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Purpose: To provide an understanding of infertility treatment, issues surrounding infertility surgery, and issues surrounding multiple embryo transfers among individuals faced with the potential loss of fertility.

Goals: To provide an evidence-based approach to infertility management, infertility surgery, and the use of single embryo transfer in addition to describing the limitations of and recommendations for infertility treatment.

Background

I. Infertility

- Definition:
  - A disease (an interruption, cessation, or disorder of body functions, systems, or organs) of the reproductive tract which prevents the conception of a child or the ability to carry a pregnancy to delivery. It is defined by the failure to achieve a successful pregnancy after 12 months or more of appropriate, timed unprotected intercourse or Therapeutic Donor Insemination. Earlier evaluation and treatment may be justified based on medical history and physical findings and is warranted after 6 months for women age 35 years or older.
  - The presence of an identified infertility factor should allow for immediate treatment, obviating the need for the waiting period to meet the definition of infertility.
  - Recurrent pregnancy loss is a disease distinct from infertility, defined by two or more failed pregnancies. When the cause is unknown, each pregnancy loss merits careful review to determine whether specific evaluation may be appropriate. (ASRM)
  - For purposes of determining when evaluation and treatment for infertility or recurrent pregnancy loss are appropriate, pregnancy is defined as a clinical pregnancy documented by ultrasonography or histopathologic examination. (ASRM)

Artificial donor insemination may (refer to specific benefit language) be considered diagnostic in terms of meeting the definition of infertility for females without a male partner who do not otherwise have an identified infertility factor. Such artificial insemination is limited to not more than 12 inseminations for females <35 years of age and not more than 6 inseminations for females 35 years of age and older. In this context, ovarian stimulation is not indicated as the insemination is being performed in a natural cycle. (The above does not apply to any individual with an infertility diagnosis as such individual would be subject to the medical necessity infertility clinical guidelines when medical necessity review is part of the infertility benefit.)

- The causes of infertility may be attributable to the female in 40% of cases, to the male in 40% of cases and to a combination of both male and female factors in 10% of cases.
- The cause of infertility cannot be determined in up to 10-20% of couples.
- Female factors can further be divided into tubal (40%), ovulatory (40%), uterine (10%) and cervical (10%).
• Cigarette smoking adversely affects fertility.

• Endometriosis is associated with infertility; however, the mechanism of impaired fertility in the presence of minimal disease has not been clearly elucidated.

• If a hysterosalpingogram (HSG) is performed, particularly with an oil-based dye (Dreyer, 2017), for diagnostic evaluation of infertility, there is an increased chance of fertility (10% over the ensuing 6 months) as thin, filmy adhesions may be lysed by the dye injected into the tubes, which will allow them to become patent.

• Luteal phase deficiency has never been established as a cause of infertility.

• It has never been demonstrated that antibodies against sperm in either the male or female partner is a cause of infertility.

• It has never been demonstrated that asymptomatic infection of the male or female genital tract can cause infertility.

• The spontaneous conception rate for the “normal” couple is 25% per ovulatory cycle.

• Fecundity declines gradually after age 32 and more precipitously after age 37. National data from the SART registry 2017 demonstrates that the cumulative live birth per intended retrieval resulting in live births decreased progressively from:
  o 54.7% in females younger than 35 years;
  o 40.6% for females aged 35-37 years;
  o 25.6% for females aged 38-40 years;
  o 12.8% for females aged 41-42; and
  o 4.4% for females over the age of 42. The age-related decline in fertility is accompanied by a significant increase in the rates of aneuploidy and spontaneous abortion. (SART, 2020)

• The post-coital test has never been demonstrated to correlate with pregnancy outcome and should only be used in cases where the outcome will significantly affect treatment strategy. The test may be considered useful in cases of suspected sexual dysfunction.

II. Intrauterine Insemination

Intrauterine insemination (IUI) involves the placement of washed, motile sperm directly into the uterine cavity.

• Indications for IUI:
  o Sexual dysfunction
  o Sequelae of cervical trauma
  o Mild male factor infertility
  o Unexplained infertility
  o Minimal or mild endometriosis
  o Unilateral tubal factor infertility due to a previous salpingectomy or proximal tubal occlusion.

• Historically, controlled ovarian stimulation (COS) with clomiphene citrate or gonadotropins combined with intrauterine insemination (IUI) has provided less invasive options before proceeding to IVF.
• A traditional approach involved 3 cycles of clomiphene/IUI followed by 3 cycles of gonadotropin/IUI before pursuing IVF.
• Gonadotropin/IUI is associated with an increased risk for multiple gestation (30%) including high-order multiple births (8.1%). (Gleicher, 2000)
• The pregnancy rate per cycle for gonadotropin/IUI is 9%. (Guzick, 1998, 1999)
• The pregnancy rate per cycle for clomiphene/IUI is 7%.
• Conception, when it occurs, is achieved within 4 clomiphene or gonadotropin/IUI cycles in 90% of cases. (Chaffkin, 1991)
• The cumulative pregnancy rate for gonadotropin/IUI treatment is 33%.
• The cumulative pregnancy rate for clomiphene/IUI treatment for women <35 is 25%. (Dovey, 2008; Ecohard, 2000)
• IUI with controlled ovarian stimulation may be effective in increasing live birth rate in women with minimal or mild endometriosis. (Nulsen, 1993; Tummon, 1997)
• Skipping gonadotropin/IUI in the traditional approach and moving instead directly to IVF yields a significant increase in pregnancy rate and time to conception while decreasing overall costs. (Goldman, 2010; Reindollar, 2010)
• Gonadotropin/IUI should not be used for treatment given the increased cost of medication, risk for a multiple gestation and a cumulative pregnancy rate that is only slightly higher compared to clomiphene/IUI. (Goldman, 2010; ASRM, 2020)
• Several studies have not demonstrated a benefit for IUI in the context of ovulation induction in the treatment of PCOS. (AHRQ, 2019)

III. Poor Prognosis and Futility
Examples where continued treatment may be futile: (ASRM, 2006)
• Markedly elevated FSH levels
  o ≥20 for women < 40
  o ≥ 15 for women ≥ 40
    ▪ FSH levels should be evaluated in the context of other markers of ovarian reserve, such as AMH, AFC and response to prior ovarian stimulation
    ▪ In the absence of a history of prior ovarian stimulation, a cycle of ART may be considered, especially in women age <35.
• Lack of viable spermatozoa
• Ovarian failure where a couple is attempting conception with their own gametes
• Numerous ART cycles without adequate egg production, fertilization and/or embryo development

IV. Treatment in the Natural Cycle
• Natural cycle treatment assumes:
  o Normal ovulatory function with spontaneous (unstimulated) ovulation
  o At least one patent fallopian tube
Normal uterine cavity

- Treatment options in the natural cycle encompass:
  - Timed coitus
  - Cervical insemination
  - Intrauterine insemination (IUI)
  - Assisted reproductive technologies (ART)

- Cervical insemination in the natural cycle may be beneficial in cases involving sexual dysfunction.

- Intrauterine insemination may be useful in cases involving cervical trauma (e.g., cervical ablation, following a wide cervical cone biopsy).

- There is no evidence that, absent sexual dysfunction or cervical trauma, natural cycle (i.e., no ovarian stimulation) IUI has any benefit over appropriately timed heterosexual intercourse. (Helmerhorst, 2005; ASRM, 2020)

- Natural cycle IUI may be considered in the setting of donor insemination when no other infertility factor is present.

V. Tubal Surgery

- Tubal disease accounts for 25%–35% of female factor infertility, with more than half of the cases due to salpingitis. (Honore, 1999)

- A history of ectopic pregnancy, pelvic inflammatory disease (PID), endometriosis, or prior pelvic surgery raises the index of suspicion for tubal factor infertility.

- For patients with no risk factors, a negative chlamydia antibody test indicates that there is less than a 15% likelihood of tubal pathology. (denHartog, 2006)

- Although a laparoscopy is considered the best method to determine tubal patency, 3% of women diagnosed with bilateral tubal occlusion conceived spontaneously. (Mol, 1999)

- Proximal tubal blockage accounts for 10%-25% of tubal disease. (Honore, 1999)

- A hysterosalpingogram (HSG) may have a therapeutic effect, with higher fecundity rates reported for several months after the procedure when patency of at least one fallopian tube is demonstrated. (Johnson, 2009)

- Distal tubal disease involves hydrosalpinges, tubal phimosis, fimbrial and peristomal adhesions.

- Tuboplasty is not appropriate for severe tubal disease or with both proximal and distal tubal disease.

- There are no adequate trials comparing pregnancy rates with tubal surgery vs. ART.

- The advantages of tubal surgery are that it is mostly a one-time intervention and that patients may attempt conception monthly without further intervention.

- The disadvantages of tubal surgery are that it involves an invasive procedure
with concomitant associated risks of bleeding, infection, organ damage, and risk of anesthesia. In addition, patients may need to wait at least 6 months up to 2 years to see the maximum beneficial outcome from surgery in terms of cumulative pregnancy rates. Finally, there is a risk of recurrence of tubal pathology (e.g. adhesion formation, occlusion of the fallopian tube(s) as well as a higher risk for an ectopic pregnancy).

- Time to pregnancy is an important consideration when contemplating tubal surgery. Corrective tubal surgery even for the most favorable prognoses may not be appropriate for women ≥35 years. (Feinberg, 2008)

VI. Endometriosis

- The evidence for performing surgery with the sole intent of increasing live birth rate indicates that a relatively large number of women need to be treated to gain an additional pregnancy in women with minimal or mild endometriosis. (Jacobson, 2010)
- Operative laparoscopy, including adhesiolysis is effective in increasing the pregnancy/live birth rate compared to diagnostic laparoscopy. (Jacobson, 2010)
- While the removal of endometriosis in women with minimal or mild endometriosis in women undergoing a laparoscopy for other indications may improve pregnancy, implantation and live birth rates compared to those undergoing a diagnostic laparoscopy alone, there is no conclusive evidence to support laparoscopy for asymptomatic women with the only aim to diagnose and subsequently treat peritoneal endometriosis in order to improve the result of the ART treatment. (ESHRE, 2013, Falcone, 2011, Opøien, 2011)
- The comparative effectiveness of various surgical techniques is not well studied.
- Endometriosis does not adversely affect pregnancy rates with ART.
- Pregnancy rates for patients with minimal or mild endometriosis are not different from patients with tubal factor infertility in ART cycles.

VII. Uterine Factor

- The septate uterus is the most common congenital anomaly of the uterus and is associated with the highest incidence of reproductive failure. (Raga, 1997)
- The avascular nature of the uterine septum may represent a less than optimal environment for implantation.
- A unicornuate uterus represents only 4.4% of uterine anomalies.
- A bicornuate uterus, while associated with a higher incidence of pregnancy loss, rarely requires surgery. (Taylor, 2008)
- The uterus didelphys has a good prognosis for conception and rarely requires surgery. (Taylor, 2008)
- Little is known about the association of endometrial polyps and fertility.
Intrauterine adhesions are associated with poor reproductive outcome. (Schenker, 1982)
  o Surgery improves fertility and reduces pregnancy loss.

Uterine myomas are common and mostly asymptomatic.
  o Large fibroids may impede access to the ovary during ART.
  o Fibroids that distort the uterine cavity may reduce ART pregnancy rates.
  o It is unclear whether or not large fibroids that do not distort the uterine cavity may reduce ART pregnancy rates in some patients.

VIII. Elective Single Embryo Transfer (eSET)

Assisted reproductive technology (ART) poses a major risk of multiple pregnancy and birth that is associated with adverse maternal and infant outcomes.

The principal reason behind the large number of multiple pregnancies after in-vitro fertilization (IVF) is the practice of transferring more than one embryo within the uterus in order to maximize pregnancy rates. (ASRM, 2012; Criniti, 2005; Pandian, 2009)

Twin pregnancies and higher order gestations are associated with an increased risk of:
  • Preeclampsia
  • Hypertension
  • Preterm labor
  • Premature rupture of membranes
  • Low birth weight (<2,500 g)
  • Operative delivery
  • Fetal death and/or
  • Cerebral palsy. (Mullin, 2010)

Even though eSET requires subsequent frozen embryo transfer cycle(s) if the initial fresh cycle is unsuccessful, it is prudent to promote elective single blastocyst embryo transfer as a means of reducing the frequency of multiple gestations and the associated risks of poor maternal and birth outcomes. (Johnson, 2013; Sunderam, 2012).

  • Numerous countries have adopted regulations that mandate eSET resulting in a twin gestation rate of <5%.
  • Pregnancy rates for eSET are comparable to multiple embryo transfer. (Thurin, 2004)
  • Although pregnancy outcome diminishes with increasing maternal age, all age groups should be considered for blastocyst stage eSET (Niinimaki, 2012; Kato, 2012) particularly in the context of preimplantation genetic
testing or other technologies that enhance the embryo selection process.

IX. Gestational Carrier

Gestational surrogacy involves third party reproduction that is distinct from sperm or egg donation. A gestational carrier is genetically not related to the embryo and serves merely as the host to carry the pregnancy. In contrast, in traditional surrogacy, the surrogate is genetically related to the embryo having been the source of the egg that has been fertilized either through artificial insemination or in vitro fertilization. A traditional surrogate may be utilized when the intended parent(s) lacks both eggs and a uterus, for example in the setting of a single male or same sex male couple wishing to have a family. There are a myriad of medical conditions that would warrant the use of a gestational carrier. These include but are not limited to: congenital or iatrogenic absence of the uterus; a severe müllerian anomaly; unexplained or failed treatment of recurrent pregnancy loss (2 or more losses); unexplained recurrent implantation failure (3 or more failed assisted reproductive technology (ART) cycles); maternal medical conditions where carrying a pregnancy may pose a serious risk to the mother or fetus; maternal medications that pose a risk of teratogenicity; prior poor obstetrical history. (Dar, 2015).

The medical aspects of a gestational carrier cycle are fairly standard and involve the intended parent(s) undertaking an ART cycle, fertilization of the oocytes, embryo culture and ultimately the transfer of an embryo(s) to the gestational carrier. These embryos may be either fresh or previously frozen. The gestational carrier’s uterus must be prepared to receive the embryos and the transfer must be synchronized to embryo development. This typically involves the administration of both estrogen and progesterone to promote appropriate endometrial development and receptivity.

In addition to the medical aspects there are additional factors that must be taken into consideration in the setting of a gestational carrier (and traditional surrogate) cycle. The intended parents should undergo medical, legal and psychological counseling as should separately the gestational carrier (Reilly, 2007; Dermount, 2010). A legal contract between the intended parent(s) and the gestational carrier should be in place to avoid the potential of future issues pertaining to maternity and parental rights and obligations. Matters pertaining to compensation should be clearly addressed. The gestational carrier should undergo appropriate infectious disease screening (ASRM and SART, 2013). The GC and her partner (if applicable) should undertake informed consent and fully understand the process, risks and benefits of all procedures including the number of embryos to be transferred, maternal complications of pregnancy, possible adverse outcomes, etc. (ASRM, 2013, 2017; Dar, 2015).

X. Cryopreservation

Human embryo cryopreservation dates back to the 1980s when embryos were frozen at various stages of development ranging from the pronuclear to cleavage stage. The process involved a slow freezing protocol that yielded mixed results and less than ideal thaw survival (<60%) and subsequent live births. Over the past 10 years, with the introduction of vitrification technology, survival rates have climbed to well over 90% with live birth rates approaching 45% (SART 2016 National Preliminary Report). More recently, cryopreservation of mature oocytes has proven to be effective for those individuals who for moral/ethical/religious reasons are opposed to freezing embryos (with the potential of later having to face the issue of discarding embryos that have not
been transferred) as well as for medically indicated fertility preservation for those individuals facing gonadotoxic treatment. The ability to freeze embryos is a necessary component of elective single embryo transfer as supernumerary embryos must be frozen and stored for later sequential transfer if needed. Embryo cryopreservation is also a vital component of pre-implantation genetic testing given the lag time from embryo biopsy to result reporting. Finally, while not a covered benefit, embryo banking/accumulation may be logical in cases of diminished ovarian reserve or advanced maternal age in order to obtain an adequate supply of embryos for later use when future fresh retrievals might otherwise yield few or poor quality oocytes/embryos.

**XI. Surgical Sperm Aspiration**

Surgical sperm aspiration is the surgical removal of sperm to obtain high quality sperm in adequate numbers to be used in assisted reproductive technology cycles and/or cryopreservation.

Approximately 5%-10% of males evaluated for infertility are azoospermic. (Schlegel, 1997; Schlegel, 1999)

**XII. Immune Therapies in Conjunction with ART**

There is a common belief that the maternal immune system is damaging in early pregnancy and needs suppressing. However, there is no high-quality evidence to support this notion, and the classical features of inflammation are not seen in decidua in early pregnancy.

<table>
<thead>
<tr>
<th>General Indications</th>
<th>General Indications for Initial and Continuation of Infertility Treatment Coverage</th>
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<tbody>
<tr>
<td></td>
<td>The below general infertility criteria are to be met for consideration of treatment:</td>
</tr>
<tr>
<td></td>
<td>- Prognosis for conception must be ≥ 5%; <strong>AND</strong></td>
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<tr>
<td></td>
<td>- No evidence of significant diminished ovarian reserve. Markers of significant diminished ovarian reserve include but are not limited to (one or more of the following within the previous 6 months):</td>
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<tr>
<td></td>
<td>- FSH level ≥ 15 mlU/ml if ≥35 years of age; <strong>OR</strong></td>
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<tr>
<td></td>
<td>- FSH level ≥ 20 mlU/ml if &lt; 35 years of age; <strong>OR</strong></td>
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<tr>
<td></td>
<td>- AMH level &lt; 0.3 ng/ml; <strong>OR</strong></td>
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<td></td>
<td>- Antral follicle count &lt; 7(ASRM (a)); <strong>AND</strong></td>
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<td></td>
<td>- If there has been monitored, medicated-stimulated infertility treatment within the previous 6 months it must demonstrate adequate ovarian response to stimulation. Examples include but are not limited to:</td>
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<td></td>
<td>- 1 follicle ≥ 15 mm diameter for IUI</td>
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<td></td>
<td>- Minimum of 1 follicle ≥15 mm diameter for ART</td>
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<tr>
<td></td>
<td>- [See also: <em>Ovulation Induction, Ovarian Stimulation, ART</em>]</td>
</tr>
<tr>
<td></td>
<td>The general infertility surgery criteria as listed below are to be met for consideration of treatment:</td>
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<tr>
<td></td>
<td>- Pelvic pain that is not responsive to conservative management; <strong>OR</strong></td>
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<tr>
<td></td>
<td>- Presence of a pelvic mass for which gynecologic diagnosis warrants surgical</td>
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</tbody>
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intervention; OR

- As an alternative treatment modality to the Assisted Reproductive Technologies (ART) particularly for individuals who are averse to pursuing ART for religious, social or financial concerns.

In the absence of other infertility factors or recurrence of disease additional infertility treatment is not indicated following infertility surgery for 12 months for individuals <35 and 6 months for individuals ≥ 35 years of age.

[See also: Tubal Surgery and Surgery for Endometriosis]

Infertility treatment is warranted when an infertility factor has been identified. This would include but is not limited to:

- Two abnormal semen analyses (abnormal count and/or motility), ovulatory dysfunction; compromise of the fallopian tubes; documented untreated or recurrent endometriosis; sexual dysfunction; abnormalities of the cervix or uterus that may interfere with conception.

Treatment is not indicated for females who are ≥ 55 years of age due to the obstetrical and medical risks of pregnancy.

<table>
<thead>
<tr>
<th>Treatment Criteria</th>
<th>Ovulation Induction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ovulation induction is not indicated beyond the 6&lt;sup&gt;th&lt;/sup&gt; ovulatory cycle regardless of which drug or combinations of drugs have been administered.</td>
</tr>
<tr>
<td></td>
<td>[See also: IUI]</td>
</tr>
<tr>
<td>A. Clomiphene citrate (Clomid®, Serophene®)</td>
<td></td>
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<tr>
<td>1. Clomiphene citrate is indicated to treat females with ovulatory dysfunction in the following situations:</td>
<td></td>
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<tr>
<td>- Anovulation; OR</td>
<td></td>
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<tr>
<td>- Oligo-ovulation; OR</td>
<td></td>
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<tr>
<td>- Amenorrhea; AND</td>
<td></td>
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<tr>
<td>- Other specific causative factors (e.g., thyroid disease, hyperprolactinemia) have been excluded or treated</td>
<td></td>
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<tr>
<td>2. Clomiphene citrate is not indicated in the following situations:</td>
<td></td>
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<tr>
<td>- Beyond the 6&lt;sup&gt;th&lt;/sup&gt; clomiphene citrate induced ovulatory cycle; OR</td>
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<tr>
<td>- When there is a failure to respond to ovarian stimulation after appropriate dosage adjustment, (e.g., doses of clomiphene citrate up to 250 mg per day and no follicles ≥17 mm in diameter); OR</td>
<td></td>
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<tr>
<td>- An estradiol level &lt;100 pg/ml/follicle ≥15 mm in diameter</td>
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<tr>
<td>B. Letrozole (Femara®)</td>
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<tr>
<td>1. Letrozole is indicated to treat females with ovulatory dysfunction in the following situations:</td>
<td></td>
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<tr>
<td>- Anovulation; OR</td>
<td></td>
</tr>
<tr>
<td>- Oligo-ovulation; OR</td>
<td></td>
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<tr>
<td>- Amenorrhea; AND</td>
<td></td>
</tr>
<tr>
<td>- Other specific causative factors (e.g., thyroid disease, hyperprolactinemia) have been excluded or treated</td>
<td></td>
</tr>
</tbody>
</table>
2. Letrozole is not indicated in the following situations:
   - Beyond the 6<sup>th</sup> letrozole induced ovulatory cycle; OR
   - When used alone for females with unexplained infertility; OR
   - When there is a failure to respond to ovarian stimulation, (e.g., no follicles ≥17 mm in diameter).

C. Tamoxifen
   1. Tamoxifen is indicated to treat females with ovulatory dysfunction in the following situations:
      - Anovulation; OR
      - Oligo-ovulation; OR
      - Amenorrhea; AND
      - Other specific causative factors (e.g., thyroid disease, hyperprolactinemia) have been excluded or treated.
   2. Tamoxifen is not indicated in the following situations:
      - Beyond the 6<sup>th</sup> clomiphene citrate induced ovulatory cycle; OR
      - When there is failure to respond to ovarian stimulation after appropriate dosage adjustment, (e.g., doses of Tamoxifen up to 250 mg per day and no follicles ≥17 mm in diameter); OR
      - An estradiol level <100 pg/ml/follicle ≥15 mm in diameter.

D. Gonadotropins
   1. Gonadotropins are indicated to treat females with ovulatory dysfunction in the following situations:
      - Anovulation;
      - Oligo-ovulation; OR
      - Amenorrhea; AND
      - Other specific causative factors (e.g., thyroid disease, hyperprolactinemia) have been excluded or treated; AND
      - Failure to ovulate with clomiphene citrate and letrozole.
         - PCOS, anovulatory or oligo-ovulatory patients who fail to ovulate with clomiphene after dosage adjustment up to 150 mg per day should attempt ovulation induction with letrozole before proceeding to gonadotropins.
         - Patients diagnosed with hypothalamic amenorrhea (failure to withdraw to progesterone) who demonstrate hypoestrogenemia may move directly to gonadotropins.
   2. Gonadotropins are not indicated in the following situations:
      - Beyond the 6<sup>th</sup> gonadotropin induced ovulatory cycle; OR
      - When there are ≥ 4 follicles which are ≥15 mm in diameter from a previously gonadotropin-induced ovulation, despite a dosage adjustment (e.g., doses of gonadotropin down to 37.5 IU per day); OR
      - When used alone for females with unexplained infertility; OR
      - When there is a failure to respond to ovarian stimulation, (e.g.,
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DOSES OF GONADOTROPINS up to 225 IU per day and no follicles ≥ 15 mm in diameter) [See also: ART, gonadotropin dose]; OR

- In lieu of clomiphene or letrozole to correct a thin endometrial lining (Dietterich, 2004; Kolibianakis, 2002; Assante, 2013); OR
- An estradiol level <100 pg/ml/follicle ≥15 mm in diameter.

3. Gonadotropins are not indicated:

- In total doses that exceed 225 IU/day for ovulation induction; OR
- For duration of therapy that exceeds 14 days per cycle.
  - A longer than 14 day stimulation may be considered in the setting of hypothalamic amenorrhea.

I. Ovarian Stimulation

Controlled ovarian stimulation is not indicated beyond the cycle limitations listed below regardless of which drug or combinations of drugs have been administered. Ultrasound monitoring for ovarian stimulation using oral medications in conjunction with IUI is not medically necessary. (ASRM, 2020)

A. Clomiphene citrate, letrozole and Tamoxifen

1. Clomiphene citrate, letrozole and Tamoxifen are indicated to treat females only when used in conjunction with intrauterine insemination (IUI) in the following situations:
   - With unexplained infertility; OR
   - Minimal or mild endometriosis; OR
   - Diminished ovarian reserve; OR
   - Male factor infertility

2. Clomiphene citrate, letrozole and Tamoxifen are not indicated in the following situations:
   - To treat females with unexplained infertility, diminished ovarian reserve, bilateral tubal factor infertility, unilateral mid or distal tubal compromise (obstruction, phimosis, adhesions), endometriosis, male factor infertility or recurrent pregnancy loss (absent an ovulatory disorder) when used alone (without IUI) (ASRM) [See also: Recurrent Pregnancy Loss and Gonadotropins, IUI and ART]; OR
   - In the setting where natural cycle IUI is indicated; OR
   - Beyond 3 cycles (Farquhar, 2018; ASRM, 2020)[See also: IUI cycle limitations]; OR
   - In the setting of very poor/futile prognosis, defined as:
     - FSH level ≥15 mIU/ml if ≥40 years of age or FSH level ≥20 mIU/ml if <40 years of age (Fertility Solutions Expert Panel);
       - FSH levels should be evaluated in the context of other markers of ovarian reserve, such as AMH, AFC and response to prior ovarian stimulation
OR

- Following ART cycles that fail to result in conception due to poor ovarian response or poor quality oocytes or embryos.

B. Gonadotropins

1. Gonadotropins are indicated when used only in conjunction with intrauterine insemination in the following situations:
   - To treat females with diminished ovarian reserve that have not responded to clomiphene citrate or letrozole; OR
   - Initial treatment for women with diminished ovarian reserve; OR
   - In the setting of unilateral tubal disease due to a previous salpingectomy or proximal tubal occlusion when there is no evidence of tubal compromise on the patent side when at least 2 cycles of oral agents (clomiphene or letrozole) have failed to yield a dominant follicle on the side with a patent fallopian tube.
   - Gonadotropins are not indicated when used alone (without IUI) in the setting of unexplained infertility, diminished ovarian reserve, endometriosis, or male factor infertility.

2. Gonadotropins are not indicated when used alone or in conjunction with intrauterine insemination (IUI) in the following situations:
   - To treat females with unexplained infertility, endometriosis, bilateral tubal factor infertility, unilateral mid or distal tubal compromise (obstruction, phimosis, adhesions), male factor infertility or recurrent pregnancy loss (McClamrock, 2012; ESHRE, 2013) [See also: Recurrent Pregnancy Loss and IUI, Clomid, Letrozole and Tamoxifen, ART; OR
   - In lieu of clomiphene or letrozole or Tamoxifen to correct a thin endometrial lining. (Dietterich, 2004; Kolibianakis, 2002; Assante, 2013; Gingold, 2015), OR
   - When there is a failure to respond to ovarian stimulation, (e.g., doses of gonadotropins up to 150 IU per day and no follicles ≥ 15 mm in diameter); OR
   - An estradiol level <100 pg/ml/follicle ≥15 mm in diameter); OR
   - When there are ≥ 4 follicles which are ≥15 mm in diameter from a previously gonadotropin-induced ovulation, despite a dosage adjustment; OR
   - Beyond 3 cycles (Farquhar, 2018; ASRM, 2020)[See also: IUI cycle limitations]; OR
   - In the setting of very poor/futile prognosis, defined as:
     o FSH level ≥15 mIU/ml if ≥40 years of age or FSH level ≥20 mIU/ml if <40 years of age (Fertility Solutions Expert Panel);
       - FSH levels should be evaluated in the context of other markers of ovarian reserve, such as AMH, AFC and response to prior ovarian stimulation
     OR
   - Following ART cycles that fail to result in conception due to poor
ovarian response or poor quality oocytes or embryos.

3. Gonadotropins are not indicated:
   - In total doses that exceed 150 IU/day for controlled ovulation stimulation [See also: Gonadotropins for ART]; OR
   - For duration of therapy that exceeds 14 days per cycle.

**Note:** Gonadotropins may be utilized in the face of ovulatory dysfunction, see above section ovulation induction.

II. Therapeutic Donor Insemination

A. Therapeutic donor insemination is indicated in the following situations:
   1. Male factor infertility; OR
   2. Failure of fertilization with ART; OR
   3. Female without a male partner (when this is a covered benefit) upon meeting the definition of infertility

B. Therapeutic cervical or intrauterine donor insemination is not indicated in the following situations:
   1. Failure to conceive within 12 donor insemination cycles in a female <35 years old; OR
   2. Failure to conceive within 6 donor insemination cycles in a female ≥35 years old;
   
   **AND**
   
   There are no other infertility factors.

   In the absence of any known infertility factor, therapeutic donor insemination is not indicated in conjunction with ovarian stimulation.

   (Cycle limitations apply for unexplained infertility, minimal to mild endometriosis and tubal factor infertility.)

   3. Cervical donor insemination is not indicated when using frozen sperm.

   [See also: IUI and Ovarian Stimulation]

III. Intrauterine Insemination (IUI)

A. Intrauterine insemination (IUI) in a natural (unstimulated) cycle is indicated when no other confounding infertility factors exist in any one (1) of the following situations:
   1. Sexual dysfunction
   2. Cervical trauma
   3. Therapeutic donor insemination
   4. Mild to moderate male factor (AHRQ, 2019)

B. Intrauterine insemination (IUI) in a natural (unstimulated) cycle is not indicated in the treatment of unexplained infertility (ASRM, 2020), diminished ovarian reserve, ovulatory dysfunction, tubal factor infertility, endometriosis or severe male factor infertility.

C. Intrauterine insemination (IUI) in conjunction with controlled ovarian stimulation is indicated in any one (1) of the following situations:
   1. Unexplained infertility
2. Mild and moderate male factor infertility
3. Minimal or mild endometriosis
4. Unilateral proximal tubal occlusion absent any compromise of the patent fallopian tube
5. Diminished ovarian reserve

D. Intrauterine insemination (IUI) is not indicated in any one (1) of the following situations:
   1. >1 insemination per cycle (Osuna, 2004; Albrozi, 2003; Tonguc, 2010)
   2. Isolated teratospermia unless there is <2% normal morphology on at least two semen analyses
   3. Severe male factor infertility (< 1 million motile sperm after sperm preparation)
   4. Ovulatory dysfunction absent a concomitant male factor, sexual dysfunction or cervical trauma (AHRQ, 2019)
   5. Bilateral tubal factor infertility
   6. Unilateral mid or distal tubal compromise (e.g., loculated spill, phimosis, occlusion)
   7. Moderate or severe endometriosis (ESHRE, 2013) unless treatment has previously been rendered and there is documentation of at least one uncompromised fallopian tube
   8. Recurrent pregnancy loss (See also: Recurrent Pregnancy Loss and Gonadotropins, Oral Medications and ART)

9. In the setting of unexplained infertility, diminished ovarian reserve, unilateral tubal factor infertility or mild to moderate male factor infertility or minimal or mild endometriosis in the following situations:
   • Beyond 3 cycles (ASRM, 2020)
   • In the setting of very poor/futile prognosis, defined as:
     o FSH level ≥15 mlU/ml if ≥40 years of age or FSH level ≥20 mlU/ml if <40 years of age (Fertility Solutions Expert Panel); OR
   • When the diagnosis is limited exclusively to teratospermia unless 0% strict morphology has been demonstrated on at least two semen analyses.

10. In the setting of sexual dysfunction or cervical trauma when there are no other confounding infertility factors, in the following situations:
   • Beyond 6 cycles

11. In the setting of ART in the following situations:
   • To convert an ART cycle to IUI when at least 2 follicles ≥15 mm in diameter are present (particularly in the setting of diminished ovarian reserve or on the 2nd or greater ART cycle when maximal dosage of gonadotropins are being used); OR
   • Following an ART cycle that fails to result in conception due to poor ovarian response or poor quality oocytes or embryos; OR
   • Following ≥ 2 ART cycles that have failed to result in a conception despite good quality oocytes or embryos. (Reichman, 2013)
IV. Assisted Reproductive Technologies (ART)

A. Assisted Reproductive Technologies (ART) are indicated for the following:

1. Unexplained infertility
2. Diminished ovarian reserve
3. Tubal factor infertility
4. Male factor infertility
5. Endometriosis
6. Ovulatory dysfunction
   - When ovulation induction has not resulted in conception
   - Poor response to ovulation induction
   - Hyper-response to ovulation induction where there is a risk for ovarian hyperstimulation or a multiple gestation
7. Failure to achieve conception with any other treatment modality

B. Assisted Reproductive Technologies (ART) are not indicated in the following situations:

1. When using autologous oocytes in the setting of a very poor or futile prognosis or when using autologous or donor oocytes in female recipients who are ≥55 years of age due to the obstetrical and medical risks of pregnancy. (ASRM (d))
2. When there is a failure to respond to ovarian stimulation (e.g., as demonstrated by failure to achieve at least 3 follicles >12 mm in diameter); OR
3. ART cycle does not demonstrate the attainment of at least one (1) embryo suitable for transfer (Note: an additional cycle may be considered when there is a significant change in treatment protocol after 1 such cycle including, but not limited to, a change in gonadotropin dosage that does not exceed pharma guidelines, a change in agonist/antagonist protocol or a change in the clinical presentation); OR
4. Lack of viable spermatozoa; OR
5. Ovarian failure where a couple is attempting conception with their own gametes; OR
6. Recurrent pregnancy loss except in the setting of recurrent aneuploidy or ≥5 unexplained losses [See also: Recurrent Pregnancy Loss and IUI, Gonadotropins and Clomid, Letrozole and Tamoxifen]; OR
7. Numerous ≥ 2 ART cycles without adequate egg quality or production, fertilization and/or embryo quality or development; OR
8. When using autologous oocytes in the setting of very poor/futile prognosis, defined as follows (Fertility Solutions Expert Panel):
   - FSH level ≥15 mIU/ml if ≥40 years of age
   - FSH level ≥20 mIU/ml if <40 years of age
9. Gonadotropins are not indicated:
   - In total doses that exceed 450 IU/day for controlled ovulation stimulation (Nargund 2017; van Tilborg 2017; Youseff 2018; Gerber 2020); OR
C. Natural (unstimulated) Cycle Assisted Reproductive Technologies (ART) are indicated for all females under the age of 35 and all patients' ≥ 35 years of age with normal ovarian reserve.

D. Natural cycle IVF is not indicated:
   1. In the setting of diminished ovarian reserve in females ≥ 35 years of age;
   OR
   2. There have been not more than 2 natural ART cycle attempts with a failure to obtain an embryo suitable for transfer; OR
   3. There has been a failure to attain a conception following two natural cycle intended retrieval cycle starts.

E. Freezing of ALL oocytes or embryos (when this is a covered benefit) is indicated in the following situations:
   1. Avoidance of ovarian hyperstimulation syndrome; OR
   2. For pre-implantation genetic testing for a monogenic disorder (PGT-M) or aneuploidy screening (PGT-A) or testing for structural rearrangements (PGT-SR); OR
   3. For enhancing the uterine environment.

F. Fresh oocyte retrievals are not indicated when previously frozen oocytes (M2) or embryos of at least BB grading quality (or equivalent) are available for transfer and if tested, are genetically normal.

G. Intracytoplasmic Sperm Injection (ICSI)
   ICSI is indicated for the following:
   1. Male factor infertility
      • "Male factor" infertility is seen as an alteration in sperm concentration and/or motility and/or morphology in at least two sperm analyses, collected 1 and 4 weeks apart. (WHO, 1999)
   2. After failed conventional insemination (either complete failure or lower-than-expected rates (<50%). (Palermo et al, 1999; Benadiva et al, 1999; Katrop et al, 1999; Optum Infertility Expert Panel 2018)
   3. Failed attempts at traditional IVF or conventional insemination when the quality of the ovarian stimulation was not the main cause of failure. (Van der Westerlaken et al, 2005)
   5. When using previously cryopreserved oocytes.

   ICSI is not indicated for the following:
   1. Unexplained infertility (Foong, 2006)
   2. Advanced maternal age (Kim, 2007)
   3. Low oocyte yield (Kim, 2007)
   4. Repeat IVF attempts after documented poor ovarian stimulation (Roest et al, 1998; Kinzer, 2008; Westerlaken, 2005)
5. Routine IVF (Bhattacharya, 2001; Geng, 2020)

6. When the diagnosis is limited exclusively to teratospermia unless <2% strict morphology has been demonstrated on at least two semen analyses.

### H. Cryopreservation

Embryo or mature oocyte cryopreservation when this is a covered benefit is indicated:

1. In the prevention of ovarian hyperstimulation syndrome
2. In the context of elective single embryo transfer to freeze and store supernumerary embryos
3. In the context of pre-implantation genetic testing, allowing for the return of test results
4. In the presence of poor endometrial development
5. When there is a failure to obtain sperm at the time of a fresh ART cycle at egg retrieval
6. In the context of freeze only cycles:
   - All embryos are cryopreserved with the intent for subsequent transfer within a 6 month time period
7. Medically necessary cryopreservation for individuals facing gonadotoxic therapy when this is a covered benefit

Embryo or mature oocyte cryopreservation is not indicated:

1. For the purpose of embryo or oocyte accumulation or banking
2. For planned oocyte cryopreservation unless specifically covered in plan documents

### VI. Elective Single Embryo Transfer (eSET)

#### A. Elective single blastocyst embryo transfer (eSET) is indicated in the following situations (AHRQ, ASRM):

1. Patients with a favorable prognosis as defined as:
   - Expanded day 5 or 6 blastocysts with well-defined inner-cell mass and trophectoderm as defined by the individual embryology laboratory AND one of the following:
     - Embryo(s) or eggs available and suitable for cryopreservation; OR
     - Presence of one or more euploid embryos regardless of the female’s age; OR
     - Previous live birth after an IVF cycle.

2. All patients undergoing ovum donation where the donor is <35 years of age.

3. For females <35-37 years of age eSET is further indicated by one of the following:
   - On the 1st full ART embryo transfer cycle; OR
   - On the 2nd full ART embryo transfer cycle if the prognosis is
1. On the 3rd full ART embryo transfer cycle if the prognosis is favorable for females $<35$ years of age; OR
2. A euploid embryo is available for transfer.
3. For patients between 35 and 37 years of age, strong consideration should be made for a single-embryo transfer.

4. For females 38-40 years of age eSET is further indicated:
   - On the 1st full ART embryo transfer cycle if the prognosis is favorable as defined above; OR
   - A euploid embryo is available for transfer.
   - For patients between 38 and 40 years of age, no more than three untested cleavage stage embryos or two blastocysts should be transferred.

5. Patients 41-42 years of age should plan to receive no more than four untested cleavage stage embryos or three blastocysts.

6. In women $>43$ years of age, there are insufficient data to recommend a limit on the number of embryos to transfer when the patient uses her own oocytes. Caution should be exercised as the risk associated with multiple pregnancy increases dramatically with advancing maternal age.

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;35</th>
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<th>38-40</th>
<th>41-42</th>
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<td>(fresh or frozen)</td>
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<td>1</td>
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<tr>
<td>prognosis embryos</td>
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</tbody>
</table>

B. Multiple blastocyst embryo transfer is indicated in the following situations (AHRQ):
1. The transfer of 2 blastocyst embryos may be considered if no favorable
prognosis embryos are available.

2. For females 35-37 years of age:
   - On the 3rd full ART embryo transfer cycle the transfer up to 2 embryos may be considered.

3. For females ≥38 years of age:
   - The transfer of up to 2 blastocyst embryos may be considered if there is only one favorable prognosis embryo.
   - The transfer of 3 blastocyst embryos may be considered if there are no favorable prognosis embryos are available.
   - Only 1 euploid blastocyst should be transferred.

C. Multiple cleavage stage embryo transfer is indicated in the following situations (ASRM 2017):

1. For females <35 years of age with a favorable prognosis no more than 1 embryo should be transferred. All others should have no more than 2 embryos transferred

2. For females <35-37 years of age with a favorable prognosis no more than 1 embryo should be transferred.
   - Females with fewer than 2 high quality embryos should have no more than 3 embryos transferred.

3. For females 38-40 years of age with a favorable prognosis no more than 3 embryos should be transferred.
   - All others should have no more than 4 embryos transferred.

4. For females 41 - 42 years of age with a favorable prognosis no more than 4 embryos should be transferred. All others should have no more than 5 embryos transferred.

The following unproven adjuncts are not indicated when used in conjunction with an ART cycle unless otherwise medically indicated: They include but are not limited to Dehydroepiandrosterone, Testosterone, Growth Hormone, Aspirin, Heparin, antioxidants for the female partner, seminal plasma, platelet-rich plasma, intravenous immune globulin (IVIG), intralipid.

Reproductive medicine (endometrial receptivity analysis), RNA gene expression profile, 238 genes by next-generation sequencing, endometrial tissue, predictive algorithm reported as endometrial window of implantation (e.g., pre-receptive, receptive, post-receptive) is not indicated.

VII. Pre-Implantation Genetic Testing

A. Pre-implantation genetic testing for a monogenic disorder or structural rearrangement (PGT-M, PGT-SR) for the diagnosis of known genetic disorders only when the fetus is at risk for the genetic disorder or there is a risk for recurrent pregnancy loss. This would include, but is not limited to the following:

1. Autosomal dominant disorders;
2. Sex-linked (X or Y chromosome) disorders;
3. Autosomal recessive diseases for which very specific mutations in heterozygosity can lead to a phenotype;
4. Recessive disorders (e.g. Spinal Muscular Atrophy) where it is not atypical for an affected child to have inherited one of the deletions in a de novo fashion.
5. Unbalanced and balanced translocations (where there is a risk for the balanced translocation to become unbalanced).
6. At least one intended parent is a carrier for a mitochondrial condition.

B. Check the benefit documents and state mandates for coverage of pre-implantation genetic diagnosis (PGT-M or PGT-SR). PGT-M and PGT-SR may be considered a covered expense if the fetus is at risk for a genetic disorder. The medical condition being prevented must result in Significant Health Problems or Severe Disability and be caused by a single gene (PGT-M) or structural changes of a parents’ chromosome (PGT-SR). Significant Health Problems or Severe Disability is defined as: A disability or impairment that is physical or mental and substantially limits one or more major life activities. The impairment is expected to last at least 12 months or result in death. (Department of Labor; Office of Disability Employment Policy; Federal Government Definition for Social Security Disability Benefits)

C. Pre-implantation genetic testing for aneuploidy is not indicated.

VIII. Gestational Carrier
The use of a gestational carrier is medically indicated when a specific condition precludes the intended parent from carrying a pregnancy or when carrying a pregnancy has a significant risk of death or harm to the woman or the fetus. A medical indication must be clearly documented in the patient’s medical record with evidence of appropriate specialist (e.g. maternal fetal medicine) consultation. The use of a gestational carrier is indicated in the following situations and warrants the need for an ART cycle to obtain an embryo(s) (ASRM, 2017; Dar, 2015):

1. Absence of the uterus (congenital or acquired and not as part of a sterilization procedure)
2. Significant uterine anomaly including but not limited to
   a. Irreparable Asherman’s syndrome
   b. Unicorneate uterus, bicornuate uterus, uterus didelphys and variants thereof with a history of recurrent (2 or more) pregnancy loss
   c. Unicorneate rudimentary uterine horn
   d. Irreparable submucosal leiomyomata uteri or other leiomyomata that would result in pregnancy loss or an inability to conceive
   e. Irreparable cervical incompetence
3. Absolute medical contraindication to pregnancy
   a. e.g. pulmonary hypertension
4. Serious medical condition that would be exacerbated by pregnancy or cause significant risk to the fetus
5. Serious obstetrical condition that would cause significant risk to the fetus including but not limited to:
   a. History of uterine rupture
   b. History of severe Rh sensitization
6. Endometrial factors such as failed, unexplained multiple (3 or more) ART
cycles despite the transfer of good quality embryos (recurrent implantation failure)
7. Recurrent (5 or more) unexplained pregnancy losses
8. Maternal use of teratogenic medications
9. Prior poor obstetrical history

IX. Tubal Surgery [See also: General Indications for Surgery]

A. Tubal surgery is indicated in the following situations (ASRM, 2015):
1. To treat proximal tubal occlusion with selective salpingography or hysteroscopy with tubal cannulation in an individual not pursuing ART.
   • There is good evidence to support HSG as the standard first line test to assess tubal patency, but it is limited by false-positive diagnoses of proximal tubal blockage.
2. To treat hydrosalpinges prior to an ART cycle by salpingectomy or proximal tubal occlusion.
3. To treat distal tubal disease in an individual not pursuing ART.

B. Tubal surgery is not indicated in the following situations:
1. When the intent of surgery is to enhance fertility in the absence of an infertility treatment benefit.
2. To treat proximal tubal occlusion for the following:
   • Salpingitis isthmica nodosum in the presence of a compromised distal tube
   • Chronic salpingitis
   • Obliterative fibrosis
3. Women over the age of 35.
4. In the presence of a significant male factor.
5. In an individual pursuing ART.
6. To treat mid or distal tubal occlusion by tubal cannulation.
7. To treat severe hydrosalpinges by neosalpingostomy.
8. To perform a fimbrioplasty, salpingostomy or neosalpingostomy for severe tubal disease or concomitant proximal and distal tubal occlusion.

C. Additional infertility treatment (e.g., controlled ovarian stimulation, IUI or ART) is not indicated within 12 months of tubal surgery for women <35 years of age or within 6 months for women ≥35 years of age unless additional infertility factors have been identified or there is recurrence of tubal compromise as documented by a postoperative hysterosalpingogram, laparoscopy, etc. This also applies to tubal cannulation for both unilateral and bilateral proximal occlusion when tubal patency has been reestablished. (ASRM, 2021)

X. Surgery for Endometriosis [See also: General Indications for Surgery]
A. Surgery for Endometriosis is indicated in the following situations:
   1. When there are gynecologic indications for surgery such as:
      - Pelvic pain that is not responsive to conservative management; OR
      - Presence of a pelvic mass and/or pain for which gynecologic diagnosis otherwise warrants surgical intervention; OR
      - An alternative for women who do not wish to pursue ART.

B. Surgery for Endometriosis in asymptomatic women is not indicated in the following situations:
   1. When the intent of surgery is to enhance fertility in the absence of an infertility treatment benefit.; OR
   2. Where the only aim is to diagnose and subsequently treat peritoneal endometriosis in order to improve the result of ART treatment; OR
   3. To perform an aspiration or cystectomy of an endometrioma prior to ART unless there are other gynecologic indications for surgery; OR
   4. To resect deep nodular implants of endometriosis prior to ART in order to improve the result of ART treatment.

C. Additional infertility treatment (e.g., controlled ovarian stimulation, IUI or ART) is not indicated within 12 months of surgery for women <35 years of age or within 6 months for women ≥35 years of age unless additional infertility factors have been identified or there is documentation of tubal compromise by a postoperative hysterosalpingogram, laparoscopy, etc. or recurrence of disease.

XI. Uterine Surgery
   A. Uterine Surgery is indicated in the following situations:
      1. To treat a uterine septum that extends >1cm from the superior uterine wall; OR
      2. To treat a unicornuate uterus based upon symptomatology associated with the presence of a functional rudimentary horn; OR
      3. To treat uterine polyps; OR
      4. To treat uterine adhesions; OR
      5. To treat the following:
         - Submucosal myomas (FIGO classification 0 through 2) (Munro, 2011)
         - Intramural myomas that protrude into or significantly distort the uterine cavity (FIGO classification 3) (Munro, 2011)
         - Myomas that limit access to the ovary, occlude the Fallopian tube(s), or are located at the myometrial/endometrial junction
         - Large (≥ 4 cm) myomas following a failed ART cycle
B. Uterine Surgery is not indicated in the following situations:

1. When the intent of surgery is to enhance fertility in the absence of an infertility treatment benefit; OR
2. To treat a uterine septum that extends ≤ 1 cm from the superior uterine wall (an arcuate or sub-septate uterus); OR
3. To treat a bicornuate uterus; OR
4. To treat a uterus didelphys; OR
5. To treat subserosal or pedunculated fibroids prior to ART in order to improve the result of ART treatment.

C. Additional infertility treatment (e.g., controlled ovarian stimulation, IUI or ART) is not indicated within 12 months of surgery for women <35 years of age or within 6 months for women ≥35 years of age unless additional infertility factors have been identified or there is documentation of tubal compromise by a postoperative hysterosalpingogram, laparoscopy, etc. or recurrence of disease.

XII. Male Factor Infertility

A. Varicocele Repair/Varicocelectomy (Schlegel 2020):

Surgical varicocelectomy is indicated in men attempting to conceive who have palpable varicocele(s), infertility, and abnormal semen parameters, except for azoospermic men.

Varicocelectomy is not indicated for men with non-palpable varicoceles detected solely by imaging.

Varicocelectomy is not indicated for men with clinical varicocele and non-obstructive azoospermia.

B. Sperm Retrieval

Surgical sperm aspiration is indicated for obstructive azoospermia in the setting of:

- Congenital absence of the vas deferens (carrier of cystic fibrosis gene (Jaffe, 1994), OR
- Infection, OR
- Vasectomy, OR
- Trauma.

BY:

1. Microsurgical epididymal sperm aspiration (MESA) (Schlegel, 1994, 2020; Tourmaye, 1994) OR
2. Percutaneous epididymal sperm aspiration (PESA) (Craft, 1995), OR
3. Open testicular biopsy (TESE) (Schlegel, 1997, 2020; Schlegel, 1999) OR
4. Percutaneous testicular sperm aspiration (TEFNA) (Persson, 1971),
5. Percutaneous testicular needle biopsy (PercBiopsy) (Sheynkin, 1998)

Surgical sperm aspiration by microdissection testicular sperm extraction (TESE) is indicated for non-obstructive azoospermia in the setting of:

- Maturation arrest, OR
- Sertoli-only syndrome

BY:

1. Microdissection testicular sperm aspiration (mTESE) OR
2. Open testicular biopsy (TESE) (Schlegel, 1997, 2020; Schlegel, 1999) OR
3. Percutaneous testicular sperm aspiration (TEFNA) (Persson, 1971), OR
4. Percutaneous testicular needle biopsy (PercBiopsy) (Sheynkin, 1998)

Men with retrograde ejaculation (RE) may be treated with:

- Sympathomimetics and alkalinization of urine with or without urethral catheterization, OR
- Induced ejaculation, OR
- Surgical sperm retrieval.

Men with aspermia may be treated with (Schlegel 2020):

- Surgical sperm extraction, OR
- Induced ejaculation (sympathomimetics, vibratory stimulation or electroejaculation).

Surgical sperm aspiration is not indicated in the absence of azoospermia.

C. Male Hypogonadotropic Hypogonadism

Initial treatment with hCG injections (1,500-2,500 IU, twice weekly) is indicated followed by FSH, when indicated, after testosterone levels are normalized on hCG (Schlegel 2020).

<table>
<thead>
<tr>
<th>Clinical Evidence</th>
<th>Ovulation Induction</th>
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</thead>
</table>
|                   | Anovulatory females or those with oligomenorrhea or amenorrhea who wish to conceive should be treated with agents that induce ovulation once specific causative factors (e.g., thyroid disease, hyperprolactinemia) have been excluded or treated. Clomiphene citrate or letrozole is the initial agent of choice. Letrozole has been shown to have increased efficacy in the setting of PCOS. (Legro, 2014) Dosage adjustments should be based exclusively upon ovulatory response, and not be based upon failure to conceive. A failure to have an ovulatory response to
clomiphene or letrozole may warrant a trial of gonadotropins. If a woman has not conceived within 6 ovulatory cycles, a move to IVF would be the next treatment option. Gonadotropin treatment regimens should employ optimal stimulation regimens that ideally yield no more than 2 mature follicles. Females who do not conceive within 6 ovulatory cycles, are poor or hyper-responders to gonadotropin therapy should be directed to ART. (VanVoorhis, 1998)

**Ovarian Reserve**

- Ovarian reserve testing may consist of baseline FSH and estradiol levels, and measurement of anti-Müllerian hormone and antral follicle counts. (Nardo, 2009; ASRM, 2020)
- FSH levels over 10mIU/ml may be considered as suspect for diminished ovarian reserve. (ACOG, 2008)
- Menopausal levels of FSH range from 25.8 – 134.8 mIU/ml (NLM)
  - High FSH= 16.7 mIU/ml
  - Moderately high FSH = 11.7 mIU/ml
  - Normal FSH= <10 mIU/ml (IRP 78/549) (ASRM, 2012a,b)
    - FSH levels in and of themselves may not be solely and entirely predictive of pregnancy outcome particularly in women < 35 years of age as ovarian reserve reflects oocyte quantity and not quality (Steiner, 2017)
    - FSH levels should be evaluated in conjunction with additional predictors of cycle success including anti-Müllerian hormone (AMH), antral follicle count (AFC) as well as follicular response to stimulation and in the case of assisted reproductive technology (ART), oocyte quantity and quality
- Delivery rates for women with diminished ovarian reserve in excess of defined threshold levels of FSH are reported to be approximately 1%. (Scott, 2004)
  - Older women (age >40 years) with an elevated FSH (on day 3 of the menstrual cycle) may not be candidates for undergoing ART, as they may have significantly lower implantation rates and clinical pregnancy rates, compared with a normal day 3 FSH in the same age category. (Luna, 2007)
- A lower antral follicle count is associated with infertility. (Rosen, 2011)
- Decreased ovarian reserve does not constitute an absolute contraindication to treatment. (ASRM, 2012a; ASRM, 2020)

**Letrozole**

- There is no evidence that controlled ovarian stimulation with Letrozole is superior to clomiphene for patients with unexplained infertility undergoing IUI. A multi-center randomized clinical trial involving 900 couples with unexplained infertility demonstrated rates of conception, clinical pregnancy and live births were statistically significantly lower than those in the standard therapy group (the combined clomiphene and gonadotropin groups). The rate of multiple gestations was not significantly reduced among women treated with letrozole.
Letrozole was found to be non-inferior to clomiphene in terms of conception, clinical pregnancy and live birth rates. While clomiphene treatment resulted in a high incidence of hot flashes (30.9% vs. 16.8%) compared to letrozole, letrozole treatment demonstrated a higher rate of headaches (41.9% vs. 34.9%) and joint or limb pain (5.8% vs. 2.7%) compared to clomiphene. (Badawy, 2009; Diamond, 2015)

- Letrozole is contraindicated in women with premenopausal endocrine status, in pregnancy, and/or lactation due to potential for fetal malformations. According to the manufacturer (Novartis) the drug should only be used for its primary indication- breast cancer therapy for postmenopausal women. Secondary to concerns about teratogenicity, the FDA issued a strong label warning against the use of letrozole in reproductive age women seeking pregnancy. However, a study concluded that there was no overall difference in the rates of major and minor malformations between clomiphene and letrozole, but it appeared that congenital cardiac anomalies were less frequent in the letrozole group. (Tulandi, 2006)

- Two meta-analyses comparing letrozole with clomiphene as a first-line agent for ovarian stimulation demonstrated no difference in pregnancy and live birth rates (Donghong, 2011; Misso, 2012). As compared with clomiphene, letrozole was associated with higher live-birth (27.5% vs. 19.1%) and ovulation rates (88.5% vs. 76.6%) among infertile women with the polycystic ovary syndrome who were treated for up to 5 menstrual cycles (Legro, 2014).

- Letrozole compared to clomiphene demonstrated a lower incidence of hot flushes (20.3% vs. 33%) but a higher incidence of fatigue (21.7% vs. 14.9%) and dizziness (12.3% vs. 7.6%) and a lesser, but not significant, increase in endometrial thickness (2.4 ± 3.8 mm vs. 3.4 ± 3.7 mm) (Legro, 2014)

- A randomized trial of 900 women with unexplained infertility treated with letrozole demonstrated a lower clinical pregnancy rate (22.4% v. 28.3%), lower singleton gestation rate (16.1% v. 22%) and a higher multiple gestation rate (13.4% v. 9.4%) compared to women treated with clomiphene. Side effects were also different with letrozole resulting in a higher incidence of abdominal bloating (18.6% v. 16.8%), breast pain (7.2% v. 6.4%), headaches (41.9% v. 34.9%) and joint or limb pain (5.8% v. 2.7%) but a lower incidence of constipation (2.7% v. 9.4%) and hot flashes (16.8% v. 30.9%) compared to clomiphene. (Diamond, 2015)

Intrauterine Insemination

- Cervical factor infertility may be subject to a trial of IUI, but should move to treatment with ART if IUI is not successful within 4 cycles. (Guzick, 1999)

- Natural cycle IUI and controlled ovarian stimulation with clomiphene or letrozole with IUI are equally effective in the treatment of mild to moderate male factor infertility (AHRQ 2019)

- For unexplained infertility, a retrospective cohort study of 1738 women undergoing 4199 treatment cycles using both clomiphene citrate and intrauterine insemination reported that pregnancy rates decrease with advancing maternal age and with subsequent treatment cycles. The authors concluded that it is reasonable to offer a limited number of cycles of clomiphene citrate and intrauterine insemination as first-line therapy in
younger women with tubal patency without regard to ovulatory status (Dovey, 2008). Studies of women 40 years and older report age-related decline in fecundity and cumulative live birth rates with controlled ovarian stimulation, intrauterine insemination and in vitro fertilization. (Harris, 2010; Wiser, 2012; ASRM, 2014)

- Natural cycle IUI: The use of IUI appears to improve cycle fecundity when combined with ovarian stimulation. In one trial comparing intercourse with insemination in a natural cycle, conceptions occurred in 6 of 145 (4.1%) IUI cycles and 3 of 123 (2.4%) intercourse cycles ($P_{.46}$) (Kirby, 1991). One would need to provide 100/2.71 or 37 cycles of IUI therapy to obtain a single additional pregnancy compared with control cycles. (ASRM, 2006)

- Unexplained infertility in females under the age of 35 may initially be addressed with a limited (≤3) number of clomiphene IUI cycles but should progress rapidly to ART. Females age 35 and older should be advised to move directly to IVF. (ASRM, 2020; Hendricks, 2006)

- When used in combination with IUI, CC seems to be beneficial compared with expectant management. One study randomized 67 females with unexplained infertility to CC/IUI or expectant management for up to 8 cycles. Fourteen patients achieved pregnancy with CC/IUI treatment over 148 cycles (9.5% pregnancy rate per cycle), compared with 5 patients managed expectantly (over 150 cycles; 3.3% pregnancy rate per cycle). In a more recent trial, 475 females were observed for up to 3 cycles of CC/IUI. There were 123 pregnancies over 1,294 cycles and 98 ongoing or live births (7.6% ongoing or live births per cycle). Up to three cycles is a common therapeutic regimen before progressing to more aggressive therapies. (ASRM, 2013, 2020)

- After 6 cycles of gonadotropin/IUI the cumulative pregnancy rate ranges from 0 to 48.5%. (Merviel, 2010; Aboulghar, 2001)

- The pregnancy rate per cycle appears to diminish after the 3rd cycle. (Merviel, 2010)

- After 3 cycles of gonadotropin/IUI 39.2 to 87% of conceptions will have occurred. (Merviel, 2010; Aboulghar, 2001; Sahakyan, 1999; Dickey, 2003)

- After 4 cycles of gonadotropin/IUI 89 to 98% of conceptions will have occurred. (Merviel, 2010; Aboulghar, 2001; Sahakyan,1999; Nuojua-Huttunen,1999; Dickey, 2003)

- Women age 38-39 years old have a diminished prognosis following 2 gonadotropin/IUI cycles and women ≥ 40 years have a diminished prognosis after one cycle. (Sahakyan, 1999; Harris, 2010)

- Women ≥ 41 years old have a diminished prognosis with clomiphene citrate/IUI treatment. (Aboulghar, 2001)

- Clomiphene citrate may be as effective as gonadotropins when used in conjunction with IUI in cases of cervical factor, mild male factor and unexplained infertility.

- Pregnancy rates for Clomid/IUI (2%-19.3%) do not differ from those involving gonadotropin/IUI (7%-19.2%) or low dose (75 IU/day) gonadotropin/IUI (8.7%-16.3%) but the incidence of twin gestations is
markedly reduced (12.5% vs. 28.6% and 29.3% respectively). (McClamrock, 2012; Danhoff, 2018; Dankert, 2007; ASRM, 2020)

- Controlled ovarian stimulation and IUI may increase the live birth rate 5.6 fold in women with minimal or mild endometriosis compared to expectant management. (Tummon, 1997)

- ART is recommended for women with moderate or severe endometriosis. (ESHRE, 2013)

- Cumulative pregnancy rates within 4 cycles are 51.44% and 25.4% for clomiphene and gonadotropins respectively (the difference in pregnancy rates is not statistically significant). (Ecochard, 2000; Guzik, 1999; Reindollar, 2010, 2011)

- There is no evidence that, absent sexual dysfunction, cervical trauma or mild male factor infertility natural cycle (i.e., no ovarian stimulation) IUI has any benefit over appropriately timed heterosexual intercourse.

- Natural cycle IUI may be considered in the setting of donor insemination when no other infertility factor is present.

- There is no evidence from the published studies that intrauterine insemination is an effective treatment for cervical hostility. (Helmerhorst, 2009)

- A single timed insemination per cycle is sufficient as there is no benefit to additional inseminations per cycle. (Osuna, 2004; Albrozi, 2003; Tonguc, 2010)

- There is no evidence in published studies that reverting to treatment with IUI following failed ART cycles due to poor ovarian response, poor quality oocytes or embryos has been proven to be clinically effective.

- IVF compared with IUI presents superior pregnancy rates in the setting of two or more follicles. (Reichman, 2013)

Treatment in the Natural Cycle

- There is no evidence in the medical literature that timed coitus based upon serial ultrasound monitoring of follicular development improves pregnancy outcome. (ASRM, 2006, 2012a, 2012b; Lewis, 2004)

- Natural cycle ART may have some benefit in individuals who prefer to avoid ovarian stimulation.
  - Pregnancy rate per cycle ranges from 9.8 to 19.2%. (Schimberni, 2009; Gordon, 2013)
  - Live birth rate per initiated cycle ranges from 0 (age group >42) to 15.2% (age group <35). (Gordon, 2013)
    - Across all age groups the cumulative live birth rate per cycle is reported as 2.6% with a live birth rate per patient ranging from 6.8 to 7.9% and the probability of a live birth reaching only 5.8% after 4 consecutive treatment cycles. (Polyzos, 2012)
    - Live birth rates per intended retrieval are 13.9% for
females <35 years of age, 10.7% for females 35-37 years of age, 7.1% for females 38-40 years of age, 4.1% for females 41-42 years of age and 0.6% for females >42 years of age with corresponding implantation rates of 32.7%, 34.7%, 23.8%, 14.9% and 5.1% respectively.

- In the setting of diminished ovarian reserve, however, the live birth rates drop dramatically to 13.9%, 3.4%, 6.1%, 2.5% and 0.5% respectively. (SART, 2016)

- Cycle cancellation rates range from 46 (age group <35) to 77% (age group >42) (Gordon, 2013) More recent data demonstrate cancellation rates ranging from 23.4% to 27%. (SART, 2015)

Embryo Banking and Use of Frozen Embryos

- There is no evidence in the medical literature to support the practice of repeated ART cycles for the purpose of accumulating (banking) embryos for later use (egg retrievals without a fresh or frozen embryo transfer) with the exception of freeze all cycles for medical necessity.

- It is clinically appropriate and cost effective to utilize all frozen embryos for transfer prior to another fresh ART cycle. (Forman, 2013; Richter, 2006; Shapiro, 2011, 2013)

Use of Clinical Adjuncts in ART (Lensen, 2019)

- Numerous adjuncts have been utilized in an attempt to improve the follicular response to stimulation, fertilization, embryo development or implantation. Many studies have been poorly designed and demonstrate little to no improvement in outcomes. Specifically:
  - Dehydroepiandrosterone: The current evidence is too inconsistent to draw any firm conclusions on the beneficial effect of DHEA for poor responders undergoing IVF. (Nagels, 2015; Kamath, 2020)
  - Testosterone: Testosterone pretreatment has not been proven to be beneficial for poor responders and evidence from larger ongoing RCTs is awaited. (Nagels, 2015; Kamath, 2020)
  - Growth Hormone: There is a lack of strong evidence to support the use of adjuvant GH in ART. Furthermore, there is no agreement on the dosage and length of GH administration which have varied among the studies. (Choe, 2018; Kamath, 2020)
  - Aspirin: There is no proven efficacy for routine use of aspirin as an adjuvant in IVF treatment. (Siristatidis, 2016; Kamath, 2020)
  - Heparin: Its routine use as an adjuvant in the general population undergoing IVF is not supported by the current literature. (Akhtar, 2013; Kamath, 2020)
  - Antioxidants for the female partner: The current evidence does not support the routine use of supplemental antioxidants for women undergoing IVF. (Showell, 2017; Kamath, 2020)
  - Seminal Plasma: The Cochrane review that compiled these RCTs concluded that there was no clear evidence of a difference in LBR
with seminal plasma application or exposure. (Ata, 2018; Kamath, 2020)

- Platelet-rich Plasma: Use of PRP is not approved by the U.S. Food and Drug Administration and is therefore an off-label use. Currently, the use of PRP in reproductive medicine should be considered experimental. (Kamath, 2020; de Miguel-Gomez, 2021)

- IVIG: Intravenous immunoglobulin (IVIG) is an important therapy in diverse autoimmune and inflammatory disorders, as well as primary immunodeficiencies. Its effects on the systemic immune system are complex and how it might affect the uterine immune system is completely unknown. A recent systematic review included two small trials evaluating the application of IVIG during ovarian stimulation or near the time of embryo transfer, and reported no clinical benefit. (ASRM, 2018; DePlacedo, 2019; Galeotti, 2017; Stephenosn, 2000)

- Intralipid: Intralipid is an emulsion of soy bean oil, egg phospholipids and glycerin, commonly administered as intravenous nutrition for patients not able to tolerate an oral diet. Intralipid is thought to also modulate immune function and has been observed to reduce the probability of spontaneous abortion in a mouse model. A systematic review identified only a single trial: a double-blind RCT which found that giving intralipid to women with ‘elevated NK cell levels’ did not improve chemical pregnancy rate. (ASRM, 2018; Dakhly, 2016)

- Endometrial Receptivity Assay (ERA) (Lensen, 2019)

  - The ERA is a novel diagnostic test based on microarray technology, created by a single commercial enterprise. The test requires an appropriately timed endometrial biopsy to measure the endometrial expression of 248 genes. A prediction model is then applied to categorize the endometrium as one of: “receptive, pre-receptive, or proliferative”. This categorization then allows women to undergo a more “personalized” embryo transfer, where the exact timing of the transfer has been aligned to each woman’s personal window of implantation. The test has repeatedly demonstrated that women with recurrent implantation failure are more likely to suffer from a non-receptive endometrium, and approximately 25% of women with recurrent implantation failures are reported to have an altered implantation window. Additionally, the test applied to the same women biopsied in multiple cycles will consistently produce the same result (Ruiz-Alonso, 2013; Diaz-Gimeno, 2013). However, to date, only a single RCT has been completed, for which only interim and per-protocol analyses are available (Simon, 2016; Simon 2019). It is therefore not possible to confirm whether or not the ERA increases the probability of live birth. A recent study demonstrated no improvement in live birth rate when the ERA was utilized for the general ART population as a screening tool (Riestenberg, 2021)

Tubal Disease

- Studies treating patients with bilateral proximal tubal occlusion showed that the obstruction is relieved in about 85% of the tubes with tubal cannulation and
that about half of the patients conceive. Approximately a third of the opened tubes subsequently re-occlude. (Honore, 1999; Pinto, 2003) A meta-analysis on tubal cannulation demonstrated that the pooled (both unilateral and bilateral obstruction) cumulative clinical pregnancy rates were 22.3% (95% confidence interval [CI]: 17.8%–27.8%) at 6 months and increased slowly to achieve 26.4% (95% CI: 23.0%–30.2%) at 12 months, 27.9% (95% CI: 24.9%–31.3%) at 36 months, and 28.5% (95% CI: 25.5%–31.8%) at 48 months. The pooled (unilateral and bilateral obstruction) live-birth rate was 22% (95% CI: 18%–26%) and the pooled ectopic pregnancy rate was 4% (95% CI: 3%–5%) (26). In women with bilateral obstruction, the clinical pregnancy rate was 27% (95% CI: 23%–32%) (DeSilva, 2017). Relatively few women conceive naturally >6–12 months post cannulation. Consequently ART may be considered after 6 months to a year (depending upon age) after successful cannulation. The optimal treatment of unilateral proximal tubal occlusion has not been determined. One study reported similar pregnancy rates with ovarian stimulation and intrauterine insemination in patients with untreated unilateral proximal tubal occlusion and in those with unexplained infertility (Farhi, 2007). Therefore, there is no requirement for intervention with a unilateral proximal tubal obstruction with no distal abnormalities (ASRM, 2021)

- A good prognosis for distal tubal surgery is associated with patients who have no more than limited filmy adnexal adhesions, mildly dilated tubes (<3 cm) with thin and pliable walls, and a lush endosalpinx with preservation of the mucosal folds. (AFS, 1988)
- Intrauterine pregnancy rates after neosalpingostomy for mild hydrosalpinges range from 58% to 77% but decreases to 0% to 22% for severe disease. The corresponding ectopic pregnancy rates range from 2%-8% and 0%-17% respectively. (Nackley, 1998)
- Hydrosalpinges have been demonstrated to lower pregnancy, implantation and delivery rates. (Camus, 1999; Zeyneloglu, 1998)
- Laparoscopic salpingectomy or tubal occlusion has been demonstrated to restore pregnancy and live birth rates to those of women without a hydrosalpinx. (Dechaud, 1998; Kontoravdis, 2006; Strandell, 1999)

**Endometriosis**

- The cumulative spontaneous pregnancy rate within 3 years (life table analysis) after surgery has been reported to range from 46% to 77% for moderate endometriosis and 44% to 74% for severe endometriosis. (Adamson, 1994; Nezhat, 1989; Vercellini, 2006)
- There is no evidence to support the use of adjunctive hormonal therapy to improve pregnancy rates prior to or following surgery for endometriosis. (Furness, 2004)
- ART pregnancy rates for women with moderate or severe endometriosis are lower than those for patients with tubal factor infertility. (Barnhart, 2002)
- There is no medical evidence that laparoscopic aspiration or cystectomy of an endometrioma prior to ART shows any benefit over expectant management with regard to the clinical pregnancy rate. (Benschop, 2010)
Although the presence of bilateral endometriomas at the time of ART affects responsiveness to hyperstimulation, the quality of the oocytes retrieved and the chances of pregnancy are not affected. (Benaglia, 2013)

There is no evidence that resection of deep nodular implants of endometriosis prior to ART improves pregnancy outcome. (Bianchi, 2009, Papaleo, 2011)

**Uterine Factor**

- 79% of pregnancies in patients with a uterine septum may end in miscarriage. (Homer, 2000)
- The role of metroplasty in the treatment of infertility is not clear. (Pabuccu, 2004)
- ART appears to be less successful in women with a septate uterus. (Lavergne, 1996)
- There is no evidence to support resection of a uterine septum that extends <1cm (sub-septate or arcuate uterus) from the superior uterine wall.
- In the largest series of women with a unicornuate uterus who were infertile or had recurrent pregnancy loss, the live birth rate in those with a communicating rudimentary horn was 15%, with a non-communicating rudimentary horn 28%, and with a rudimentary horn without a cavity 35%. (Akar, 2005)
- Polypectomy may improve spontaneous pregnancy rates. (Perez-Medina, 2005)
- Polyps <2 cm do not appear to affect ART outcome adversely. (Taylor, 2008)
- One large study of intrauterine adhesions demonstrated a term pregnancy rate of 81.3% among women with mild disease, 66.0% among women with moderate disease, and 31.9% of those with severe disease following surgical treatment. (Schenker, 1982)
- Sub-mucosal and intramural fibroids that protrude into the uterine cavity are associated with decreased pregnancy and implantation rates both of which improve following myomectomy. (Garcia 1984; Goldenberg, 1995)
- Subserosal and intramural myomas that do not distort the uterine cavity do not appear to affect ART outcome adversely. (Dietterich, 2000; Surrey, 2001; Yarali, 2002; Wang, 2004; Klatsky, 2007)
- A review suggests that fibroids with a submucous or an intracavitary component are associated with decreased fertility and increased spontaneous abortion rates. Myomectomy (either hysteroscopic, laparoscopic, or abdominal) is of value for submucosal fibroids. (Olive & Pritts, 2010)

**Intracytoplasmic Sperm Injection (ICSI)**

ICSI is a safe and effective treatment of male factor infertility. While the diagnostic criteria used to identify male factor infertility fail to predict decreased or absent fertilization in assisted reproductive technology (ART) studies to date support the safety and efficacy of ICSI to treat various male factor conditions. (ASRM, 2012) The rationale for using ICSI in other situations is to avoid a failure of fertilization. In the setting of unexplained infertility, a large meta-analysis demonstrated a fertilization rate
per oocyte retrieved of 67.5% using ICSI vs. 47.8% allocated to conventional insemination (Johnson, 2012) Other studies while demonstrating a higher fertilization rate with ICSI compared to conventional fertilization (58% vs. 47%) have shown no difference in clinical pregnancy or live birth rates (Bhattacharya, 2001; ASRM, 2020)

- In the setting of unexplained infertility, current evidence does not demonstrate any significant improvement in fertilization rate, embryo quality, implantation rate, clinical pregnancy rate or live-birth rate (Foong, 2006).

- In the setting of low oocyte yield, two controlled studies comparing conventional insemination vs. ICSI demonstrated no difference in fertilization rates, fertilization failure, embryo quality, mean embryos per patient, clinical pregnancy rates and miscarriage rates (Kim, 2007; Luna, 2011).

- There is no data demonstrating the benefit of ICSI when used in women over 35 years of age (Kim, 2007).

- There is evidence to support the use of ICSI when there has been a failure of fertilization with conventional insemination. While subsequent conventional insemination may result in fertilization rates ranging from 30%-97% the fertilization rate may be correlated with number of follicles, oocytes retrieved and mature oocytes (Roest, 1998; Kinzer, 2008). A prospective study however demonstrated a marked improvement in fertilization with ICSI (48%) compared to conventional insemination (115).

- There is no data regarding the use of ICSI when using cryopreserved oocytes. Nevertheless, changes in the zona pellucida associated with the freezing process may affect fertilization with conventional insemination, thus warranting the use of ICSI. (ASRM, 2012; ASRM, 2020)

- In the setting of pre-implantation genetic testing (PGT) ICSI may be warranted to ensure mono-spermic fertilization (Thornhill, 2005; ICSI in 2006: evidence and evolution. Hum Reprod Update 2005; ASRM, 2020)

- While an argument has been made that the use of ICSI should be used for all patients to minimize the risk for fertilization failure, a well powered, multi-center, randomized controlled trial demonstrated that the fertilization rate per oocyte retrieved was actually higher with conventional insemination compared to ICSI (Bhattacharya, 2001).

**Efficacy of eSET**

- Single embryo transfer is most applicable for transfer of blastocyst-stage embryos as these appear to have higher implantation rates compared to cleavage-stage embryos. (Papanikolaou, 2006; Blake, 2007; Zech, 2007)

- Compared with DET-conceived infants, eSET-conceived singletons are less likely to be born either preterm (RCT-based relative risk [RR] 0.37, 95% confidence interval [CI] 0.25–0.55) or with low birth weight (RCT-based RR 0.25, 95% CI 0.15–0.45; cohort study RR 0.51, 95% CI 0.29–0.91). (Grady, 2012)

- Following implementation of a mandatory eSET program, eSET fresh transfers
have resulted in clinical pregnancy rates of 67.7% (Csokmay 2011) and a live-birth rate of 64.6% (Kresowik, 2011) with a significant reduction in multiple-birth rate to 3-4%.

- The transfer of a single euploid blastocyst embryo yields comparable pregnancy rates to untested double blastocyst transfer (Forman 2013) and yield pregnancy rates comparable to egg donation cycles. (Griffo, 2013)

- Some studies suggest a lower initial pregnancy rate for eSET compared to two embryo transfer (Pandian 2009; McLernon 2010, van Montfoort 2006), but cumulative pregnancy rates are similar (54.7% for eSET vs. 49% for a double transfer). (Criniti, 2005; Henman, 2005; le Lannou, 2006)

- eSET in women under 37 resulted in increased cumulative live birth compared with multiple embryo transfer. In women aged between 37 and 40, CLBR in eSET group was similar with that in MET group. In both age groups, eSET reduced multiple birth rates. (Fujimoto, 2015)

- Double embryo or more was associated with a significantly increased risk for multiple pregnancy, placenta accreta, preterm premature rupture of membrane, cesarean section (CS), pre-term birth, low birth weight, small for gestational age, and early neonatal death compared with single embryo transfer. (Takeshima, 2016)

- Double frozen blastocyst transfer yielded a higher live birth per transfer, but 33% of births from double frozen blastocyst transfer were twins versus only 0.6% of single FBT. Double frozen blastocyst transfer was associated with statistically significant increases in preterm birth and low birth weight, the latter of which was statistically significant even when the analysis was limited to singletons. Of the blastocysts transferred via single frozen blastocyst transfer, 38% resulted in a liveborn child versus only 34% with double frozen blastocyst transfer. This suggests that two single FBTs would result in more liveborn children with significantly fewer preterm births when compared with double frozen blastocyst transfer. (Devine, 2015)

### Double Embryo Transfer

- In a randomized controlled study the twin rate with blastocyst transfer following double embryo transfer (DET) was 47% vs. 0% for eSET. (Gardner, 2004)

- Multiple gestation rates of 50% to > 60% have been reported following the transfer of two top quality blastocysts. (Gardner, 2004; Crinit, 2005; Balaban, 2000; Gardner, 2000)

- Pregnancy rates are similar for autologous eSET versus double blastocyst transfer (65%-76% vs. 63%-79%). (Salame, 2011)

### Blastocyst Stage Embryos

- Other studies demonstrate high implantation rates (65%) and live birth rates (54%) when supernumerary blastocysts are available for cryopreservation. (Hill, 2013; Mullin, 2012; Dare, 2004)

- Extended embryo culture allows transfer of embryos with the highest implantation potential. (Balaban, 2000; Shapiro, 2000)

- Blastocyst has been found to achieve higher implantation and live birth rates
compared with cleavage stage embryos. (Gardner, 2007; Blake, 2007; Papanikolaou, 2008).

- Favorable (>50%) pregnancy rates have been reported for single blastocyst transfer in women >35 years of age. (Davis, 2008; Shapiro, 2000)

**Pre-implantation Genetic Testing for Aneuploidy (PGT-A)**

- **Analysis** of data from national assisted reproductive technology (ART) surveillance systems from 2011-2012 has found that the use of PGT-A is not associated with improved rates of clinical pregnancy or live birth after fresh autologous blastocyst transfer among women aged ≤37 years, irrespective of the indication (Chang, 2016; Kushnir, 2016).

- **Retrospective** studies suggest a benefit of PGT-A testing, particularly in women up to age 43 years (improved live-birth rate per cycle start seen in women aged 38-40 years with PGT-A and implantation rates in women 40-43 years of age (implantation rate was 50.9% in euploid embryos compared with unscreened fresh [23.8%] and FET [25.4%] cycles) (Whitney, 2016; Lee, 2015).

- **eSET:** When comparing live-birth rates per elective single embryo transfer cycle in a 2015 study, there was no significant difference between groups (20.9% without PGT-A vs. 24.4% with PGT-A) (Ubaldi, 2017).

- **Recurrent Pregnancy Loss (RPL):** to date, the literature has not suggested an improved live-birth rate using PGT-A in RPL patients.

- One study found that applying PGT-A to patients with unexplained RPL (n=232) was not cost-effective when compared with expectant management (n=302); though PGT-A decreased miscarriage rates (7% vs 24%), the live-birth rate was not improved (40% vs 55%) (Murugappan, 2015).

- There are lingering concerns pertaining to the embryo biopsy and interpretation of the genetic testing. Specifically, these relate to the issues surrounding Mosaicism, Embryo Damage and the extremely challenging questions of false-positive testing and loss of euploid embryos between day 3 and blastulation all of which remain unanswered.

**Cryopreservation**

Traditionally, embryos are usually transferred in the same IVF cycle in which oocytes are collected. More recently there has been a shift in practice towards favoring freezing of the entire cohort of good quality embryos (Weinerman and Mainigi, 2014; Chen, 2016; Shapiro, 2014a, b). In such “freeze only” cycles, all good quality embryos are frozen and transferred at a later stage (Aflatoonian, 2012; Doody, 2014). Among the advantages of using frozen embryo transfer (FET) cycles is the associated reduction in ovarian hyperstimulation syndrome (OHSS) and/or the facilitation of pre-implantation genetic testing (Devroey, 2011; Maheshwari, 2012; Roque, 2015). Additionally, delay of transfer to a later FET cycle may be associated with an improvement of receptivity for implantation of the uterine environment in the presence, for example of a premature progesterone elevation or thin endometrial lining (Shapiro, 2010; Shapiro, 2011). Of additional and perhaps greater import is the need to freeze supernumerary embryos in the context of elective single embryo transfer cycles.
Cumulative live birth rates appear to be similar to those of a fresh transfer of cleavage stage embryos (45.6% vs 46.4%, but are superior when blastocyst stage embryos are transferred/cryopreserved (45.3% vs 65.7%) (Zhu, 2011; Maheshwari, 2012; Zacca, 2018). Other studies have demonstrated comparable live birth outcomes for fresh vs. frozen/thaw transfer cycles (Chen, 2016; Vuong, 2018).

From a neonatal perspective numerous registry studies and meta-analyses have demonstrated that infants resulting from fresh autologous ET have reduced birth weight, increased risk of low birth weight, and other perinatal risks associated with birth weight when compared with infants resulting from the transfer of frozen-thawed embryos. FET cycles yield increases in birth weights ranging from 80g to 250 g (Ishihara, 2010; Kalra, 2011; Wennerholm, 2013; Nakashima, 2013; Li, 2014; Schwarze, 2015; Shapiro, 2016)

Mature oocyte cryopreservation was recognized as being appropriate treatment as defined in this document by the American Society for Reproductive Medicine in 2013 (ASRM, 2013). Utilization of cryopreserved autologous oocytes leads to similar outcomes, including pregnancy rates compared to women undergoing IVF with frozen embryo transfer (45.5% vs 52.3%) (Alvarez, 2015) Several studies, however, have also observed decreased success with oocyte vitrification in women of advanced age. A large Italian retrospective cohort study of 450 couples undergoing oocyte thaw cycles using previously vitrified supernumerary oocytes found that maternal age was inversely correlated with delivery rates (Rienzi, 2012). Another report also noted that ongoing pregnancy rates in 182 oocyte vitrification/warming cycles were significantly lower in women over 40 years of age (Ubaldi, 2010). In this study, age stratified cumulative pregnancy rates per transfer were: 48.6% in %34 year-olds, 24.1% in 35–37 year-olds, 23.3% in 38–40 year-olds, and 22.2% in 41–43 year-olds. In summary, success rates with oocyte cryopreservation appear to decline with maternal age consistent with the clinical experience using fresh oocytes.

**Recurrent Pregnancy Loss**

Treatment for unexplained recurrent pregnancy (RPL) loss should be considered in the context of a successful outcome with expectant management alone. No apparent cause for RPL is identified in 50%-70% of couples. The chance for a future successful pregnancy may exceed 50%-60% depending upon maternal age and the number of previous losses (Lund, 2012; ESHRE, 2017). Five years after the first consultation, 66.7% (95% CI 63.7-69.7) had achieved a live birth, increasing to 71.1% (95% CI 68.0-74.2) after 15 years. There was a significantly decreased chance of at least one subsequent live birth with increasing maternal age; of women aged 40 years or older, 41.7% (95% CI 29.8-56.1) achieved a live birth within 5 years compared to 81.3% (95% CI 69.2-90.7) of women aged 20–24 years. There was also a significant decrease in chance of a live birth by increasing number of miscarriages before first consultation ranging from 71.9% (95% CI 67.5-76.1) in women with 3 miscarriages to 50.2% (95% CI 40.5-60.8) in women with 6 or more previous miscarriages. Only women 40 years of age or older had a successful outcome over time of <60% at 10 years of follow-up after the first consultation (approximately 35% at 1 year of follow-up). Another study demonstrated a predicted percentage success rate of subsequent pregnancy according to age and previous miscarriage history (Brigham, 1999). Success rates ranged from 84% [CI:77-90] for a 30 year old with 2 previous miscarriages down to 42% [CI:22-62] to 42% [CI:22-62] for a 45 year old with 6 previous losses.
Surgical Sperm Aspiration

Surgical testicular sperm aspiration has been shown to be an effective treatment for nonobstructive azoospermia (Schlegel, 1997). In 1999, Schlegel et al demonstrated successful sperm retrieval in 35% of random testicular biopsy cases and 52% in micro testicular biopsy. This shows that microsurgical testicular sperm aspiration is 1.5 time more effective than random biopsy of the testicle for nonobstructive azoospermia. (Schlegel, 1999)

For the surgical treatment of obstructive azoospermia, microsurgical epididymal sperm aspiration (MESA) has been found to be the optimal method as it yields the highest clinical pregnancy rates and greatest number of retrieved sperm. (Sheynkin, 1998) (Bernie, 2013) A live birth rate of 39% using MESA-ICSI vs 24% live birth rate using TESE-ICSI demonstrates a significantly higher birth rate with MESA. (van Wely, 2015) Cayan et al suggest that cryopreserved/thawed sperm retrieved through MESA and used with ICSI produces similar success rates when compared to fresh sperm retrieved through MESA. They found no significant difference in fertilization rates (58.4% for fresh sperm and 62% for frozen thawed sperm), clinical pregnancy rates (31.6% for fresh sperm and 36.8% for frozen thawed sperm), and live birth rates (21.1% for fresh sperm and 36.8% for frozen thawed sperm). (Cayan, 2001)

After a search of the current literature, there are no studies comparing pregnancy outcome rates using sperm obtained through surgical methods vs sperm obtained through ejaculation.

Varicocelectomy

Varicoceles have long been thought to be associated with male infertility. A recent meta-analysis observed higher estimated pregnancy rates for men undergoing repair of clinical varicocele compared to no treatment (Wang 2015). Pregnancy rates without treatment were assumed to be 17%, while rates were calculated to be 42% (95% CI 26% to 61%) with sub inguinal microsurgical varicocelectomy, 35% (95% CI 21% to 54%) with inguinal micro varicocelectomy, 37% (95% CI 22% to 58%) with inguinal open (non-microsurgical) surgery, and 37% (95% CI 19% to 61%) with laparoscopic surgery. For palpable varicoceles, observed the calculated estimated pregnancy rates were 52% (95% CI 24% to 83%) for sub inguinal micro varicocelectomy, 53% (95% CI 18% to 90%) for inguinal micro varicocelectomy, 55% (95% CI 27% to 88%) for inguinal open surgery, and 52% (95% CI 18% to 90%) for laparoscopic surgery. Another meta-analysis of ART outcomes evaluated the chance of pregnancy using ART for couples where men had varicocele repair relative to couples where the man had an untreated varicocele (Kirby, 2016). In these 7 non-randomized retrospective studies, only men with clinical varicoceles were considered. In this report by Kirby et al., the OR for pregnancy and live birth were 1.76-fold higher for men treated with varicocelectomy prior to ART.

In men with no palpable varicocele, surgical repair does not appear to be warranted. No demonstrable benefit of varicocele repair was observed in pregnancy or bulk seminal parameters with the exception of a possible small numerical effect on progressive sperm motility that is unlikely to be clinically important (Kim, 2016).

There is insufficient evidence to support varicocelectomy in the setting of a clinical varicocele and non-obstructive azoospermia. One study that reported return of...
adequate motile sperm in the ejaculate to avoid surgical sperm retrieval after varicocele repair had a success rate of only 9.6% (Schlegel, 2004).

<table>
<thead>
<tr>
<th>Definitions</th>
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<tbody>
<tr>
<td><strong>Amenorrhea</strong>: the complete lack of menstrual bleeding</td>
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<tr>
<td><strong>Anovulation</strong>: the lack of ovulatory menstrual cycles. Females with anovulation may still have periodic bleeding but these episodes are not associated with prior ovulation</td>
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<tr>
<td><strong>Bicornuate uterus</strong>: a bifurcated uterus</td>
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<tr>
<td><strong>Endometriosis</strong>: a condition where endometrial implants are located external to the uterine cavity. Often but not always associated with pain, pelvic adhesions, ovarian cysts</td>
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<tr>
<td><strong>Fimbrioplasty</strong>: reconstructive surgery of the distal fimbriated end of the fallopian tube</td>
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<tr>
<td><strong>Hydrosalpinx</strong>: distal occlusion of a fluid filled fallopian tube. Often causes denudation of the tubal cilia.</td>
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<tr>
<td><strong>Medical Futility</strong>: “Futility” refers to treatment that has a ≤1% chance of achieving a live birth</td>
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<tr>
<td><strong>Male Factor Infertility</strong>: World Health Organization Reference Limits for Human Semen Characteristics</td>
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<tr>
<td><strong>Semen Parameter</strong>: One-Sided Lower Reference Limit (Fifth Centiles With 95% Confidence Intervals):</td>
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<tr>
<td>Semen Volume 1.5 mL (1.4-1.7)</td>
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<tr>
<td>Total Sperm Number 39 million per ejaculate (33-46)</td>
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<tr>
<td>Sperm Concentration 15 million/mL (12-16 million/mL)</td>
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<tr>
<td>Vitality 58% Live (55-63%)</td>
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<tr>
<td>Progressive Motility 32% (31-34%)</td>
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<tr>
<td>Total Motility (Progressive + Non-Progressive) 40% (38-42%)</td>
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<tr>
<td>Morphologically Normal Forms 4.0% (3.0-4.0)</td>
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<tr>
<td>• <strong>Mild Male Factor</strong>: abnormalities in the semen analysis where the sperm concentration is ≥10 million/ml but &lt;15 million/ml and/or progressive motility is ≥ 30% but &lt;40% or ≥ 5 million total motile sperm</td>
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<tr>
<td>• <strong>Moderate Male Factor</strong>: abnormalities in the semen analysis where the sperm concentration is ≥5 million/ml but &lt;10 million/ml and/or progressive motility is ≥ 25% but &lt;30%</td>
<td></td>
</tr>
<tr>
<td>• <strong>Severe Male Factor</strong>: abnormalities in the semen analysis where the sperm concentration is &lt;5 million/ml or sperm preparation techniques result in a sperm concentration of &lt;1 million motile sperm/ml (Schlegel, 2020)</td>
<td></td>
</tr>
<tr>
<td>• Isolated teratospermia is considered a male factor when there is &lt;2% normal morphology on at least two semen analyses 1-4 weeks apart</td>
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<tr>
<td><strong>Metroplasty</strong>: surgical reconstruction of the uterus</td>
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<tr>
<td><strong>Neosalpingostomy</strong>: surgery to create a new opening in the distal end of the fallopian tube when there is complete fimbrial obstruction or obliteration</td>
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<tr>
<td><strong>Oligo-ovulation</strong>: Ovulatory menstrual cycles that are &gt;35 days apart</td>
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<tr>
<td><strong>Poor Prognosis</strong>: “Very poor prognosis” refers to treatment for which the odds of achieving a live birth are very low but not nonexistent (&gt;1% to &lt;5% per cycle). (ASRM, 2006)</td>
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<tr>
<td><strong>Recurrent Pregnancy Loss</strong>: Recurrent pregnancy loss is a disease distinct from</td>
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</table>
infertility, defined by two or more failed pregnancies.

**Salpingitis isthmica nodosum**: chronic nodular inflammation of the proximal fallopian tube often resulting in tubal occlusion

**Salpingectomy**: partial or complete removal of a fallopian tube

**Salpingostomy**: surgery to create an opening in the fallopian tube

**Septate uterus**: a congenital anomaly with incomplete resorption of the medial uterine wall. Sometimes associated with recurrent pregnancy loss and possibly infertility

**Tubal Factor Infertility**: Infertility that is caused by or associated with compromise of one or both fallopian tubes. This may be due to peritubal or fimbrial adhesions, blockage, or phimosis (narrowing)

**Unexplained Infertility**: Infertility for which no causative factor has been identified

**Unicornuate uterus**: a congenital anomaly with development of a hemi-uterus. Often associated with a rudimentary horn.

**Uterine Factor Infertility**: Infertility that is caused by or associated with compromise of the uterine (endometrial) cavity. This may be due to intrauterine lesions such as polyps, sub-mucosal leiomyomata, or synechiae (adhesions). Intramural, subserosal and external pedunculated leiomyoma have not been proven to be associated with infertility unless the endometrial cavity is distorted or they compromise a fallopian tube. Congenital anomalies such as a septate, bicornuate, unicornuate or didelphic uterus tend to be associated with recurrent pregnancy loss. A sub-septate (septum extending <1/4 the length of the uterine cavity) or arcuate (minimal indentation of the superior aspect of the uterus) are not associated with infertility or pregnancy loss.

**Uterus didelphys**: a congenital anomaly with a double uterus, sometimes with a double cervix and double vagina

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**Bibliography**


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<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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<tbody>
<tr>
<td>Luna M, Grunfeld L, Mukherjee T, et al.</td>
<td>Moderately elevated levels of basal follicle-stimulating hormone in young patients predict low ovarian response, but should not be used to disqualify patients from attempting in vitro fertilization. Fertil Steril 2007;87:782–787.</td>
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Shapiro BS, Daneshmand ST, Bedient CE, Gaarner FC. Comparison of birth weights in patients randomly assigned to fresh or frozen-thawed embryo transfer Fertil Steril 2016;106:317-21

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Revision History
The following are approved changes incorporated into the revision numbers indicated below.

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description of Change</th>
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<tbody>
<tr>
<td>1.0</td>
<td>12/01/2013</td>
<td>New medical necessity document (CE)</td>
</tr>
<tr>
<td>1.1</td>
<td>12/05/2013</td>
<td>Confidentiality statement added to footer (LW)</td>
</tr>
<tr>
<td>1.2</td>
<td>01/30/2014</td>
<td>Minor edits made to verbiage per EP recommendations. (CE)</td>
</tr>
<tr>
<td>2.0</td>
<td>02/26/2014</td>
<td>Infertility Surgery and eSET incorporated into this document. (CE)</td>
</tr>
<tr>
<td>2.1</td>
<td>06/26/2014</td>
<td>Minor edits made to verbiage and clarification of age groups for applicable ART cycles per AD. (CE)</td>
</tr>
<tr>
<td>2.1</td>
<td>07/14/2014</td>
<td>Governing control number of document changed from PR4069 to PR4221.(CE)</td>
</tr>
<tr>
<td>3.0</td>
<td>07/14/2014</td>
<td>Updated by AD with new information on letrozole. (LW)</td>
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<tr>
<td>Date</td>
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<tr>
<td>10/13/2014</td>
<td>Minor changes to guideline verbiage by AD. (CE)</td>
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<tr>
<td>07/09/2015</td>
<td>Guideline review and update by AD. New information on tubal factor infertility, letrozole, thin endometrial lining, PCOS and teratospermia added. (CE)</td>
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<tr>
<td>10/02/2015</td>
<td>Clinical evidence and references updated by AD. (CE)</td>
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<tr>
<td>05/05/2016</td>
<td>Policy revision with additional indications for use of letrozole, gonadotropins, eSET and use of preimplantation genetic testing by AD. (CE)</td>
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<tr>
<td>06/22/2016</td>
<td>Minor changes to guideline verbiage by AD. (CE)</td>
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<tr>
<td>09/12/2016</td>
<td>Clarification on cycle limitations, removal of PCOS Rotterdam criteria and clarification on when tubal and/or endometriosis surgery is not covered by AD. (CE)</td>
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<tr>
<td>05/04/2017</td>
<td>Guideline review and revision with revised antral follicle count as part of consideration for infertility treatment, addition of FSH and age parameters to define very poor/futile prognosis, addition of age parameters for autologous and donor oocytes in ART, and clarification on coverage of therapeutic donor insemination, IUI with moderate or severe endometriosis, and ART with repeat pregnancy loss by AD. (CE)</td>
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<tr>
<td>05/03/2018</td>
<td>Annual review with revisions by AD. SART data was updated, post-coital test indications were revised, FSH, AMH and antral count levels as infertility indicators were revised, ICSI information added, eSET cycles for women aged 41-42 were revised, information on multiple cleavage stage embryo transfers was revised, verbiage of no infertility benefits for autologous oocytes in females ≥ 44 years was added, non-indications for IUI and donor insemination were revised, additional information on natural cycle IUI has been provided. (CE)</td>
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<tr>
<td>10/01/2018</td>
<td>Replaces JA22214780. (CE)</td>
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<tr>
<td>08/27/2018</td>
<td>Interim review with revisions by AD. Information on Gestational Carrier added, clarification that natural cycle IVF is not indicated after failure of two natural cycle ART attempts, definition of infertility expanded and age for ART updated. (CE)</td>
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<tr>
<td>06/26/2019</td>
<td>Guideline review with revisions by AD. Added information on surgical sperm aspiration, cryopreservation, non-indication in controlled ovarian stimulation, markers of ovarian reserve, indication for natural cycle IUI, isolated teratospermia as non-indication in IUI and ICSI, indication for pre-implantation genetic testing, 14-day gonadotropin stimulation for hypothalamic amenorrhea and lack of benefit for ovulation induction in IUI for PCOS. Revised FSH levels as indication or poor prognosis and futility, definition of mild male factor infertility and terminology of pre-implantation genetic testing. Removed allowance for a controlled ovarian stimulation and IUI cycle for women ≥ 40 years of age. Clarified male factor infertility indication in natural cycle IUI and unilateral tubal factor infertility in IUI. (CE)</td>
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<tr>
<td>12/10/2019</td>
<td>Isolated teratospermia added to male factor infertility definition. (CE)</td>
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<tr>
<td>02/11/2020</td>
<td>Guideline update by AD. Added information to infertility definition section applicable to artificial donor insemination for females without male partners</td>
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<th>Date</th>
<th>Details</th>
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<tbody>
<tr>
<td>11.0</td>
<td>05/15/2020</td>
<td>Guideline review and update by AD. The definition of infertility was revised, ultrasound monitoring was added as not medically necessary in ovarian stimulation with oral medications in conjunction with IUI, added Clomid and letrozole as not indicated when natural cycle IUI is indicated, ICSI indication added when previously cryopreserved oocytes are used, and adjunct treatments not indicated when used in conjunction with ART were added. (CE)</td>
</tr>
<tr>
<td>12.0</td>
<td>11/10/2020</td>
<td>Interim update by AD. The definition of infertility was revised. (CE)</td>
</tr>
<tr>
<td>13.0</td>
<td>05/05/2021</td>
<td>Annual guideline review with revisions. Added information regarding immune therapies, tamoxifen in ovulation induction and stimulation, non-indication for gonadotropins, IVIG and intralipids as unproven in ART, male infertility, and tubal cannulation as not indicated for mid or distal tubal occlusion. eSET information updated to reflect ASRM recommendations and preimplantation genetic testing wording correlated with the federal definition of disability. PGT for aneuploidy, ERA, RNA gene expression profile, 238 genes sequencing, endometrial tissue, predictive algorithm reported as endometrial window of implantation added as not indicated. (CE)</td>
</tr>
<tr>
<td>14.0</td>
<td>01/06/2022</td>
<td>Interim guideline review with revisions. Revised: general indications for infertility treatment and use of autologous or donor oocytes for females ≥55 years of age as not indicated; removed Clomid, letrozole and Tamoxifen for unilateral tubal factor infertility from previous salpingectomy or proximal tubal occlusion; standardized maximum number of cycles in ovarian stimulation and IUI to three regardless of age; removed age parameters for IUI in the setting of sexual dysfunction or cervical trauma; removed age parameters for use of autologous oocytes; and added the need for an ART cycle for gestational carriers. (CE)</td>
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