From Egg to Embryo

Your Guide to IVF

A Patient Handbook
New Hope Fertility Center 8th Anniversary Edition

“We make a living by what we get, but we make life by what we give.”

-Winston Churchill
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Our Patient Promise

When it comes to your fertility care, we know that you can choose between many excellent institutions. We are truly honored that you have entrusted New Hope Fertility Center with this decision and we consider it our duty to provide you with the absolute best patient care possible.

Our practice revolves around our patients. Experienced doctors, friendly staff, calming spaces, and customized protocols all come together to make sure your experiences at our center can be as comforting and successful as possible.

As you begin your treatment, we encourage you to keep a journal of your thoughts and note questions to ask during your appointments. We are here to provide support through every step of your treatment.

We have prepared this handbook to serve as a helpful companion to your journey. We invite you to review the materials and contact us with any questions.

At New Hope Fertility Center we promise our patients respect. We have brought a global, gentle and individualized approach to the treatment of infertility. Like the Chinese symbol below, we commit to listen to our patients with our ears, our eyes, our undivided attention, and our hearts.

Warmly,

Dr. John Zhang, MD, MSc, PhD, HCLD
Founder & Director
New Hope Fertility Center
Meet our Doctors

John J. Zhang, MD, MSC, PhD, HCLD

“The first thing that we do is talk to our patients to understand their unique needs. Then we create a customized fertility care plan. This system has allowed New Hope to have many successes, including breaking the age barrier for women who previously had trouble conceiving.”

A true pioneer in the area of human reproduction with minimally invasive (Natural Cycle and Mini-IVF™) fertility care, Dr. John Zhang founded New Hope Fertility Center in 2004.

Since its opening, Dr. Zhang has been behind several notable achievements in the area of assisted reproductive technology (ART), including the birth of a child by a 49-year-old using her own eggs and helping to restore a young woman’s fertility through an ovarian tissue transplant surgery in February of 2012.

Dr. Zhang completed his medical degree at the Zhejiang University School of Medicine, and subsequently received his Master’s Degree at Birmingham University in the UK. In 1991, Dr. Zhang earned his Ph.D. in In-Vitro Fertilization (IVF), and, after studying and researching the biology of mammalian reproduction and human embryology for nearly 15 years.

Dr. Zhang continues his research in non-embryonic stem cell research, a promising field for human reproduction, as well as long-term cryopreservation of oocytes (human egg cells), and oocyte reconstruction via nuclear transfer.
Lyndon Chang, MD, FACOG

“I recently helped a woman who failed multiple treatments elsewhere get pregnant using her own eggs. Our ‘less-is-more’ approach often reveals that previous over-treatment was the problem in the first place.”

Dr. Chang is the Senior Medical Associate at New Hope Fertility Center. He graduated Phi Beta Kappa from Pennsylvania State University and received his Medical Degree from Thomas Jefferson Medical College at the age of 23. He received his training in Obstetrics & Gynecology at Lenox Hill Hospital on the Upper East Side of Manhattan where he received the Kupperman award for resident excellence. He stayed on staff at Lenox Hill Hospital to help supervise the residency program and was awarded Resident Teacher of the Year. He later founded ELJ Obstetrics & Gynecology, a major Obstetrical group at Lenox Hill Hospital, before joining New Hope in 2006.

During his tenure, Dr. Chang has been an integral part of numerous landmark achievements, including: oldest patient to successfully conceive using her own eggs, patient with highest FSH to conceive using her own eggs, and the first successful IVF pregnancy with a patient after an ovarian transplantation. He also co-developed the Luteal Phase Stimulation protocol, which allows women a second chance to retrieve in a single cycle. He specializes in helping woman of advanced maternal age (40+), women with high FSH, Conventional IVF non-responders, and women who struggle with recurrent IVF failures.
Dr. Yang is board certified in Obstetrics and Gynecology, specializing in minimally invasive procedures with a strong interest in treating patients with PCOS, diminished ovarian reserve, and uterine lining issues with Mini-IVF™ and Natural IVF. Since joining New Hope Fertility Center in 2008, he has actively participated in groundbreaking research projects as well as daily clinical procedures. He has been selected as a Top Obstetrician & Gynecologist in the United States since 2009.

Dr. Yang received his MD with high honors from Henan Medical College in 1983, and his Masters and Ph.D. in Toxicology from Tongji Medical University in China in 1986 and 1989. While working in Beijing, Dr. Yang was appointed as Associate Director of the Molecular Biology Laboratory at the Institute of Occupational Medicine with the Chinese Academy of Preventive Medicine. He was subsequently appointed as Assistant Professor in the Department of OB/GYN at New York University’s School of Medicine in 1998. He has published more than 30 papers in internationally recognized journals.

Dr. Yang completed his internship and residency training in Obstetrics & Gynecology at NYU’s School of Medicine and the New York Downtown Hospital. Upon graduating, he was appointed as teaching attending in the Department of OB/GYN at New York Downtown Hospital affiliated with New York-Presbyterian Healthcare System and Weill Cornell Medical College. He received the National Faculty Award for Excellence in Resident Education in 2006 by the Council on Resident Education in Obstetrics and Gynecology. In 2005, he also received an award for Special Excellence in Endoscopic Procedures by the American Association of Gynecologic Laparoscopists.

Mingxue Yang, MD, PhD.

“In my last four years with New Hope, I’ve done more than 2000 procedures involving embryo transfers. With a background in internal medicine, I’ve instilled this experience into our treatments, which compliment the mind, body, and health history of each patient.”
Dr. Janelle Luk is a skilled and experienced specialist in reproductive endocrinology focusing in patients with endometriosis, PCOS, tubal factor, unexplained infertility and diminished ovarian reserve. She serves as a co-director of the Diminished Ovarian Reserve Program at New Hope Fertility Center. Dr. Luk employs a combination of conventional stimulation methods and the natural cycle stimulation protocol to synthesize the most optimal stimulation method for each individual patient. Fluent in English and Cantonese with proficiency in medical Mandarin, she brings compassion, energy, experience and a wealth of research and clinical expertise to benefit each patient she treats.

Dr. Luk received her bachelor’s degree in biology and social science with high honors from Cornell University. She then went on to the Yale University School of Medicine to earn her medical degree and graduated with Cum Laude Honors and was awarded the Ferris Award for Outstanding Research thesis on endometriosis. Dr. Luk completed her residency in obstetrics and gynecology at Harvard Medical School and affiliated training programs at the Brigham and Women’s Hospital, Massachusetts General Hospital and Children’s Hospital, Boston. Following residency training, Dr. Luk then completed a three-year Clinical Fellowship in Reproductive Endocrinology and Infertility at Yale University School of Medicine. She is the recipient of numerous honors, including the Harvard Medical School student teaching award and Beatrice Pitcher/Jessie Garrett Scholarship.

Dr. Luk has a strong scientific background both in the laboratory and clinic. She has given many presentations at meetings of the American Society for Reproductive Medicine, American College of Obstetrics and Gynecology, Society for Gynecologic Investigation, among others. Dr Janelle Luk serves as a reviewer for a number of scientific journals (i.e. Current Opinions in Obstetrics and Gynecology and Journal of Clinical Endocrinology and Metabolism) and has published manuscripts, chapters, and review articles on a wide range of topics including ovarian physiology, obesity, preconceptual diet, and infertility. Dr. Luk is a author of “Luteal Phase Progesterone Support in ART/IVF” on Medscape which is a web resource for physicians and other health professionals.
Dr. Sherman Silber is a renowned pioneer in male infertility, reproductive microsurgeries and ovarian tissue transfer. He is one of the world’s leading authorities on IVF, sperm retrieval, ICSI (Intracytoplasmic Sperm Injection), vasectomy reversal, and tubal ligation reversal. He has contributed major scientific breakthroughs to our understanding and successful treatment of male and female sterility.

Dr. Silber has several “world-firsts” to his credit including the world’s first microsurgical vasectomy reversal, testicle transplant and ovary transplant. Along with his colleagues in Brussels, he developed the TESE-ICSI technique for retrieving a few sperms from hopelessly sterile men and achieving normal pregnancies with them. Dr. Zhang and Dr. Silber have worked to treat the most difficult IVF cases from all over the world.

Dr. Silber is the author of three medical textbooks, four consumer books (including the best-selling How to Get Pregnant series), and more than 200 scientific papers on human infertility and reproduction. He appeared on Donahue, Good Morning America, The Today Show, The Oprah Show, ABC Nightly News with Peter Jennings, Nightline with Ted Koppel, and talk shows with Gary Collins. He has been a consultant for The Joan Rivers Show and ABC News, and a regular contributor to KMOX, WOR and NPR radio. Dr. Silber was one of four physicians picked to be on the U.S. Congress Office of Technology Assessment study to help infertile couples in the United States.

Dr. Silber attended medical school at the University of Michigan and went on to pursue post-graduate training first at Stanford University, and then at the University of Michigan. From 1967 to 1969, he provided medical care via the U.S. Public Health Service to Eskimos, Indians, and Aleuts. Later he taught at the University of Melbourne Medical School in Australia and at the University of California Medical School in San Francisco. He is the director of the St. Louis Fertility Center and a consultant in male infertility at New Hope Fertility Center in New York City. In addition, he is an active member of the Belgian IVF team that pioneered the ICSI procedure and a professor and scientific collaborator at MIT in Cambridge, Massachusetts.
After receiving his medical degree with honors (Academic Excellence), in 1999 from Universidad de Guadalajara, Dr. Chavez-Badiola successfully pursued and completed his training in Obstetrics and Gynecology in Guadalajara, Mexico, becoming Chief Resident in Obstetrics and later on, Chief resident in Gynecology.

In 2005, Dr. Chavez-Badiola was granted the “Highly Skilled Specialist Sponsorship” by the British Council, allowing him to become a Fellow in Reproductive Medicine at The Hewitt Centre for Reproductive Medicine in Liverpool, the largest IVF Center in the UK, earning a full registration by the General Medical Council in the United Kingdom.

After his return to Mexico in 2007, Dr. Chavez-Badiola was appointed as Professor to the Human Reproduction Department at Universidad de Guadalajara, the largest University in Western Mexico. In that same year, he was appointed as Research Coordinator to the Clinical Sciences Division for the Health Sciences University Center at the same University.

Inspired by Dr. Zhang’s philosophy and impressed with the results achieved with Mini-IVF™, Dr. Chavez-Badiola decided to take the opportunity to learn the Mini-IVF™ protocol from Dr. Zhang. He committed himself to performing Natural Cycle IVF and Mini-IVF™ for patients at New Hope Mexico and has achieved great results. He has been part of the New Hope family since 2009.
June Cheang, M.D.

“Understanding the unique needs of our patients’ is the motto of our clinic. My team and I will provide the most effective treatment options to our patients and will help infertile couples to achieve their dreams – to have a child.”

Dr. June Cheang is a specialist in the field of Obstetrics, Gynecology and Infertility who specializes in diagnosing as well as giving treatment to infertile couples. She has expertise in treating reproductive disorders including polycystic ovarian syndrome (PCOS), endometriosis, ovarian dysfunction, and tubal factor, using assisted reproductive technology (ART) to help infertile couples.

She received her Medical Degree with high honors from Jinan University of Guangzhou in 2004. After graduating, she completed her residency in the Obstetrics and Gynecology Department of Kiang Wu Hospital and has been an attending physician since 2007. As an enterprising doctor, she has focused on strengthening her knowledge in laparoscopy, and hysteroscopy at the Chinese University of Hong Kong and Chung Shan Medical University of Taiwan in 2005 and 2007, respectively.

Dr. Cheang had participated in cutting edge research in assisted reproduction and was published in the journal *Fertility & Sterility* in 2007. She presented her findings in a meeting held by the International Federation of Gynecology and Obstetrics (FIGO). Additionally, she completed extensive professional assisted reproductive training at New Hope Fertility Center in New York City. Dr. Cheang’s enthusiasm in fertility studies led to the establishment of the first fertility center in Macao, helping infertile couples from China, Hong Kong, Russia and nearby countries. Her professional knowledge in infertility studies has achieved numerous successful pregnancies in Macao. The center’s first “in vitro fertilized baby” was born naturally on March 28, 2012.
This chapter provides an introduction to reproductive health of the female and male anatomy. It also reviews many of the common causes of infertility. As you begin your treatment, this chapter will be a useful reference in understanding your body and your treatment protocol.
1.1 The Female Reproductive System

The female reproductive system is a complex system of several organs that produces egg cells and nourishes and protects the developing embryo. Using Figure 1.1a as a guide, familiarize yourself with the main parts of the female reproductive system.

- The vagina is a musculomembranous canal that is the female sexual organ. It extends from the cervix of the uterus to the exterior of the body. The cervix is the narrow opening of the uterus.

- The uterus is a muscular, hollow pear-shaped organ in the lower pelvis. It is home to the embryo as it develops into a fetus during pregnancy. Upon fertilization, the egg develops into an embryo. It attaches to and is nourished by the lining of the uterus, the endometrium. The endometrium is composed of mucous membrane influenced by estrogen and progesterone hormones. It becomes thick each month in order to support a pregnancy. If pregnancy does not occur, the thickened lining is shed during a process called menstruation.

- The fallopian tubes are 3-4 inch tubes extending from the upper sides of the uterus to just above the ovaries. The tubes form a passageway between the uterus and the ovaries. Here, the egg and sperm meet and fertilization can occur. Extending from each tube, just above the ovary, are fingerlike projections called the fimbriae, which catch the egg released by the ovary so that it can be drawn up into the tube.
• The ovaries are home to a woman’s lifetime reserve of eggs. By the time a female begins her menstrual cycle; her egg reserve has decreased from several million at birth to about 400,000. As a woman ages, her egg reserve continues to diminish until menopause, when her reserve is depleted. During each cycle, several eggs mature in the ovaries in fluid-filled sacs called follicles. Each month, one “dominant follicle” develops and then ruptures, releasing a single egg, which is drawn into a fallopian tube for possible fertilization (see Figure 1.1b).

**Figure 1.1b Fertilization Process**

### 1.2 The Menstrual Cycle

The menstrual cycle is the monthly pattern of preparing for a possible pregnancy. The average menstrual cycle is 28 days, though some women may experience shorter or longer cycles. During a menstrual cycle one of the ovaries releases an egg and the uterus grows a new endometrium. If the egg is not fertilized by sperm, the endometrium sheds from the uterus in form of a menstrual period through the cervix and vagina. The menstrual cycle is controlled by the hypothalamus, the pituitary, the ovary and the uterus.

Many systems communicate by hormones – substances that carry the information from one cell to another. The hormonal system is chiefly regulated by the pituitary gland, the brain and the ovaries.
Follicular Phase
During the follicular phase, the pituitary gland releases follicle stimulating hormone (FSH) which stimulates the growth and development of follicles in the ovaries. As the follicles mature, estrogen levels start to rise sending feedback information to the brain that signals the pituitary gland to inhibit FSH production and begin the production of luteinizing hormone (LH). In addition to reducing FSH production, estrogen also causes the endometrium to thicken and later be ready of embryo implantation. The spike of LH triggers ovulation, which occurs mid-cycle. This feedback loop is shown below in Figure 1.2a.

Luteal Phase
As LH and FSH spike, the “dominant follicle” ruptures and releases a single, mature egg known as an oocyte. The egg leaves behind the ruptured follicle that shortly thereafter gets filled with blood and forms another functional structure called corpus luteum. The corpus luteum secretes progesterone, which encourages the transformation of the endometrium in preparation for implantation. Meanwhile, the egg travels in one of the fallopian tubes toward the uterus. While in the fallopian tube, the egg may be fertilized by sperm, if sexual intercourse occurred and an adequate amount of sperm is available in the vagina. Once the egg is fertilized, it will continue moving toward the uterus in the form of an embryo and eventually may attach to the endometrium.

The corpus luteum lasts only 12-14 days, unless it begins to receive human chorionic gonadotropin (hCG) from the implanted embryo, in which case it
remains active for 10 weeks. If pregnancy does not occur, the corpus luteum breaks down, progesterone levels decrease, and menstruation occurs; the endometrium, which is no longer needed, is expelled through the cervix and vagina. The corpus luteum is replaced by a scar called the corpus albicans. Use the following figures to guide you through the phases of the menstrual cycle.

**Figure 1.2c and 1.2d The Menstrual Cycle**
1.3 Fertilization and Pregnancy

Pregnancy can occur only if the egg encounters sperm within 24 hours of ovulation. After ejaculation, sperm swim from the vagina up through the cervix into the uterus. From the uterus, they make their ascent into both of the fallopian tubes, propelled by their tails and by the contractions of the uterine walls. If ovulation has not occurred when they arrive at the fallopian tubes they can survive up to three days, waiting to fertilize an egg.

When egg and sperm connect, many sperm attempt to burrow through the outer membrane of the egg, called the zona pellucida (see Figure 1.3a). If a single sperm is successful in breaking through the zona, fertilization occurs. The egg becomes impenetrable to other sperm and the single sperm that has entered fuses with the egg, transferring its genetic material.

The fertilized egg goes through cell division over the course of the next four days and the fertilized egg, now known as an embryo, travels to the uterus. On day five, the embryo rearranges itself into a hollow ball of cells called a blastocyst. Pregnancy may occur once the blastocyst or embryo has attached to the endometrium. Embryo implantation is shown in figure 1.3b on the next page.
Figure 1.3b Embryo implantation.
1.4 Common Causes of Female Infertility

Below you will find a list of the most common causes of female infertility. In general, these include gynecological factors, hormonal dysregulation, sexually transmitted diseases, diet and lifestyle.

- **Age:** Fertility is greatly influenced by age. After the age of 35, fertility decreases rapidly, and by age 45, the monthly chance of becoming pregnant naturally is approximately 5%.

- **Early menopause:** The absence of menstruation and the early depletion of ovarian follicles before age 35 can result in infertility. Although the cause is often unknown, immune system diseases, radiation, chemotherapy and smoking are often associated with this condition.

- **Elevated prolactin:** Prolactin is the hormone that, when elevated, stimulates breast milk production. In women who are not pregnant or nursing elevated prolactin can negatively affect ovulation. High levels may result from a pituitary tumor or as a side effect of various drugs.

- **Emotional stress:** Prolonged emotional stress may interfere with the normal production of the FSH and LH hormones required for reproduction, decreasing the body's ability to produce a follicle and ovulate naturally.

- **Endometriosis:** Endometriosis is the growth of endometrial tissue outside of the uterus. This tissue responds to the hormonal cycle and grows, sheds and bleeds in sync with the lining of the uterus each month. Endometriosis can lead to inflammation, pelvic pain and infertility.

- **Ovulation disorders:** Hypothalamic-pituitary disorders can result in low levels of LH and FSH, disrupting normal ovulation.

- **Polycystic Ovary Syndrome (PCOS):** An ovulation disorder caused by many ovarian cysts. In most patients this syndrome goes along with absent or irregular menstrual periods and is also associated with endocrine anomalies like changes in sugar and fat metabolism. In addition, patients with PCOS can have excessive reaction to gonadotropins. Once normal menses are resumed, the patients should have excellent chances to get pregnant.

- **Smoking:** The chemical components of cigarettes have been isolated in the fluid surrounding developing oocytes (eggs) to show that smoking can cause DNA damage during oocyte cell division.
• Pelvic adhesions: Pelvic adhesions form bands of scar tissue that bind organs after pelvic infections, such as Gonorrhea or Chlamydia. They may form as a result of appendicitis, abdominal or pelvic surgery, and may impact fertility.

• Thyroid disorders: Hyperthyroidism and hypothyroidism can disrupt the menstrual cycle and cause infertility.

• Tubal factors: Obstruction caused by benign uterine fibroids or scarring in the fallopian tubes can affect fertility both by making it more difficult for an egg to travel down the fallopian tubes, and by preventing the sperm from reaching the oocyte, preventing fertilization. If the sperm and the oocyte do meet, the fertilized egg may not be able to travel to the uterus, increasing the risk for an ectopic pregnancy. Tubal infection may also have long term effects on fertility since the risk of ectopic pregnancy increases with each occurrence of tubal infection.

• Weight management: Being over or underweight can disrupt the menstrual cycle, which can interfere with ovulation and hormone regulation. Women who have difficulty with weight management may have reduced pituitary hormones such as FSH and LH that hinder ovulation.

• Other medical conditions: Fertility may be impaired as a result of autoimmune disorders, sexually transmitted diseases, cancer treatments, diabetes, anemia and the irregular shape of reproductive organs such as the uterus.
1.5 The Male Reproductive System

The male reproductive system differs from the female reproductive system in many ways. Unlike women, men produce their sex cells, called sperm, throughout sexual maturity. Additionally, male reproductive organs are both internal and external. Use Figure 1.5 to familiarize yourself with the main parts of the male reproductive system.

**Figure 1.5 Male Reproductive System:** The male reproductive system is composed of both external and internal organs.

- The penis and the testes are both external parts of the male reproductive system. The testes make sperm and secrete the hormone testosterone.
- Sperm are stored and mature in the epididymis, the tissue layer surrounding the testes. The production and maturation of sperm takes approximately 72 hours and sperm remain viable within the epididymis for several months.
- From the epididymis, sperm travel via the vas deferens to a walnut-sized gland called the prostate. The prostate surrounds the urethra and produces prostatic fluid that is added to semen.
- Located above the prostate gland are seminal vesicles, which produce seminal fluid and join the vas deferens at the ejaculatory duct.
1.6 Common Causes of Male Infertility

A number of factors can contribute to male infertility. These include conditions affecting sperm function, production and delivery, hormonal dysregulation, sexually transmitted diseases, and general health and lifestyle factors.

- **Age**: Though not as marked in men as it is with women, a gradual decline in fertility is common after age 40 in men.

- **Impaired shape and motility**: Abnormal spermatogenesis, or sperm production, may result in sperm that are not able to reach the egg or to penetrate it.

- **Low sperm concentration**: Normal sperm concentration in men is greater than or equal to 20 million sperm per milliliter of semen. Sperm count \( \leq 50\% \) of this number indicates low sperm concentration.

- **Varicocele**: Varicose veins in the scrotum, called varicocele, may prevent normal cooling of the testicles and lead to reduced sperm count and motility.

- **Undescended testicle**: This congenital condition occurs when one or both testicles fail to descend from the abdomen into the scrotum during fetal development. Because undescended testicles are exposed to higher internal body temperatures compared to the temperature in the scrotum, sperm production may be decreased.

- **Testosterone deficiency (male hypogonadism)**: Disorders of the testicles, or conditions affecting the hypothalamus or pituitary gland in the brain, may result in low testosterone levels that impair fertility.

- **Testicular overheating**: Frequent use of saunas or hot tubs can impair sperm production and lower sperm count by raising the core body temperature.

- **Genetic defects**: Some sperm abnormalities may be the result of genetic predispositions.

- **Sexually transmitted diseases**: Repeated bouts of sexually transmitted diseases, such as chlamydia and gonorrhea, can affect sperm motility.

- **Organic issues**: Erectile dysfunction, premature ejaculation, painful intercourse and psychological problems can all contribute to infertility.

- **Retrograde ejaculation**: This occurs when ejaculate does not leave the body during orgasm but, instead, enters the bladder.
• Blockage of the reproductive system or anatomical irregularities: Blockage of the ejaculatory ducts or various passages through which sperm and ejaculate flow can affect fertility. Men with cystic fibrosis sometimes have a missing or blocked vas deferens, and the lack or misplacement of any part of the reproductive system will often require reconstructive surgery.

• No semen (ejaculate): Men with spinal cord injuries or diseases may not have the ability to produce the fluid required to carry the sperm from the penis into the vagina.

• Pesticides and other chemicals: Herbicides and insecticides have been associated with reduced sperm production and testicular cancer. Lead exposure may also cause infertility.

• Malnutrition and weight management: Deficiencies in nutrients such as vitamin C, selenium, zinc and folate may contribute to infertility. Additionally, a high body mass index is associated with impaired fertility in men.

• Smoking, alcohol and substance abuse: Use of any of these substances may temporarily reduce the number and quality of sperm.

• Cancer treatments: Cancer treatments such as radiation, chemotherapy, and in the case of testicular cancer, the removal of the testicles, can affect fertility.

• Other medical conditions: Fertility may be impaired as a result of various health conditions such as autoimmune disorders, diabetes, thyroid disease, Cushing’s syndrome and anemia.

![Figure 1.6 Structure of Sperm](image-url)
In the previous chapter, we reviewed the male and female anatomy and common causes of infertility. Currently, an array of advanced procedures and diagnostic tools are available to help correct even the most difficult infertility cases, preserve embryos for future transfer and determine the genetic health of embryos. The following sections will help you become familiar with many of these infertility treatments and procedures.
2.1 Timed Intercourse

Over the course of your menstrual cycle, your core body temperature fluctuates slightly. During the follicular phase of your cycle, your core body temperature is lower than during the luteal phase of your cycle, and a sustained shift in temperature (0.4 to 0.6 degrees Fahrenheit) indicates that ovulation has occurred. Planning intercourse to synchronize with this sustained shift in body temperature, when you are most fertile, is called timed intercourse. This can be accomplished by charting your basal body temperature (BBT) which is taken at the same time each morning before getting out of bed.

Your expected ovulation may also be monitored in 2-4 office visits. During these office visits you will have sonograms and blood tests to measure hormone levels. When ovulation is expected, you will be instructed on the ideal days to engage in sexual intercourse.

2.2 Intrauterine Insemination (IUI)

Intrauterine insemination (IUI), also known as artificial insemination, involves using a catheter to place a number of washed sperm directly into the uterus. This method increases the number of sperm that reach the fallopian tubes and therefore the chances of fertilization. IUI is often selected by couples who have been trying to conceive for at least one year but who have no known reasons for their infertility. It may also be selected for conditions such as low sperm count, decreased sperm motility, requirement of donor sperm, a poor cervical environment, or sexual dysfunction.

Although IUI still requires the sperm to reach and fertilize the egg on its own, it is important to make sure that the sperm is healthy and motile. IUI provides the sperm an advantage by giving it a head start, but it still has to seek out the egg on its own. For patients with tubal blockages or damage, ovarian failure, menopause and severe male factor infertility, IUI would not be suitable.

For an IUI, we often, though not always, stimulate ovulation with medication to encourage multiple egg development, and then time insemination to coincide with ovulation. Semen is collected for insemination after 2-3 days of ejaculatory abstinence and then “washed” in the laboratory (separating sperm from the naturally accompanying seminal plasma). Washed sperm is then placed into a very thin sterile flexible catheter, which is inserted through the woman’s cervix and then injected into the uterine cavity (see Figure 2.2).
2.3 In-vitro Fertilization (IVF)

IVF is an assisted reproduction technique in which an egg is fertilized outside of a woman’s body. Many IVF treatments involve administering fertility medications to a woman to mature more than one egg in each cycle. Immediately before ovulation, a doctor retrieves the eggs and unites them in the laboratory with sperm either from the patient’s partner or from a donor. The resulting embryo is then transferred to the woman’s uterus for implantation. If successful, pregnancy is confirmed with a blood test 1-2 weeks later. Below is a brief overview of common IVF protocols and their distinguishing features.

Natural Cycle IVF
Natural Cycle IVF is a drug and chemical-free protocol. It avoids fertility drugs that would otherwise stimulate your ovaries to produce multiple eggs. The underlying principal of this procedure is to capture the single egg your body naturally produces each month during your menstrual cycle.

Minimal Stimulation IVF (Mini-IVF™)
Mini-IVF™ stimulates the ovaries with minimal medications (oral tablets with 3-6 injections), to try to obtain “quality” eggs. It also uses a nasal spray trigger (Synarel) for ovulation induction instead of hCG (human chorionic gonadotropin) resulting in fewer side effects when compared to conventional IVF.
For an egg retrieval during a Mini-IVF™ cycle, we use a uniquely thin, flexible needle to retrieve the eggs resulting in briefer, less painful egg retrievals.

**Hyper-Stimulation (Conventional) IVF**

Conventional IVF protocols are designed to produce a high quantity of eggs by treating patients with multiple high doses of daily injections.

**Donor Egg IVF & Donor Sperm IVF**

If your egg or your partner’s sperm is not viable for pregnancy, donor eggs and sperm offer an alternative route to pregnancy. Donor Egg IVF cycles generally use conventional IVF treatments to maximize the number of eggs that the donor can provide each cycle. Those eggs can then be fertilized with either a partner’s sperm or donor sperm.

**Surrogate IVF (Using a Gestational Carrier)**

When you do not have a functioning uterus or have difficulty sustaining a pregnancy to term, you may opt to use a surrogate or gestational carrier to carry your child to term. Gestational carriers undergo an embryo transfer procedure using your egg (or donor eggs) fertilized by your partner’s sperm (or a sperm donor). Since the embryos are created through IVF, your gestational carrier does not have any genetic link to your child.

### 2.4 Embryology Techniques

**Vitrification (cryopreservation) and embryo banking:**

Vitrification is an innovative flash-freezing technique for oocytes, embryos and ovarian tissue. Unlike conventional, slow-dunk freezing methods, vitrification has a 99% survival rate and allows you to store surplus embryos for later use.

**Genetic testing**

Numerous diseases and disorders classified as chromosomal disorders, single gene defects, and sex-linked disorders can be tested for through a technique called pre-implantation genetic diagnosis (PGD).

PGD involves the removal and biopsy of cell(s) from the embryo. A day 3 embryo consists of just six to eight cells. At that stage, a single cell is removed. Biopsies taken at the day 5 stage, when the embryo has about 100 cells, are more indicative. At the day 5 stage, your doctor can remove three or four cells from the trophectoderm, the part of the blastocyst that will become the placenta.
PGD is performed for all single gene defects where the specific mutation is identifiable. Analysis of the cells occurs by fluorescent in situ hybridization (FISH), a diagnostic method used to show the number and arrangement of chromosomes. PGD is an early screening technique and it does not entirely rule out the chance of a defect being present. For this reason, PGD should be followed up with first-trimester screenings.

Additionally, our center uses a technique called Array-Comparative Genomic Hybridization (aCGH) to screen all 24 chromosomes to look for aneuploidy, including gender in embryos. This technique is especially useful in women with a history of recurrent pregnancy loss to rule out chromosomal abnormalities before the embryo transfer.

**Intracytoplasmic Sperm Extraction (ICSI):**

Intracytoplasmic sperm injection is a micromanipulation technique used in cases of male factor infertility where normal sperm quantity and motility is impaired. With ICSI, a single sperm is selected on the basis of its shape and size and then injected into the cytoplasm of a mature egg to achieve fertilization (see Figure 2.4 on the next page).

![Figure 2.4 Sperm is injected into cytoplasm of mature egg using ICSI.](image)

### 2.5 Female Surgeries and Procedures

As discussed in the previous chapter, infertility can result from a number of mechanical and structural problems with the reproductive system that surgery may be able to correct. Some common procedures are detailed in the following pages.
Reproductive Health Overview

Hysterosalpingogram (HSG)
This diagnostic radiology procedure is used to examine the inside of the uterus, the fallopian tubes, and their surrounding environment. A dye is inserted in a thin tube through vagina and into the uterus. Images are taken using a fluoroscope as the dye passes through the uterus and fallopian tubes. The resulting images are used to find any injuries, blockages or anatomical abnormalities.

Hysteroscopy
A hysteroscopy is a procedure used to look at the inside of the uterus. A camera is inserted through the vagina into the neck of the uterus and attached to a light source and a hysteroscope for visualization. This surgical technique allows doctors to view the internal structures of the uterus without the need for an abdominal incision.

Myomectomy
A myomectomy is done to remove uterine fibroids and improve the health of the uterus. This procedure can be done abdominally or hysteroscopically.

Ovarian Tissue Transfer
If you are unable to produce viable eggs, ovarian tissue transfer is one donor option you might consider. Tissue transfer involves removing ovarian tissue from one woman, microsurgically dissecting the tissue, and subsequently transplanting it into another woman. It can be a preferable alternative to egg dona-
tion because ovarian tissue has potentially thousands of eggs, and the tissue continues to function as a normal healthy ovary in your body long after the transfer.

2.6 Male Surgeries and Procedures

Microsurgical sperm aspiration procedures (MESA and TESE) are used to retrieve sperm directly from different areas of the testicle. Both procedures are performed under local anesthesia. The sperm can then be used in conjunction with IVF and Intracytoplasmic Sperm Injection (ICSI).

**Microsurgical Epididymal Sperm Aspiration (MESA):**
MESA is used when infertility is caused by blockage. Using an operating microscope, reproductive specialists isolate the epididymis and then retrieve fluid from an epididymal tubule. The fluid obtained is then processed in the laboratory to ensure that sperm is present. Afterwards, the tubules are closed microsurgically. The sperm can either be used immediately or frozen for later use.

**Testicular Sperm Extraction (TESE):**
TESE involves removing a small piece of testicular tissue through an incision in the testes. The tissue is then processed to extract sperm in the laboratory. As opposed to MESA, this process usually results in fewer specimens since they are more difficult to work with and do not freeze as well as. TESE is only used in severe cases where it is the only method to deal with poor sperm.
The reasons for infertility are varied and sometimes complex, but can often be addressed with the help of an expert team. This chapter provides a step-by-step overview of your Mini-IVF™ treatment starting with the initial consultation. You may find the question and answer section at the end of this chapter helpful, as it reviews common patient questions.
3.1 What to Expect

During the initial consultation, you will meet with your personal care team to discuss your medical history and family goals so that, together, you can design a treatment plan tailored to your needs.

Your comprehensive fertility evaluation begins with a blood test to determine your FSH, estradiol, LH and progesterone levels, as well as a sonogram to determine your antral follicle count (AFC), which help dictate medication and treatment. You will receive routine sonograms to confirm follicular quantity and sizes. Subsequent blood tests and sonograms will aid in timing of the ovulation and establish a baseline for your endometrial lining thickness. This baseline will help us understand the likelihood that an embryo will implant on the uterine wall. Sonogram and blood test results ultimately determine when you will begin your treatment cycle and which treatment you will benefit from the most.

Figure 3.1 Mini-IVF™ Procedural Overview
Mini-IVF™ stimulates your ovaries with minimal medications (4-6 oral stimulant, such as Clomid and/or an injectable combination of FSH and LH) to produce only the best quality eggs your body can mature in one cycle (approximately one to three eggs). The mild nasal spray, Synarel, is used for ovulation induction. Synarel has a short half-life in the body and does not have the side effect profile common to hCG. The major benefits of the Mini-IVF™ protocol are listed below.

- Reduced health risks and discomfort, often associated with daily drug injections and use of high-dose fertility drugs (see section 3.4).
- Minimal medication requirement and reduced cost of drugs.
- Patients can cycle continuously, eliminating the typical two to three month waiting period between cycles.
- Facilitates only the best quality follicles.

Step 1: Ovarian Stimulation and Cycle Monitoring

On or near day three of your menstrual cycle, you will begin a daily course of an oral stimulant, such as Clomid, as needed, until your follicles have developed sufficiently for ovulation. Some injectable medication may also be necessary depending on your hormonal requirements. Routine sonograms and blood tests will monitor follicular growth progression and ovulation.

Figure 3.2a Follicular Growth Progression: Once follicles have reached the desired size, ovulation will be triggered.
Step 2: Egg Retrieval

Prior to ovulation, once your follicles have reached the desired size and your hormone levels have risen, a trigger will be used to prompt final maturation. This typically happens about 36 hours before egg retrieval. On the day of retrieval, a thin, flexible ultrasound-guided needle will be directed to the ovaries through the vaginal canal for egg collection. Since Mini-IVF™ uses a small flexible needle and retrieves only a few eggs, retrievals are relatively quick and simple. While you have the option of local anesthesia or IV sedation, most patients choose local anesthesia with an anti-anxiety drug such as Valium.

After retrieval you may experience spotting and abdominal tenderness. This is normal and should subside shortly after the procedure. Although the entire retrieval process will last approximately three to ten minutes, please allow a few hours for recovery. If any of your eggs are not fully matured at the time of retrieval, they may be matured via in-vitro maturation (IVM).

Figure 3.2b Egg Retrieval: An ultrasound-guided needle will be directed to the ovaries through the vaginal canal.
Step 3: Sperm Collection

Immediately following egg retrieval, sperm is collected from your male partner through ejaculation in preparation for fertilization. If your partner is unavailable the day of your retrieval, he may produce sperm at an earlier time and have it frozen until needed. Sperm previously obtained from a TESE may be used at this time as well. If you wish to use a sperm donor, your personal care team can guide you in the process of obtaining donor sperm prior to egg retrieval.

Step 4: Fertilization and Assisted Hatching

In most cases, the sperm is added to your mature egg(s) and fertilized via intracytoplasmic sperm injection. Once fertilized, cell division occurs in the zygote and may be transferred on the second day after fertilization. If the plan is to transfer an embryo into the uterus five days after fertilization, it must “hatch,” or escape from the zona pellucida, before it can implant for pregnancy. Thus, all zygotes in our laboratory undergo laser-assisted hatching on the third day after fertilization to enhance implantation as an embryo.

Figure 3.2c Fertilization: Sperm and egg are fertilized.

Step 5: Culturing and Selection

Based on a patient’s clinical history, embryos may be cultured up to the blastocyst stage prior to transfer. The culturing process aids in selecting the best quality embryos for transfer, ensuring the viability of the embryo for undergoing implantation, gestation and live birth.
Step 6: Embryo Transfer (Fresh or Frozen)

Embryo transfer only takes a few minutes and requires no incision or medication. In preparation, it is important that you maintain a regular schedule and avoid stress and strenuous exercise.

The embryos are placed in a small amount of fluid and injected gently into the uterus through the cervix with a long, thin catheter. The transfer feels similar to a pap smear and requires no anesthesia, though you may experience minor cramping following the transfer. Post-transfer, embryo implantation generally takes two to five days.

Since New Hope promotes a single embryo transfer policy, you can choose to freeze surplus embryos using our vitrification freezing method. These embryos may be banked for use in a subsequent cycle.

![Embryo Transfer Diagram]

Figure 3.2d Embryo Transfer: Embryos are injected into the uterus.

Step 7: Confirmation

A pregnancy test is performed seven to twelve days following transfer to confirm whether the embryo has successfully implanted. An ultrasound, typically performed three weeks after a positive pregnancy blood test, will confirm pregnancy.
3.3 Considerations

While gentle protocols like Mini-IVF® offer significantly lower risks and fewer side effects when compared to conventional IVF, any prescribed medications may have side effects and can pose a risk to your health. To best manage these risks, it helps to be informed. Please carefully review the potential risks and medication side effects below and discuss any questions or concerns with your personal care team.

Potential Risks of Treatment

Ovarian Hyper Stimulation Syndrome (OHSS)

Ovarian Hyper Stimulation Syndrome (OHSS) is the most common risk associated with conventional IVF. During ovarian stimulation, the maturation of a large number of follicles within the ovary can cause the ovary to swell. As the follicles grow, the eggs inside are surrounded by fluid. When many eggs are retrieved, fluid can accumulate in the abdomen or the chest, requiring hospitalization. Vomiting, diarrhea and shortness of breath are some of the symptoms of severe OHSS, but discomfort and ovarian tenderness are also indicators. If you experience any of these symptoms, contact your doctor immediately. OHSS is very uncommon in minimal stimulation cycles, however it is still a slight risk.

Multiple Births

Multiple embryo transfers can result in a high-order pregnancy and have significant health risks to both the mother and the child. Additionally, the chances of premature delivery increase with high-order multiples. We advocate single embryo transfer to eliminate the risk of multiple births.

Potential Side Effects of Medication

If you experience any of the symptoms or side effects listed below, please contact your doctor immediately.

Birth Control Pills

Use: Birth control pills are used to regulate FSH and LH.

How it works: Birth control pills suppress the production of FSH and LH, which prevent the formation of a follicle and the subsequent release of an egg.

Side effects: Headaches, nausea, bloating, spotting and breast tenderness.
Clomid (clomiphene citrate)

**Use:** Clomid is used to stimulate the production of follicle stimulating hormone (FSH) and luteinizing hormone (LH), needed for ovulation induction and with continued use, premature ovulation suppression.

**How it works:** Clomid causes the body to think estrogen levels are low, which results in the release of FSH and LH. These hormones ultimately stimulate production of follicles and the release of mature eggs. With extended use, Clomid acts to block the production of LH, which helps prevent premature ovulation.

**Side effects:** Abdominal or pelvic discomfort, bloating, nausea, vomiting, breast tenderness, hot flashes, blurred vision, headache and irregular spotting.

Estrace (estradiol)

**Use:** Estrace is a form of estrogen that encourages uterine lining growth.

**How it works:** Estrace mimics the effects of estrogen. It increases secretions from the cervix and promotes endometrial lining growth.

**Side effects:** Nausea, vomiting, appetite loss, swollen breasts, acne or skin color changes, decreased sex drive or difficulty achieving orgasm, migraines, dizziness, chest pain, swelling of the ankles or feet, depression, changes in menstrual periods and irregular spotting.

Femara (letrozole)

**Use:** Femara is used to stimulate follicles and induce ovulation.

**How it works:** Femara inhibits the production of estrogen, inducing the release of FSH and LH.

**Side effects:** Hot flashes, headaches, loss of appetite, weight gain, general body discomfort, weakness, fatigue, nausea and diarrhea.

Antagon/Cetrotide (ganirelix acetate/cetrorelix)

**Use:** Ganirelix and Centrotide are forms of a protein used to reduce the amounts of certain hormones to suppress premature ovulation.

**How it works:** Ganirelix and Cetrotide are injectable gonadotropin-releasing hormone (GnRH) antagonists that suppress the production and activity of LH and FSH. The amount of estrogen present is reduced.

**Side effects:** Headaches, nausea, pain, redness, irritation and itching at injection site, abdominal swelling, pain or cramping.
**Novarel, Pregnyl, Ovidrel (hCG)**

**Use:** An hCG injection is used to induce ovulation.

**How it works:** hCG mimics the action of the LH surge and triggers ovulation approximately 36-48 hours after its initial use. Egg retrievals can be timed as close to ovulation as possible to increase the chance of retrieving a mature egg.

**Side effects:** Headaches, mood swings, mild swelling, breast tenderness, and pain or irritation at the injection site.

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**Ibuprofen**

**Use:** This drug reduces inflammation to make follicles less likely to rupture.

**How it works:** As a nonsteroidal anti-inflammatory drug, ibuprofen reduces hormones that cause inflammation and pain in the body. As the follicle is less inflamed, it is less likely to rupture prematurely.

**Side effects:** Upset stomach, heartburn, diarrhea, constipation, bloating, gas, dizziness, drowsiness, rash and headaches.

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**Menopur and Repronex (menotropins)**

**Use:** Menopur and Repronex are an equal mixture of the naturally occurring follicle-stimulating hormone (FSH) and luteinizing hormone (LH) in the form of a subcutaneous injectable. They are commonly used in women with a low FSH baseline.

**How it works:** Menopur and Repronex are a combination of FSH and LH hormones that stimulate ovaries to produce follicles.

**Side effects:** Abdominal pain, back pain, breast enlargement, chills, nausea, dizziness, fever, flu-like symptoms, flushing, general body discomfort, headaches, menstrual changes, muscle or joint pain and pain or rash at the injection site.

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**Synarel (nafarelin acetate)**

**Use:** Synarel is a nasal spray used to induce ovulation and cause final follicular maturation.

**How it works:** Synarel causes an LH surge, which triggers ovulation approximately 36-48 hours after its initial use. Egg retrievals can be timed as close to ovulation as possible to increase the chance of retrieving a mature egg.

**Side effects:** Headaches, hot flashes, mood swings, muscle pain, nasal irritation and runny nose.
3.4 Frequently Asked Questions

Below is a list of frequently asked questions. If the following answers do not fully address your questions or concerns, please do not hesitate to contact a member of your personal care team.

**Why do some fertility treatments begin with birth control pills?**
Birth control pills do not affect a woman’s ability to become pregnant once she has discontinued their use. Rather, the medication regulates a woman’s cycle to synchronize follicle development prior to ovarian stimulation.

**Is there an age limit for Mini-IVF™?**
We do not have an age limit for pre-menopausal women.

**If I decide to use a surrogate, are there special considerations?**
There are complex legal issues associated with surrogacy that should be first discussed with an attorney who specializes in surrogacy prior to making decisions on treatment.

**What percentage of patients choose Mini-IVF™?**
95% of our patients choose this protocol.

**Who is a candidate for Mini-IVF™?**
Mini-IVF™ is suitable for all pre-menopausal women even if they have responded poorly to previous conventional IVF attempts.

**Can stress or changes to my normal routine affect the treatment process?**
Yes. It is necessary to reduce stress and changes to your daily routine during the entire treatment process.

**Why does Mini-IVF™ require fewer hormones?**
Exposure to high doses of hormones can mature a large quantity of eggs at the expense of egg quality. Lower hormone doses help the body produce only the best quality eggs a woman can mature in one cycle to produce a healthy baby.

**How long will I take medications before an egg retrieval?**
Most women take medication for 9-13 days.

**Will all my retrieved eggs be transferred?**
The number of eggs retrieved is not necessarily the number of embryos viable for transfer.
Does New Hope perform multiple embryo transfers?
While we can perform multiple embryo transfers on request, at New Hope, we promote single-embryo transfers to reduce the risks associated with multiple births. Surplus embryos can be frozen using our vitrification method and stored in your personal embryo bank for later use.

Clomid has been used for decades. Are newer and more efficacious drugs available in place of Clomid?
Clomid remains the most prescribed fertility drug worldwide and is considered the first line in infertility treatment medication.

Have Clomid success rates improved since it was first introduced?
Clomid success rates have improved markedly due to technological advances in the field of assisted reproduction.

How often can I take a course of Clomid?
We generally allow patients to use Clomid for five to ten cycles due to the low dosage.

Is Clomid strong enough even for women over 35?
Women over 35 do very well with natural and low stimulation cycles using Clomid. These women generally produce higher FSH in response to Clomid because they have a smaller ovarian reserve than younger women and therefore do not usually require the FSH injections used in conventional therapy.

Why does New Hope use Synarel instead of hCG with Mini-IVF™ Cycles?
HCG has a long half-life and can stimulate immature follicles for long periods of time and lead to cyst formation. Synarel, alternatively, is strong enough to induce ovulation of larger follicles, but has a very short half-life. This preserves smaller follicles for future cycles, rather than stimulating them prematurely. As a result, the chances of healthy egg production are increased and women can cycle continuously. Synarel is especially advantageous for older patients with a limited ovarian reserve.

How do you know I will not ovulate prior to retrieval?
During your menstrual cycle, an estrogen sensor activates the hypothalamus to trigger an LH surge, which induces final maturation when the lead follicle reaches its optimal size. Clomid causes the body to think estrogen levels are low, which results in the release of FSH and LH. These hormones ultimately stimulate follicular production and the release of mature eggs. Over time, Clomid also acts to block the production of LH, which helps reduce the chances of premature ovulation.
Why is injectable FSH recommended for some women with Mini-IVF™?

Often, patients with a very low baseline FSH cannot produce enough FSH with Clomid and require additional FSH to aid follicular development.

Do fertility drugs cause cysts?

Sometimes an immature follicle can evolve into a cyst during the following cycle. In particular, hCG injections can facilitate cyst formation. The presence of a cyst does not necessarily mean you cannot begin another cycle, however we minimize the risk of cyst formation by using Synarel as a trigger instead of hCG.

What happens if I do not become pregnant?

If your treatment is not successful, your personal care team will meet with you to discuss your options.
Chapter 4

Patient Resources
4.1 Fertility Preservation and Cancer Patients

Your Personal Care Team at New Hope will work with you and your oncology team to coordinate care and to design a tailored treatment plan. Many of the fertility treatments outlined in this handbook are available to patients who are diagnosed with cancer or are looking to preserve their fertility prior to undergoing cancer treatment.

New Hope offers gentle stimulation techniques to aid in fertility preservation through oocyte or embryo cryopreservation. From the start of stimulation to banking, the process usually lasts three to four weeks and facilitates a speedy return to all other necessary treatments. A combination of Femara or Tamoxifen with gonadotropin injections has proven to be safe and effective.

We require the approval of your treating oncologist and ask that you provide all medical records pertaining to your cancer treatment including surgical and biopsy reports, as well as pathology reports and any tumor marker tests.

**Femara (letrozole)**

**Use:** An aromatase inhibitor used in the treatment of breast cancer. One of the effects of inhibiting aromatase is the stimulation of hormones which then induce oocyte development.

**How it works:** Femara blocks the production of estrogen. Therefore, the body receives fewer growth signals and cancer growth can be slowed or stopped. Decreased estrogen levels also cause the release of FSH and LH, which stimulate follicular development and ovulation.

**Side effects:** Hot flashes, headache, weight gain, general body discomfort, weakness, fatigue, nausea and constipation.

**Tamoxifen (nolvadex)**

**Use:** Tamoxifen is used in the treatment of breast cancer to delay recurrence. By blocking hormones which may stimulate cancer recurrence, hormones that stimulate the ovaries are produced.

**How it works:** Tamoxifen blocks the actions of estrogen causing the release of FSH and LH. FSH and LH stimulate follicular development and ovulation.

**Side effects:** Bone pain, decreased sex drive or difficulty achieving orgasm, headache, and hot flashes.
4.2 Out of Town Patients

If you are an out of town patient, take time to consider the important factors below before starting treatment.

Pre-Screening Tests
The provided IVF Checklist for Pre-Screening Testing lists all infectious disease and genetic screening tests that must be completed prior to starting an IVF cycle. If any of the required medical testing is performed outside of our facility, please fax us all medical records and test results. All infectious disease tests must be completed within one year from the date you start your IVF cycle at New Hope. If pre-screening tests were completed more than one year ago, they are invalid and will need to be re-administered before your IVF cycle can begin. Genetic screening tests are accepted regardless of the date performed. IVF screening test results will determine the candidacy of you and your partner.

Consent Forms
All consent forms must be read prior to your visit to New Hope. On the day of your appointment at New Hope, a nurse will assist you in completing all consent forms and will witness you and your partner’s signature(s).

Financial Considerations
You must contact our Financial Department prior to the start of your IVF cycle. Financial Coordinators are available 7 days a week.

Monitoring
If you are on the first day of your period or are to schedule a monitoring visit, please call and inform our clinical staff that you are an out of town monitoring patient and need orders for your local clinic. Physician orders for the first monitoring visit will then be sent to your local clinic. This ensures all correct testing is performed and that results will be sent directly to our clinic. It is also necessary to find a local clinic or hospital that can perform “same day” results on hormone levels so you can receive detailed instructions immediately following the review of results for each monitoring visit. Finally, when choosing a local clinic, please be mindful of coordinating office hours and be sure to check whether weekend monitoring is possible.
Please be sure to call our office by 3pm EST each monitoring day if you have not received a call from your Personal Care Team with instructions. This may mean that we have not received the day’s results and will need to follow up with your clinic. Also, please inform our clinical staff of your preferred pharmacy, their contact information and business hours.

**Retrieval**

A semen specimen must be available on the day of your egg retrieval, if your plan is to fertilize the oocytes retrieved (fresh transfer). If the sperm is fresh, your spouse/partner will be asked to produce a semen specimen. If the sperm is frozen, when from a spouse/partner or donor, it must be at New Hope prior to the egg retrieval.

If you have any questions regarding semen analysis, semen collection, sperm freezing/storage or transporting frozen sperm vials, please call and speak with someone in our Andrology Laboratory prior to starting your IVF cycle.

As you approach the date of your egg retrieval, we recommend that you and your spouse/partner begin preparations for the trip to our office in New York. Your Personal Care team will help you coordinate scheduling to ensure you arrive to New York on time.

**4.3 Financial Considerations**

A Financial Coordinator is available as part of your Personal Care Team to discuss all concerns about financing your treatment. Each person receives an individualized treatment plan and you will receive your plan and pricing information during the initial consultation. If applicable, prior to your initial consultation, we will contact your insurance provider to get a comprehensive understanding of your fertility coverage and when necessary, obtain all required pre-authorizations and file all in-network claims paperwork on your behalf.

During the initial consultation your Financial Coordinator will also schedule payment for all fees not covered by your insurance, including co-pays, out of network charges and deductibles. All fees must be paid in full prior to starting your treatment course. We accept cash, money orders and most major credit cards.
4.4 Glossary

The following terms either appear in this handbook or will be used commonly by your Personal Care Team.

**Androgen:** A male sex hormone that is produced in the testes and is responsible for typical male sexual characteristics.

**Anovulatory cycle:** A cycle during which the ovaries fail to release an oocyte. Therefore, ovulation does not take place. Chronic anovulation is a common cause of infertility.

**Anesthesia:** Loss of bodily sensation with or without loss of consciousness.

**Antral follicle count:** The number of follicles detected by the ultrasound at the beginning of the menstrual cycle. This indicates the size of your ovarian reserve.

**Assisted hatching:** A procedure performed after fertilization and prior to implantation in which the zona pellucida of the embryo is partially opened by application of a laser to facilitate embryo implantation.

**Assisted reproductive technology (ART):** All fertility treatments that include the handling of eggs and sperm.

**Basal Body Temperature (BBT):** Body temperature in the morning before rising, moving about or eating.

**Blastocyst:** An embryo usually five days after fertilization that has formed a fluid-filled cavity. At this stage the cells begin to form the early placenta.

**Cervix:** The narrow entrance to the uterus.

**Clinical pregnancy:** A pregnancy confirmed by hormone levels and visible by ultrasound.

**Clomiphene challenge test (CCCT):** A common test of ovarian reserve in which FSH is checked on days three and ten of the menstrual cycle and Clomid is taken on days five through nine.

**Cryopreservation:** Freezing at a very low temperature to keep embryos, eggs, or sperm viable for further transfer or fertilization. Vitrification is an advanced type of cryopreservation.
Corpus albicans: The regressed form of the corpus luteum.

Corpus luteum: A yellow mass of cells that forms from an ovarian follicle during the luteal phase of the menstrual cycle.

Cyst: An abnormal, closed, sac-like structure within a tissue that contains either fluid or tissue. A cyst can occur anywhere in the body and can vary in size.

DNA: The hereditary material in humans and almost all other organisms.

Dominant follicle: The follicle that outgrows all other follicles in the ovary. In a natural cycle only one follicle becomes dominant and this results in only one egg being released.

Ectopic pregnancy: A pregnancy where the embryo is not embedded in the uterine lining. Usually it is lodged in the fallopian tubes.

Egg: The female sex cell produced and matured by the ovary, also called an ovum or oocyte.

Egg retrieval: A procedure performed right before ovulation in which eggs are removed from the ovaries via an ultrasound-guided needle and suction.

Ejaculation: The discharge of semen.

Ejaculatory duct: A canal formed by the union of the vas deferens and the duct from the seminal vesicles.

Embryo: A fertilized egg that has begun cell division.

Embryo bank: A collection of stored embryos.

Embryo transfer: Placement of an embryo into the uterus.

Endometriosis: A condition in which tissue resembling the lining of the uterus grows outside the uterus. It is often associated with infertility.

Endometrium: Layer of fine tissue completely covering the inside of the uterus. It is very sensitive to hormones and there is a window of time when the embryo can attach and start growing into it.

Epididymis: A tubule in each testicle that carries sperm to the vas deferens.

Estradiol: The most common estrogen (hormone) produced by the ovaries.

Estrogen: The female hormone largely responsible for the development of
female secondary sex characteristics, the thickening of the endometrium and regulating the other aspects of the menstrual cycle.

**Fallopian tubes:** Part of the female reproductive system where sperm and egg meet in normal conception. This pair of tubes leads from each ovary to each side of the uterus.

**Female factor infertility:** Infertility caused by the female reproductive system.

**Fertilization:** The union of sperm and egg to form one cell with the genetic material of both parents.

**Fibroids:** Non-cancerous growths of the uterine wall that can cause abnormal uterine bleeding and pain.

**Fimbria:** Thin finger-like projections lining the fallopian tubes.

**Fluorescent In Situ hybridization:** A technique that uses fluorescent markers to detect changes in the genetic material.

**Fluoroscopy:** An imaging technique that uses X-rays to cast shadows of an internal structure on a fluorescent screen; the shadows vary in intensity according to the density of the structure.

**Follicle:** A fluid-filled sac in the ovary containing an egg.

**Follicle-stimulating hormone (FSH):** The pituitary hormone responsible for stimulating the growth and maturation of follicles. It acts in concert with LH.

**Frozen egg bank:** A collection of stored eggs.

**Frozen embryo transfer (FET):** The transfer of a once cryopreserved embryo, now thawed, via IVF into the uterus.

**Genome:** The total genetic information of a particular organism.

**Gestation:** The period during which an embryo develops.

**Gestational surrogate:** A woman who carries a pregnancy for another woman. The surrogate does not have a genetic relationship to the resulting child. The pregnancy is derived from the egg and sperm of the intended parent and her partner or donor, not the surrogate.
**Gonadotropin releasing hormone (GnRH):** Hormone secreted by the hypothalamus, a control center in the brain, that prompts the pituitary gland to release FSH and LH.

**GnRH agonists:** A GnRH analog that initially stimulates the pituitary gland to release LH and FSH. It can be used at the beginning of an IVF cycle to help stimulate follicular growth.

**GnRH analogs:** Synthetic hormones similar to the naturally occurring gonadotropin releasing hormone used to prevent premature ovulation. There are two types of GnRH analogs: GnRH agonists and GnRH antagonists.

**GnRH antagonists:** Synthetic hormones similar to the naturally occurring gonadotropin releasing hormone, that are used to prevent premature ovulation. These medications have an immediate suppressive effect on the pituitary gland.

**Human chorionic gonadotropin (hCG):** A hormone produced by the placenta, the detection of which is the basis for most pregnancy tests. It induces ovulation and follicular maturation.

**Hormone replacement therapy (HRT):** The administration of estrogen, progesterone, or a combination of the two to counteract the hormonal effects and the decrease in these hormones during menopause.

**Hyperthyroidism:** Over production of thyroid hormones due to an overactive thyroid.

**Hypothyroidism:** Under production of thyroid hormones due to an underactive thyroid.

**Hypothalamic pituitary disorder:** The loss of function in an endocrine gland due to a failure of the pituitary gland to secrete hormones that stimulate the endocrine gland’s function.

**Hypothalamus:** A specific area of the brain that regulates many basic functions in the body including temperature, blood pressure, and satiety.

**Hysterectomy:** This refers to the surgical removal of a woman’s uterus.

**Implantation:** The process in which the embryo attaches to the endometrium and starts growing into it, inducing blood vessel growth.

**Incubator:** An apparatus consisting of a box designed to maintain a constant temperature by the use of a thermostat.
**Intracytoplasmic sperm injection (ICSI):** A procedure in which a single sperm is injected directly into an egg.

**Insemination:** The placement of sperm into the uterus.

**In-vitro fertilization (IVF):** A process in which an egg and sperm are united in a laboratory dish to facilitate fertilization.

**In-vitro maturation:** The technique of allowing ovarian follicles to mature in vitro.

**Intrauterine insemination:** Also known as artificial insemination, this procedure involves placing washed sperm directly into the uterus.

**IV sedation:** Sedation or anesthetic medications delivered through an intravenous (IV) line.

**Laser-assisted hatching:** A method for softening the zona pellucida of the egg to facilitate implantation.

**Laparoscopy:** A diagnostic procedure in which a long narrow fiber-optic instrument, called a laparoscope, is inserted through an incision in or below the woman’s navel so that the internal organs may be observed.

**Luteinizing hormone (LH):** The pituitary hormone that controls the length and sequence of the menstrual cycle, including ovulation and follicular maturation.

**Male factor infertility:** Infertility caused by a problem in the male reproductive system.

**Menopause:** The period when the menstrual cycle ceases.

**Menstruation:** Monthly discharge of the endometrial lining from the uterus in non-pregnant women from puberty to menopause.

**Motility:** Sperm cells’ ability to move spontaneously and independently.

**Oocyte:** See “egg.”

**Ovarian Hyperstimulation Syndrome (OHSS):** A condition that can result from ovulation induction. OHSS is a particular concern in conventional IVF. It is characterized by enlargement of the ovaries, ovarian tenderness, fluid retention and weight gain.
**Ovarian reserve:** A woman’s fertility potential, measured by the number of eggs she has remaining.

**Ovary (Ovaries):** The two female sex glands in the pelvis, located on each side of the uterus near the end of the fallopian tubes. The ovaries produce eggs and various hormones.

**Ovulation:** Release of an egg from the ovary.

**Penis:** The external part of the male reproductive system.

**Pituitary gland:** A small gland just beneath the hypothalamus in the brain that secretes many hormones regulating body processes, including FSH and LH.

**Placenta:** The membranous vascular organ that develops during pregnancy, lining the uterine wall and partially enveloping the fetus. It is attached by the umbilical cord. Following birth, the placenta is expelled.

**Preimplantation genetic diagnosis (PGD):** A genetic screening test in which a few cells are removed from an embryo on day three or from a blastocyst on day five.

**Pregnancy:** The period from conception to birth when a woman carries a developing fetus in her uterus.

**Progesterone:** A female hormone secreted during the luteal phase of the menstrual cycle that prepares the lining of the uterus for embryo implantation.

**Prolactin:** A hormone produced by the pituitary gland that controls milk production (lactation).

**Prostate:** A chestnut sized gland in males at the neck of the urethra which produces the fluid part of semen.

**Rh:** Rhesus factor is a blood group antigen found on red blood cells of Rh positive individuals.

**Scrotum:** A pouch of skin that contains the testes, epididymis and lower portions of the spermatic cords.

**Semen:** The fluid containing sperm, also known as seminal fluid.

**Seminal vesicles:** A pair of pouch-like glands located on either side of the urinary bladder that secrete seminal fluid.
**Sonogram:** A diagnostic medical image of internal organs or an unborn fetus created using an ultrasound.

**Sperm:** The male reproductive cells that can fertilize a woman’s egg.

**Sperm washing:** A procedure to separate out sperm from seminal fluid.

**Spermatogenesis:** The formation and development of sperm.

**Subcutaneous:** Beneath the skin.

**Sexually transmitted disease (STD):** An illness that is passed on by means of sexual contact.

**Testes:** Male reproductive glands that produce sperm and secrete androgens.

**Testicular sperm extraction (TESE):** Operative removal of testicular tissue in an attempt to collect living sperm for use in an IVF-ICSI procedure.

**Testosterone:** A steroid hormone primarily secreted in the testes and the ovaries that is responsible for male traits.

**Timed intercourse:** Planning intercourse to sync with the sustained shift in body temperature that occurs during a woman’s menstrual cycle.

**Traditional Surrogate:** Used in cases of female factor infertility. A traditional surrogate is a fertile woman who carries a pregnancy intended for another family, conceived from her egg and the sperm of the infertile woman’s partner. The resulting child carries the surrogate’s genes.

**Transvaginal ultrasound aspiration:** An ultrasound-guided technique for egg retrieval whereby a long, thin needle is passed through the vaginal and ovarian walls and into the ovarian follicle. Egg retrieval occurs when suction is applied.

**Trophectoderm:** Outer cell layer of a blastocyst.

**Turner’s syndrome:** A chromosomal disorder in females who have only one X chromosome. The disease is characterized with dwarfism, heart abnormalities, and underdeveloped sex organs.

**Ultrasound:** A technology that uses high-frequency sound waves to create an image of internal organs on a monitor. Fertility specialists use it to monitor the growth of ovarian follicles, to retrieve eggs from follicles, and to evaluate a pregnancy.
**Urethra:** A duct in males and females through which urine is discharged. The urethra in males also serves as the genital duct.

**Uterus:** The hollow, muscular, female reproductive organ located in the pelvis that houses the embryo during pregnancy. The lining of the uterus is shed each month during menstruation when pregnancy has not occurred.

**Vagina:** The canal in the female reproductive system that leads to the cervix.

**Vaginal culture:** A sample of the bacteria in the vagina.

**Vas deferens:** The two muscular tubes in the male reproductive system that carry sperm from the epididymis to the urethra.

**Vitrification:** An advanced form of cryopreservation that uses cryoprotectants and a flash-freezing method to preserve eggs, sperm and embryos. It has a thaw success rate of 98%, largely because the method does not allow damaging ice crystals to form in the preserved specimen.

**Zona pellucida:** The egg's outer layer that a sperm must penetrate in order to fertilize the egg. In assisted hatching the zona pellucida is punctured.

**Zygote:** A fertilized egg before cell division begins. It is a single cell that contains the genetic material of both parents.
4.5 Information Disclaimer

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