Evaluation of the Infertile Couple in a Managed Care Environment

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INTRODUCTION

Infertility affects approximately 15% of the reproductive age population in the United
States. While that percentage appears to be increasing only slightly, more and more
infertile couples are presenting to physicians' offices seeking assistance. In light of the
public perception that infertility diagnosis and treatment is costly, and purely elective,
managed care providers have been reticent to offer coverage for this condition.
Employers have been even less receptive to purchasing riders for coverage. In fact, as of
March, 2000, only 50% of corporations with more than 500 employees offered infertility
coverage, while fewer than 20% covered in vitro fertilization (IVF) (1). This presents the
practitioner with a difficult decision: should one perform a complete, classic infertility
evaluation, regardless of cost, or is it possible to perform a more limited, less expensive
evaluation that may afford essentially the same information.

In designing cost effective diagnostic and therapeutic algorithms, many factors must be
taken into consideration. First of all, cost effective analysis ideally incorporates data
generated through prospective, randomized controlled trials. There has unfortunately
been a paucity of such studies in the infertility literature. Second, the treatment methods
and/or patient populations described in published studies may not match local conditions,
so the results of published literature may not be directly applicable to each individual
practice setting (2). Third, cost-effectiveness analysis assumes that the primary goal of
health care spending is to maximize benefits across a population rather than to distribute
them equally. In theory, this would necessitate the exclusion of some patients from
certain treatments. For example, patients over 40 might not qualify for in vitro
fertilization (IVF), while males with severe oligospermia might be directed toward donor

sperm rather than to IVF with intracytoplasmic sperm injection (ICSI) (3). While such recommendations may appear contrary to classical training, and even personally distasteful, the unacceptable rate of medical inflation experienced in the recent past has mandated changes in the way that infertility is practiced now and in the future.

Finally, although it is not the focus of this chapter, in order to determine the true cost of infertility diagnosis and treatment to society, one must consider both the direct and indirect costs of treatment. Specifically, one must include the medical treatment incurred in the production of a pregnancy, as well as any incremental costs incurred due to the production of a multiple gestation. This chapter is designed to explore these issues, and to present an alternative, cost-effective diagnostic evaluation algorithm for infertility.

THE CLASSIC INFERTILITY EVALUATION

The classic infertility evaluation consists of six basic steps:

1. Evaluation of ovulation

2. Evaluation of the male factor (Semen analysis)

3. Evaluation of the fallopian tubes (Hysterosalpingogram)

4. Evaluation of the cervix (Post-coital test)

5. Late luteal endometrial biopsy

6. Evaluation of the peritoneal cavity (Laparoscopy)

EVALUATION OF OVULATION

Ovulatory dysfunction accounts for 30-35% of all cases of infertility. There are several methods available for evaluating ovulatory function. Basal body temperature (BBT) charting is the least expensive and most variable method. It requires the woman to take her oral baseline temperature every morning upon awakening, and is based on the observation that progesterone production by the corpus luteum causes the basal temperature to rise by approximately one degree. A biphasic temperature curve provides presumptive evidence of ovulation. Although inexpensive, BBT charting is fraught with inherent significant drawbacks. First, it does not tell one anything about follicular size prior to ovulation. Second, it provides only retrospective information, and therefore cannot be effectively used to schedule insemination or time intercourse. Third, it has been demonstrated to correlate poorly with ultrasound monitoring of follicular development and ovulation, and finally, it does not provide any evidence of follicular collapse and oocyte release.

A second, indirect method of ovulation evaluation involves detection of the preovulatory luteinizing hormone (LH) surge. Although LH is secreted by the anterior pituitary gland throughout the follicular phase, its secretion increases markedly 36-40 hours prior to ovulation. This marked increase in LH secretion can be detected in the urine using a variety of commercially available kits. Ovulation usually occurs within 24-36 hours of urinary detection of the surge, and therefore, these kits can be used to time intercourse or insemination. Like BBT charting, however, LH surge detection does not provide any information about follicular dynamics (growth and collapse).

Detection of a midluteal increase in serum progesterone offers a third, indirect method of ovulation evaluation. Throughout the follicular phase, progesterone production by the granulosa cells is minimal. As LH levels increase, these cells undergo luteinization, and progesterone levels gradually rise. As progesterone production appears to peak approximately 7 days following ovulation, a blood sample obtained around that time has also been used as presumptive evidence of ovulation. Although the exact progesterone level considered to be diagnostic of ovulation remains controversial, most reports suggest that a level of 5 ng/mL or greater in a natural cycle provides strong evidence that ovulation has occurred. Again, however, the detection of a midluteal progesterone peak provides only retrospective information about the cycle in question.

The fourth, and most informative method of ovulation evaluation is the use of serial ultrasound monitoring. Transvaginal ultrasound allows one to monitor the developing follicle and confirm follicular collapse (and presumably oocyte release). When used in conjunction with LH surge detection, it provides both confirmatory evidence of appropriate follicular growth and collapse, as well as a prospective method of timing for intercourse or insemination. However, as seen in Table 1, serial sonography is also the most expensive method of ovulation documentation.

EVALUATION OF THE MALE

Approximately 30-40% of infertility is due to impaired sperm production or function. The test most commonly performed to evaluate male fertility is the semen analysis. Most

physicians like to perform this test early in the course of the infertility evaluation, so that

treatment for an abnormality can be initiated while the remainder of the work-up is in

progress. The parameters that constitute a normal semen analysis have been published by

the World Health Organization.(4) Although widely accepted and utilized, these criteria

have been defined primarily by descriptive and demographic studies. These values were

revised most recently in the 4th edition, published in 1999, and include:

Seminal Volume:	>2 mL
Concentration:	>20 million/mL
Motility:	>50%
Normal morphology:	*
White cells:	<1 million/mL

* Multicenter population-based studies utilizing the methods of morphology assessment

in the WHO manual are now in progress. Data from assisted reproductive technology

programs suggest that, as sperm morphology falls below 15% normal forms using the

methods and definitions described in the WHO manual, the fertilization rate in vitro

decreases.

It is important to remember that it takes between 90-108 days from the time that a sperm

is produced until it is ejaculated. Therefore, the result of an event that may adversely

affect sperm production may not become manifest for up to 15 weeks. As sperm

production can fluctuate significantly from day to day, one abnormal semen analysis

requires a second examination before the diagnosis of an abnormality can be made with certainty.

The total lack of sperm production is referred to as azoospermia. Oligospermia is the presence of less than 20 million sperm per mL. Decreased motility is referred to as asthenospermia, and the presence of too many abnormal forms is referred to as teratospermia. The specific type of abnormality suggested by the semen analysis often dictates further evaluation. For example, once oligospermia has been diagnosed, the next logical step usually consists of serum hormonal assessments, which include testosterone and gonadotropin (follicle stimulating hormone (FSH) and LH) measurements. These results will frequently direct the practitioner to a short list of possible causes. Teratospermia may suggest the presence of a varicocele. Whenever any significant abnormality is discovered, regardless of type, a thorough history and physical examination assume paramount importance. In addition, every fertility specialist should work closely with a urologic colleague in order to appropriately and comprehensively diagnose and treat the affected male.

It is important to note that a semen analysis is purely descriptive, i.e. it fails to assess sperm function. Therefore, many fertility specialists routinely obtain some type of sperm function test in addition to a semen analysis. Because sperm have many functions integral to fertilization, no single sperm function test is likely to prove applicable in all situations. As such, it is important for practitioners to have options at their disposal – either in their laboratory or through a reference lab. Examples of commonly performed sperm function tests include the hamster egg penetration assay, the hemi-zona assay, and

the mannose binding assay. Most practitioners do not routinely include these tests in their basic evaluation, rather they perform them only as part of an advanced assessment when the basic testing suggests an abnormality.

Testing for the presence of anti-sperm antibodies represents another area of controversy, as neither the significance nor the optimal treatment of this condition is well defined. Although the published literature does not appear to support the routine testing of all men, testing does appear to be warranted when there is a history of previous scrotal surgery, infection, or trauma. The cost of the male factor evaluation is summarized in Table 2.

EVALUATION OF THE FALLOPIAN TUBE

Fallopian tubes can become damaged as a result of previous pelvic infection, endometriosis, or previous abdominal or pelvic surgery. In addition, they can become occluded as the result of mucus plugging. The primary test of tubal patency is the hysterosalpingogram (HSG). This test represents a cornerstone of the infertility evaluation, and involves the injection of a radio-opaque dye through the cervix, into the uterus, and then into the fallopian tubes. The procedure is monitored with fluoroscopy, and when only 2 still pictures are obtained, usually delivers less than 500 mRad to the patient. The HSG is an effective method of diagnosing both proximal and distal fallopian tube occlusion. In addition, the HSG can serve to identify uterine structural abnormalities, such as endometrial polyps, fibroids, septa, and other Mullerian anomalies. A properly performed HSG can also assess both uterine and tubal mobility. In addition to

its diagnostic value, several studies have suggested therapeutic benefit resulting from the HSG as well (5,6).

Some patients cannot tolerate the physical discomfort that occasionally accompanies the HSG. In those rare cases, fallopian tube patency can be documented via chromotubation performed during a laparoscopy. At that time, indigo carmine or methylene blue can be instilled through an intrauterine catheter, with visualization of spillage through the fimbria. Although effective at assessing tubal patency, chromotubation fails to assess the uterine cavity, so it is usually advisable to perform hysteroscopy concurrently with the laparoscopy. Another alternative procedure to assess tubal patency is sonohysterography (see later in this chapter). While most published reports suggest a valid role for this procedure in assessing the uterine cavity, its efficacy in confirming tubal patency is less well established. The relative costs for HSG and sonohysterography appear to be similar, as demonstrated in Table 3.

EVALUATION OF THE CERVIX

One of the primary functions of the cervix is to make mucus throughout the menstrual cycle. As hormone levels fluctuate, the character and quantity of this mucus changes. Throughout the majority of the cycle, the mucus is thick and globular and acts as a barrier to the passage of sperm. At mid-cycle, the mucus undergoes a marked change and becomes thin, watery, and very stretchable. In addition, it is secreted in greater volume. These changes facilitate the rapid transport of sperm into the uterus and fallopian tubes.

The abundant, watery mucus also serves as a reservoir for sperm, allowing continuous release into the uterus and fallopian tubes.

The physician can evaluate both the cervical mucus and the performance of the patient's partner's sperm in the mucus with the post-coital test. This test is usually performed by analyzing a mid-cycle aliquot of cervical mucus within two hours of the patient having intercourse. Normal parameters include:

Amount of mucus:	>0.1 mL.
Color:	Clear
Spinbarkeit:	>8 cm.
Sperm:	>2 motile/hpf
White Blood Cells:	<5/hpf

Abnormalities in mucus production or quality can result from previous cervical surgery, ie. cone biopsies, cryotherapy, or laser ablation or conization. Discoloration of the mucus frequently indicates the presence of an infection. Diminished spinbarkeit (stretchability of the mucus) frequently results from timing the test improperly. It may also be caused by diminished estrogen production (anovulation) or the anti-estrogenic effects of clomiphene citrate. Abnormalities in sperm number or motility can indicate abnormal sperm production, an infection in either the male or female, or the presence of anti-sperm antibodies. Finally, the presence of white blood cells in the mucus (leukorrhea) is usually caused by infection or inflammation of the cervix or vagina.

The most common cause of an abnormal post-coital test is poor timing, ie. performing the test either too far in advance of expected ovulation or following ovulation. Although the post-coital test is a very poor predictor of fertility some use it as a screening test to ensure normal cervical mucus production and to rule out the presence of infection or anti-sperm antibodies (7). If one sees sperm agglutination, immobility, or an absence of appreciable sperm numbers despite a normal semen analysis, then anti-sperm antibody testing may be indicated. The typical cost for a post-coital test ranges from $30-75.

LATE LUTEAL ENDOMETRIAL BIOPSY

The menstrual cycle actually represents an interaction of two separate cycles: the endometrial cycle and the ovarian cycle. The endometrial cycle occurs as a direct result of hormones secreted by the developing follicle and the corpus luteum. During the follicular phase, while estrogen production is increasing, the endometrium undergoes tremendous growth. During the luteal phase, in response to progesterone production from the corpus luteum, the endometrial cells undergo changes which prepare them to accept the implantation of a newly formed embryo. Usually the ovarian and endometrial cycles are synchronized. Failure of synchronization is referred to as a luteal phase defect. Although still thought to be a cause of recurrent miscarriage, more recent data suggest that luteal phase defect is not a prevalent cause of infertility. (8)

In order to appropriately time a late-luteal biopsy, the patient should be instructed to use an LH detection kit, or she should be followed with serial ultrasound monitoring. The biopsy should be performed 10-13 days after ovulation or 11-14 days following the detection of the LH surge, because later luteal biopsies have been suggested to be more

accurate. Biopsy specimens are then dated based on the classic criteria of Noyes, Hertig, and Rock (9). An out of phase biopsy is one in which there is a discrepancy of 3 or more days between the histologic appearance of the endometrium and the chronologic date of the cycle during which the biopsy was performed.

A less expensive, and possibly equally accurate, alternative to an endometrial biopsy is to determine the length of the luteal phase by calculating the number of days between ovulation and the subsequent menstrual period. A luteal phase length of 11 or fewer days suggests the presence of a luteal phase defect, whereas a length of at least 12 days effectively rules out the condition. Although this method fails to assess "glandular:stromal dyssynchrony", the true meaning of that condition has never been elucidated with certainty. Because of the observation that up to 20% of normal women may have a single out-of-phase endometrial biopsy, the true diagnosis of luteal phase inadequacy has historically been based on the finding of an out of phase biopsy in 2 consecutive cycles (10). It may, therefore, be both reasonable and cost-effective to actually perform a biopsy only after a short luteal phase has been detected by counting days in a preceding cycle. This approach will minimize patient discomfort and cost (Table 4), while possibly reducing the incidence of a false positive diagnosis as well.

EVALUATION OF THE PERITONEAL CAVITY

The final step in the classic infertility evaluation is laparoscopy in order to rule out endometriosis or other pelvic pathology that could adversely affect fertility. Endometriosis has been reported to occur in 25-65% of women presenting for an

infertility evaluation (11). Symptoms of endometriosis do not correlate well with severity

of the disease, and frequently women with significant endometriosis do not have

symptoms. Endometriosis can adversely affect fertility due to distortion of the tubo-

ovarian anatomic relationship, the development of tubal occlusion, or through the

production of cytokines which may adversely affect tubal motility and oocyte and sperm

function.

The association between endometriosis and infertility has long been the subject of

tremendous controversy in the infertility literature. Although most investigators

recognize a strong correlation between infertility and stage III and IV endometriosis, no

such consensus is present for stage I and II disease. A recent prospective, randomized,

multicenter Canadian trial ("EndoCAN") was the first well-designed study to demonstrate

a clear association (12). In this trial, women diagnosed intraoperatively with Stage I or II

disease were randomized to intraoperative resection or ablation of their disease or

diagnosis alone. All patients were then followed expectantly. At the end of a 36-week

period, 31% of the patients in the laparoscopic surgery group had conceived, compared to

18% in the diagnostic group (p<0.05). Although interesting, these findings have not been

universally accepted. A subsequent prospective, randomized Italian trial, similarly

designed, has shown no difference in the one-year postoperative birth rate in 96 women

undergoing resection/ablation or diagnosis alone at the time of laparoscopy (13).

In addition to endometriosis, pelvic adhesions may also significantly compromise

fertility. Resulting from a previous infection or surgical procedure, adhesions can distort

the tubo-ovarian anatomic relationship, impairing or preventing oocyte pickup.

Laparoscopy affords the practitioner an opportunity to both evaluate and treat any abnormalities that are encountered during the same outpatient procedure. In addition to resecting or vaporizing endometriosis, and lysing or resecting adhesions, chromotubation can also be performed to confirm tubal patency.

Although still considered to be an integral part of the infertility evaluation, it may be possible to limit laparoscopy to certain "high risk" patients. Examples of such patients would be those women with tubal disease documented by HSG, women with symptoms suggestive of endometriosis, women with a previous history of PID or abdominal/pelvic surgery, and those women in whom endometriosis or other pelvic pathology is suggested by ultrasonographic findings. It is very difficult to determine a true cost for laparoscopy due to wide variations in charges and reimbursements by physician, region, and managed care provider. A summary is included in Table 5.

ADVANCED INFERTILITY EVALUATION

Unlike the basic infertility evaluation, no advanced diagnostic infertility algorithm has ever been formalized. Rather, ancillary tests are currently employed either when the basic evaluation suggests the presence of a specific abnormality, or to rule out a diagnosis of "unexplained infertility" when the basic evaluation fails to reveal an etiology for the couples' impaired fertility.

When ovulatory dysfunction has been diagnosed by any of the methods described above, the next logical step is to determine an etiology, so that an effective treatment strategy can

be employed. This is accomplished through the use of serum hormone assays. Older

texts suggested a battery of serum assays including FSH, LH, Prolactin, Thyroid-

stimulating hormone (TSH), Testosterone, and Dehydroepiandrosterone-sulfate (DHEA-

S) levels (14). More recent literature supports a targeted approach based on the patient's

presentation. For example, if hypogonadotropic hypogonadism is suspected, then FSH,

LH, and estradiol levels are indicated. If the patient complains of symptoms suggestive

of peri-menopause, then an FSH level is appropriate. Recent literature supports the

determination of cycle day 3 FSH and estradiol levels in women 35 or over who desire to

pursue fertility treatment, as a means of assessing ovarian reserve (15). The routine

determination of FSH and LH levels, looking for an inverted ratio indicative of polycystic

ovarian disease, no longer appears warranted, as the results do not impact the subsequent

recommendation for ovulation induction.

Androgen levels (DHEA-S and testosterone) should usually be reserved for patients with

hirsutism. Likewise, although a serum prolactin level should be obtained on every patient

with ovulatory dysfunction, a TSH level should be reserved for patients with clinical

hypothyroidism or hyperprolactinemia, due to the low incidence of subclinical

hypothyroidism.

Males with at least two abnormal semen analyses should always undergo an extensive

history and physical examination. Serum FSH, LH, and testosterone levels are certainly

warranted in the face of severe oligospermia. Sperm function testing may also be

indicated prior to developing a definitive treatment protocol, as in vitro fertilization with

intracytoplasmic sperm injection (ICSI) may be necessary in the face of poor sperm function testing.

As noted above, sperm have numerous functions integral to the fertilization process. Different sperm function tests evaluate different functions. For example, the hemi-zona and mannose binding assays assess the ability of sperm to bind to the zona pellucida. The hamster egg penetration assay evaluates the ability of sperm to penetrate into the cytoplasm of a zona-free hamster egg, and then undergo nuclear decondensation. It is possible, therefore, that a man with a normal hamster egg penetration assay may have an abnormal hemi-zona assay, or even fail to fertilize his wife's oocytes in vitro. This is why many andrologists believe that the different tests of sperm function may be synergistic rather than mutually exclusive.

Diagnostic hysteroscopy is usually reserved for the advanced infertility evaluation. This procedure affords a more thorough examination of the uterine cavity than either HSG or sonohysterography, and frequently uncovers abnormalities missed by those tests (16). Diagnostic hysteroscopy can be easily performed in the physician's office, employing carbon dioxide (CO_2) for uterine distension. When the HSG or sonohysterogram suggests the presence of an abnormality in the uterine cavity, the next logical step to pursue is therapeutic or operative hysteroscopy. Although this procedure can also technically be performed in the office, the resection of a polyp or fibroid is frequently suboptimal under these circumstances. Bleeding, if encountered, will frequently obscure the operator's view. Therefore, most specialists choose to perform operative

hysteroscopy in an operating room, using an immiscible liquid such as glycine or mannitol-sorbitol for uterine distension.

Recently, a questionable relationship between immunologic abnormalities and infertility has arisen (17). Until this issue is clarified further, the inclusion of routine immunologic testing in the infertility evaluation does not appear to be warranted.

TARGETED INFERTILITY EVALUATION

In light of the above information and based on a review of the literature, it may be possible to perform a basic infertility evaluation that provides essentially the same information, but at a substantially reduced cost. This "targeted" evaluation would follow the same diagnostic rationale as the classic evaluation, but in a more cost-effective manner. Specific examples of cost savings are as follows:

Documentation of Ovulation/Normal Luteal Phase:

For patients with regular menses, moliminal signs, and dysmenorrhea, the detection of an LH surge followed by menses 12-15 days later appears to be adequate to document both ovulation and a normal luteal phase. This eliminates the need for costly ultrasonographic monitoring of follicular development, and may also obviate the need for an endometrial biopsy.

Post-Coital Testing:

In light of the data published by Collins, et al, and others, the post-coital test can probably be eliminated from the infertility evaluation without losing any diagnostic accuracy (7).

Laparoscopy:

There has always been a tenuous relationship between Stage I and II endometriosis and infertility. Other than the recent data from the EndoCAN study, the literature strongly suggests that conception rates in patients with Stage I or II disease are unimproved by either medical or surgical management when compared to expectant management (18,19). Therefore, it seems logical to perform some sort of minimally invasive test in order to rule out, as much as possible, the presence of Stage III or IV disease. According to the revised American Society for Reproductive Medicine scoring system for endometriosis, a patient must have either extensive pelvic adhesions or at least one large endometrioma in order to generate enough points to qualify as having advanced disease (20). Although there is no reliable test to consistently detect the presence of adhesions, vaginal sonography is an effective modality for ovarian evaluation. Therefore, it may well be reasonable to perform a single transvaginal ultrasound examination in the early follicular phase – while follicular development is minimal. If no obvious endometrioma is noted, then the likelihood of the patient having Stage III or IV endometriosis is extremely low. In addition, in the patient with a normal HSG, who has no history of prior IUD usage, PID, or previous abdominal or pelvic surgery, the likelihood of finding significant pelvic adhesions is also remote. Recent data suggest that a good history, an HSG, and a single

transvaginal ultrasound may well eliminate a needless laparoscopy in up to 40% of

patients. This number may even be higher if one includes patients who are found to have

only stage I or II endometriosis at laparoscopy (21).

PRACTICE PATTERNS

Glatstein et al., recently published a nationwide survey assessing the tests employed by

Board Certified Reproductive Endocrinologists as part of their routine infertility

evaluation. Of the 473 Board Certified Reproductive Endocrinologists (REs) surveyed,

397 responded, representing a response rate of 83.9% (22) Of the respondents, 54.7%

were university hospital affiliated, while 45.3% were in private practice. Results from the

survey (Table 6) indicate that at least 89% of REs perform a basic evaluation that

includes a semen analysis, at least one method of ovulation assessment, an HSG, and a

laparoscopy. Seventy-nine percent perform post-coital testing, while 62.5% routinely

perform an endometrial biopsy.

COST COMPARISON

Based on the above information, it is possible to construct both classic and targeted

diagnostic algorithms for couples with infertility, assign appropriate costs to them, and

perform a basic cost comparison between the two different protocols.

CLASSIC EVALUATION:

Ultrasound monitoring:	$200-500
Semen analysis:	$35-85
HSG:	$150-300
Post-coital test:	$30-75
LH kit:	$28-75
Endometrial biopsy:	$150-350
Laparoscopy (MD fee only):	$500-3500
TOTAL:	$1093-4885 (Mean $2989)

TARGETED EVALUATION:

LH kit:	$28-75
Single transvaginal ultrasound:	$75-150
Semen analysis:	$35-85
HSG:	$150-300
Limited laparoscopy:	$500-3500
TOTAL:	$788-4110 (Mean $2449)

If one uses mean values and assumes that 60% of patients in the targeted evaluation group undergo laparoscopy, the total cost expended for every 100 couples evaluated would be:

Classic Evaluation:	$298,900
Targeted Evaluation:	$164,900
NET SAVINGS	**$134,000**

From this analysis, it appears that the targeted evaluation affords a significant cost saving (approximately $1340 per couple evaluated - not including facility and anesthesia savings from the 40% who do not undergo laparoscopy), while yielding essentially the same amount of diagnostic information.

SUMMARY

The classic infertility evaluation is a costly experience for many couples. In the new era of managed care, it may be possible to perform a targeted evaluation that, while significantly lowering the total cost, will not impair our ability to correctly diagnose the etiology of a couple's infertility. When combined with algorithms for streamlined

treatment, it may be possible to significantly reduce the cost for the diagnosis and

treatment of infertility.

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endocrinologists: the infertility evaluation. Fertil Steril 1997;67:443-51

Table 1: The Cost of Ovulation Documentation**

BBT Charting	$0
LH Surge detection	$28-75/cycle
Progesterone detection	$50-95
Ultrasound monitoring	$200-500/cycle

**Information presented in tabular form concerning the charges for diagnostic testing was obtained by telephone surveys of practicing Reproductive Endocrinologists in private practice. The author presents these values, not as absolutes, but rather as relative values to be used in constructing a cost model.

Table 2: The Cost of Male Factor Evaluation

Semen analysis	$35-85
Hamster egg penetration assay	$200-500
Hemi-zona assay	$300-750
Mannose binding assay	$150-200
Anti-sperm antibodies	$100-250

Table 3: The Cost of Fallopian Tube Assessment

HSG:	$150-300
Sonohysterography:	$150-400

Table 4: The Cost of Luteal Phase Assessment

Endometrial biopsy:	$150-350
Ultrasound monitoring:	$200-500
LH detection kit:	$ 28-75

Table 5: The Cost of Peritoneal Cavity Assessment

Laparoscopy (Physician fee): $500-3500
Anesthesiologist: $300-800
Facility Fee: $1500-8,500

Table 6: Components of the Basic Infertility Evaluation Employed by Board Certified Reproductive Endocrinologists (10)

Test	Inclusion (%)
Semen analysis	99.9
Ovulation assessment (1 method)	98.0
Hysterosalpingogram (HSG)	96.0
Laparoscopy	89.1
Post-coital test	79.0
Prolactin level	66.4
Endometrial Biopsy	62.5
Luteal Progesterone Level	60.4
Thyroid Stimulating Hormone	58.9
Basal Body Temperature Charting	55.3
Ultrasound	54.5
FSH level	54.3
Hysteroscopy	53.2
Chlamydia cultures	54.3
Antisperm antibody testing	23.9