candidate, please discuss this with your oncologist and gynecologic surgeon.

Experimental Measure to Preserve Fertility in Female Cancer Patients

Cryopreservation of immature oocytes: It is thought that immature eggs might stand up to the freezing and thawing processes better than mature eggs because they are less developed and less fragile than mature eggs. Immature oocytes can be collected at any time — no hormone stimulation is needed. Because of this, researchers are also looking at whether immature oocytes can be harvested, matured in the lab (instead of in the woman), and then frozen. This prevents the woman from having to get hormone stimulation and then wait for eggs to mature naturally in her body.



Immature oocytes are removed through a needle that's put through the vagina and into the ovary. Ultrasound is used to guide the needle. Immature eggs are sucked into the needle and then frozen or matured and frozen. When the woman is ready, her immature eggs are thawed, matured in the lab (if not done before freezing), fertilized, and then implanted in her uterus. If eggs are matured before freezing, they are thawed, fertilized and implanted into the uterus. Researchers are studying this, and at this time this procedure is still considered to be experimental. Few reports have been published so far showing this method results in live births.

Gonadotropin-releasing hormone (GnRH) treatment (ovarian suppression): The goal of this treatment is to shut down the ovaries during cancer treatment to help protect them from the damaging effects of treatment. The hope is that reducing activity in the ovaries during treatment will reduce the number of eggs that are damaged so that a woman could potentially resume normal menstrual cycles after treatment.

GnRH agonists are long-acting hormone drugs that can be used to make a woman go into menopause for a short time. These hormones are usually given as a monthly shot starting a couple of weeks before chemotherapy or pelvic radiation therapy begins. GnRH treatment is given each month the whole time a woman is receiving the cancer treatment.

Some studies suggest that this method might help prolong fertility in some women, especially those 35 and younger, but results are not clear and more research is needed to prove it works.

This treatment is experimental, and women who want to try it might want to look into a clinical trial that's testing GnRH treatment. If this treatment is used, it's best done with a back-up method of preserving fertility like embryo freezing.

Fertility Considerations After Cancer Treatment: Impact on Reproduction in Women Previously Treated With Chemotherapy or Radiation

Measuring fertility after cancer treatment

There are certain ways to assess the impact of cancer treatment on a woman's fertility. The most common sign of fertility is the return of menstrual cycles once treatment has been completed. If the cycles return, it is a good sign, but does not guarantee that fertility has returned to normal. If a woman is unable to become pregnant after cancer treatment, the RE can obtain blood tests to get a sense of her ovarian reserve, which is an important measure of a woman's fertility.

While there are no precise tests to measure a woman's ovarian reserve, hormone levels in the bloodstream can provide more clues about the impact of a woman's treatment, fertility status and ovarian reserve. The most common hormone measured is FSH (follicle-stimulating hormone), but levels of other hormones like Inhibin B and Anti-Mullerian hormone (AMH) also provide useful information about the ovarian reserve.

Attempting pregnancy with frozen eggs or embryos

Before attempting pregnancy, talk to your oncologist. Ask if the timing is right for you or if there are any medical reasons that would make it unsafe for you to become pregnant.

If you no longer have regular periods, you may need to take hormones for several weeks before the RE will transfer embryos into your uterus to help you achieve pregnancy. This will help to prepare the lining of your uterus for implantation. You may also need to continue taking the hormones for several months afterward to support the pregnancy.

If you froze eggs, these will be thawed and fertilized with sperm to create the embryos; if you froze embryos, these will be thawed. You will decide with your RE how many embryos to transfer.

The embryos will be drawn up into a very thin, soft catheter that is passed through your vagina and cervix into your uterus. The embryos are released and the catheter is taken out. The procedure is done in an exam room. It does not hurt, so you will not need anesthesia.

You will return about two weeks later for a pregnancy test. If you have a positive result, you will have an ultrasound several weeks later to confirm the pregnancy. You will then start seeing an obstetrician (a doctor who specializes in pregnancy and childbirth) for your care during pregnancy.

Family-building options after cancer treatment

All women with cancer may not have the desire and/or option to freeze eggs or embryos before beginning cancer treatment. However, if you are not able to become pregnant naturally or after discussion with your RE after your cancer treatment, there are still options available for building a family. These options include using donor eggs, surrogacy and adoption. Your RE will also assist in the process of identifying the most appropriate option for you.

Emotional Considerations

If you are not able to get pregnant naturally, the process of building your family after cancer treatment can be complex, lengthy and high-priced. With the myriad of feelings surrounding infertility, good coping skills are essential. It is common to experience feelings of anger, lack of control, jealousy or grief. If these emotions become overwhelming, last longer than a few days or prevent you from moving forward, consider seeking support through friends, professional counseling or groups.

The Cancer Patient Support Center at Miami Cancer Institute offers a variety of services for cancer patients facing these difficult situations, including professional counseling services. You can also find counselors who specialize in dealing with infertility through the following organizations:

- Path2Parenthood: Visit Path2Parenthood.org. Select “Find a Professional.”
- American Society of Reproductive Medicine, Reproductive Facts: Visit ReproductiveFacts.org. Look under “Resources” and select “Find a Healthcare Professional.”
- RESOLVE: The National Infertility Association: Visit Resolve.org. Search under “Resources” and select “Professional Services Directory.”

Common Questions About Fertility and Family Building From Female Cancer Patients

What is the Cost of Fertility Preservation?

Freezing eggs and embryos is expensive and is not covered by most health insurance plans.

Fertility Preservation Options	Egg Freezing	Embryo Freezing	Ovarian Tissue Freezing
Cost	\$10,000-\$17,000	\$15,000-\$18,000	\$10,000-\$13,000
Cost of Storage/Year	\$500-\$900	\$500-\$900	\$500-\$900

Note: These costs are estimates and may vary from one fertility center to the next.

A number of centers provide discounts to cancer patients and survivors. There are additional costs when you are ready to thaw and use the eggs or embryos to attempt pregnancy. Once you are referred to the Reproductive Endocrinologist, you will be counseled about various financial assistance opportunities that you may qualify for as a cancer patient perusing fertility preservation measures.

What is the chance I will be able to have a baby using frozen embryos or eggs?

The chance that you will be able to have a baby using one of these procedures (the success rates) varies based on a number of factors, including:

- Your age at the time of egg retrieval. Women who are under 35 years of age have higher success rates.
- The health of your partner's sperm.
- The experience of the fertility team with whom you are working.

It is important to understand that every egg collected may not produce a live baby.

The Society for Assisted Reproductive Technologies (SART) reports the success rates for patients who used thawed embryos. You can go to SART.org to see success rates for specific fertility centers. However, to understand your personal chance of success, speak with your reproductive endocrinologist.

Additional Resources

A number of resources are available to help you make decisions about fertility preservation. First, speak with your oncologist to make sure that it is safe for you to pursue fertility preservation. If you would like more information about the options available, or support as you consider the issues, ask your oncologist to refer you to the fertility preservation program at Miami Cancer Institute.

Cancer and Fertility

- Cancer.net (American Society of Clinical Oncology + Conquer Cancer Foundation)
- Cancer.org (American Cancer Society)
- Cancer.gov (National Cancer Institute)
- LIVESTRONG.com/Fertility
- MyOncofertility.org (Oncofertility Consortium of Northwestern University)
- SaveMyFertility.org

General information about fertility and fertility treatment

- ASRM.org (American Society of Reproductive Medicine)
- ReproductiveFacts.org
- INCIID.org (International Council on Infertility Information Dissemination)
- Resolve.org (National Infertility Association)

If you would like more information about the Fertility Preservation Program or want to speak to a fertility preservation advance practice provider, please call 786-527-8825 or visit MiamiCancerInstitute.com.



Miami Cancer Institute

BAPTIST HEALTH SOUTH FLORIDA

MiamiCancerInstitute.com

