

Infertility Treatment and the IVF Patient in Managed Care Settings

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Abstract

The dramatic increase in healthcare expenditure has generated a significant rise in member enrollment in managed care arrangements. This development, combined with state mandates requiring the provision of infertility services, is compelling providers to reduce the cost of infertility therapy. Therefore, a contemporary diagnostic and management plan for patients seeking infertility treatment must be patient focused, rational, and economical.

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The beauty of a particular healthcare delivery system rests in the eye of the beholder. Although the scope of coverage, flexibility, and customer service are critical features of a health insurance plan, cost has become the overriding factor. In 1947, healthcare spending accounted for approximately 4% of the gross national product (GNP).¹ By 1993, this figure had increased to 14%.² Employers contribute a sizable percentage of health insurance premiums for the nearly 155 million covered Americans.^{3,4} Business has argued that large expenditures on employee health benefits make it noncompetitive in increasingly cutthroat markets. Despite evidence that healthcare expenditures generate, at most, minimal effects on international competitiveness, employers have begun to move from traditional, yet costly, indemnity plans by shifting their employees into managed care arrangements.^{1,2,5}

With the drive to trim costs and the subsequent increase in capitated plans, infertility services, especially in vitro fertilization (IVF), have come under close scrutiny. Although most insurance plans do not

provide coverage for IVF procedures, public pressure during the past 10 years has forced several states to enact legislation mandating varying degrees of coverage. Therefore, the managed care "initiative" has collided with the effort to broaden the reach of infertility coverage. In this paper, we will discuss the cost of infertility treatment and offer a rational approach toward diagnosis and management in the managed care environment.

The Cost of Infertility

The treatment of infertility is costly, especially when it involves the technological approaches of IVF, which require highly trained personnel, high-technology laboratories, and the use of expensive ambulatory facilities. The issue remains how best to determine this cost. Because pregnancy rates are reported differently from center to center, it is difficult to calculate precisely the cost of infertility treatment. Moreover, not all centers publish their pregnancy rates, and accurate statistics generally pertain only to IVF or gamete intrafallopian transfer (GIFT) cycles.⁶

In practical terms, as reported in the *New York Times* (January 9, 1996) and in a recent study,⁷ the cost of a single cycle of IVF-embryo transfer (IVF-ET) can range from \$7,000 to \$11,000, with an average cost per cycle of \$7,800. This figure includes consultation, laboratory tests, medications, egg retrieval, gamete culturing, and physician and nursing fees. The costs of micromanipulative techniques and embryo freezing are additional.

Investigators have examined the cost of IVF treatment per infant delivered. Cost estimates based on this method range from \$67,000 for the average couple to \$800,000 for a couple after six attempted cycles who fall into a poor-prognosis category.⁷ Whether this estimate is reasonable is debatable, as most American couples treated with IVF undergo only one cycle.⁹ Along the same lines, a Dutch report stated that the average couple undergoes 2.5 cycles.⁸ The number of IVF cycles required for twin and triplet gestations are

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significantly higher and incur an added expenditure. The cost of managing a singleton gestation has been estimated at \$5,000 to \$10,000, whereas the respective costs for twin and triplet pregnancies are \$38,000 and \$64,000 to \$110,000.^{9,10}

Collins et al⁸ calculated that the total cost of IVF services in the United States during 1993 was roughly \$197.7 million. After taking into account deductible and coinsurance costs of IVF, the authors concluded that the additional average cost per insured employee for IVF services would be \$2.79 for the year 1995. If IVF were universally available, they projected that the increased utilization would result in, at most, an increase in premiums of \$15.69 per insured employee.

This figure does not take into account constraints that could be imposed to limit utilization (ie, age restrictions and the number of cycles covered). It also does not consider the projected increase in demand for IVF services. Postponement of both marriage and childbirth have resulted in a nearly 50% increase in the number of childless women aged 35 to 44 years.¹¹ In 1982, there were 1.8 million childless women in this age group; by 1988, this figure had increased to 2.9 million. Moreover, the decrease in availability of infants for adoption, the greater public awareness of infertility treatment, and the reduced social stigma associated with this condition all indicate an increase in the demand for infertility services.¹¹ However, a recent pilot study aimed at assessing the willingness to pay for IVF services demonstrated that respondents would pay as much as \$32 per year to make IVF available for other people.¹²

It is important to examine the cost of alternative therapy as well. For patients with tubal disease, the alternative to IVF is surgery for pelvic reconstruction. A 1986 report¹³ estimated that the cost of a successful pregnancy after tubal surgery in 1983 was approximately \$32,000. In 1996 dollars, this figure would exceed \$85,000 per live birth. That study did not take into account the significantly higher incidence of ectopic pregnancy in patients undergoing tubal surgery, or the fact that only 25% to 50% of patients with tubal disease are candidates for surgical treatment.^{13,14} Therefore, there seems to be little evidence suggesting that tubal surgery is more advantageous than IVF in treating tubal-factor infertility. Although superovulation, with in utero insemination, is one third to one sixth as costly as IVF, cost-analyses comparing the two treatments have not been published.^{6,7}

Mandated Coverage

In response to significant public pressure, several states have enacted mandates requiring private insur-

ance carriers to provide some level of coverage to their beneficiaries for infertility services. As outlined in an American Fertility Society fact sheet,¹⁵ and reported in the *New York Times* (January 9, 1996), these states include Arkansas, California, Connecticut, Illinois, Maryland, Montana, Massachusetts, New York, Ohio, Rhode Island, Texas, and West Virginia.

Although some states have legislated coverage for diagnosis and treatment of infertility, others require only that coverage be offered. Most legislation does not include a provision for the coverage of cryopreservation of embryos. Uniformly, mandates state that all plans providing coverage for pregnancy-related services also provide some level of infertility compensation. In some states, religious organizations are exempt from providing coverage for IVF if this therapy is counter to their beliefs. Also exempt are Medicaid plans and self-insured individuals. Eligibility for providing services is based on compliance with the standards and guidelines developed by the American College of Obstetricians and Gynecologists and the American Society of Reproductive Medicine.¹⁵

Most mandates differ in their definitions of infertility and the extent of services covered. The most contentious points include provisions for male-factor infertility, tubal reanastomosis, and IVF. Plans that provide coverage for IVF require patients to have exhausted all other less costly means of treatment. To qualify for coverage in Maryland, a couple must have at least a 5-year history of unexplained infertility, or infertility must be associated with endometriosis, in utero exposure to diethylstilbestrol, or blockage/removal of one or both fallopian tubes. In addition, IVF requires the utilization of the husband's sperm exclusively.

The Arkansas statute extends coverage to beneficiaries of disability insurance policies that cover services for pregnancy-related services. Benefits are available for couples with only a 2-year history of infertility, as well as for male-factor infertility. Patients whose infertility is the result of voluntary sterilization are excluded. Plans in Arkansas can impose a lifetime infertility benefit cap of \$15,000.

Massachusetts defines infertility as the inability of an otherwise healthy individual to conceive during a 1-year period and requires coverage for all medical expenses incurred for the diagnosis and treatment of infertility. Insurers are not required to cover experimental procedures, surrogacy, or reversal of voluntary sterilization.

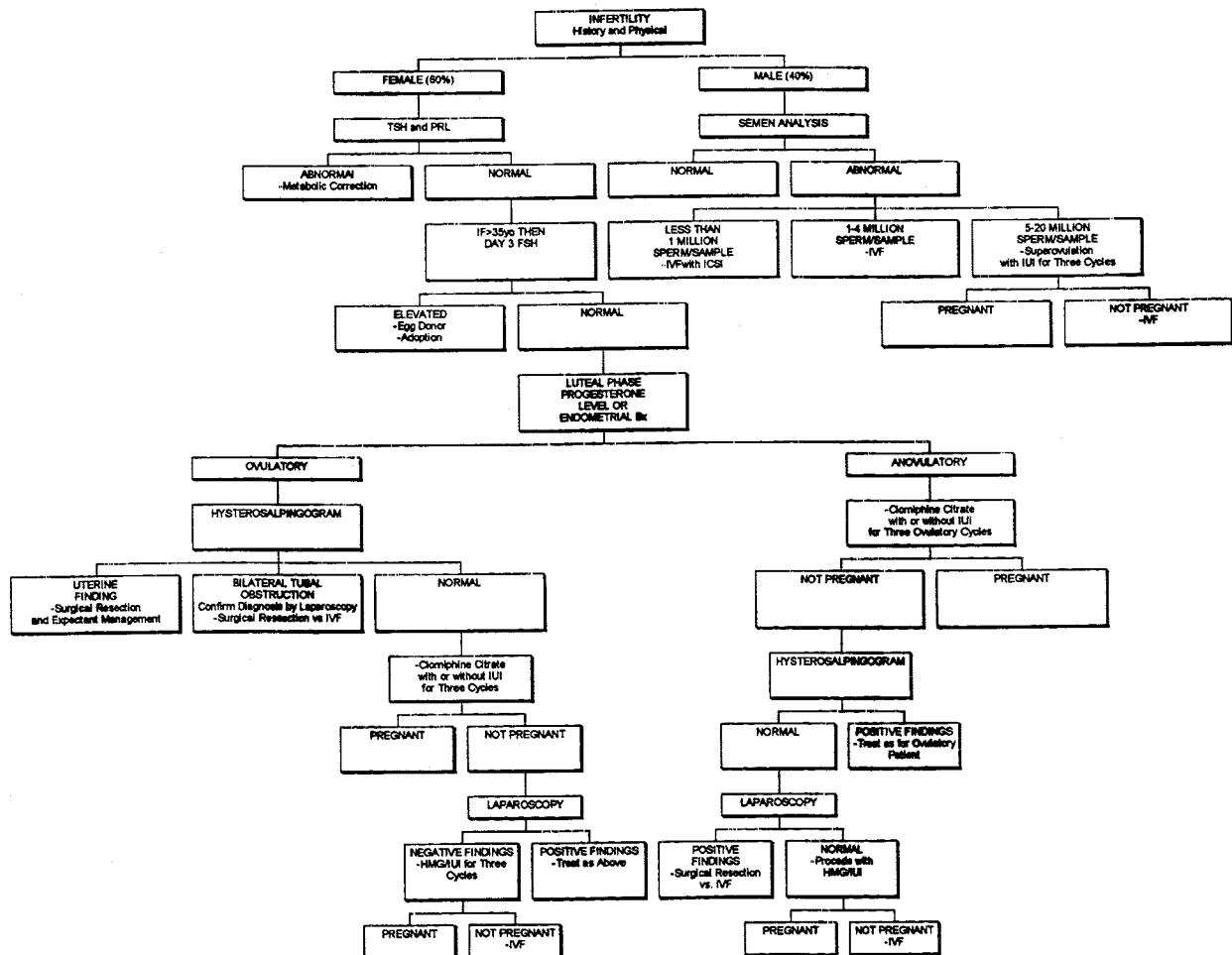
In Hawaii, all outpatient expenses arising from IVF are covered as a one-time benefit. In subsequent cycles, beneficiaries are not compensated for any out-

patient expense. Rhode Island has mandated coverage for infertility services, with the copayment not to exceed 20%. The Illinois statute applies to any group providing coverage for more than 25 employees. First attempts at conception through IVF are limited to four complete oocyte retrievals. After a successful pregnancy, two more retrievals are covered for a second child.

New York State mandates coverage for the diagnosis and treatment of medically correctable conditions,

including infertility.¹⁵ Montana, Ohio, and West Virginia have enacted statutes that require coverage of corrective tubal surgery and nonassisted reproductive techniques (*New York Times*, January 9, 1996). In California, Connecticut, and Texas, legislation states simply that health insurance providers must offer coverage for the diagnosis and treatment of infertility. The California statute applies only to group contractors offering plans to at least 20 employees and does not cover IVF.¹⁵

Figure 1. Flow Diagram of the Infertility Work Up



The information provided is intended to serve as a practical guide
 TSH = thyroid stimulating hormone; PRL = prolactin; FSH = follicle stimulating hormone; IVF = in vitro fertilization; ICSI = intracytoplasmic sperm injection; IUI = intrauterine insemination; Bx = biopsy; HMG = human menopausal gonadotropin.

Etiology, Diagnosis, and Treatment

Reproduction is an exceedingly intricate process involving a complex series of precisely timed events that science has only begun to unravel. Complete sterility notwithstanding, infertility is more accurately described as some degree of subfertility. At present, only a small number of etiologies of infertility have been well characterized. Specific tests have been developed to help to diagnose these causes.

Appropriate treatment is diagnosis specific and dependent on a complete work-up. A "partner" approach to infertility affords the provider additional insight into potential etiologies and facilitates both communication and management.¹¹ Male factors have been shown to account for roughly 40% of infertility cases, and female factors for the other 60%.¹⁶⁻¹⁸ These statistics are important to providers that diagnose and treat patients, as both partners require a comprehensive evaluation. An exhaustive patient history during the initial consultation is an essential starting point that helps to direct the choice and order of diagnostic measures and therapies. Interestingly, approximately 35% of untreated infertile patients can expect to conceive at some point during their lives.¹⁷

It is strongly suggested that individual consideration be paid to maternal age. To a large extent, a couple's reproductive potential is a function of this variable. For the normal woman, average potential fertility peaks at age 20, with a 25% chance of pregnancy per cycle. However, this potential declines with age, until, at age 45, it is nearly zero.¹⁶ In addition, the spontaneous-abortion rate for a 20-year-old woman is 12%, whereas that of a 40-year-old woman is 26%.^{11,19} Therefore, for a given diagnosis, advancing maternal age justifies aggressive management.¹⁹ A schematic representation of an infertility evaluation is represented in Figure 1. The approach illustrates a rational and step-wise escalation of both the complexity and cost of a work-up. Additional considerations are presented within the text.

Taking into account female factors leading to infertility first, 15% of infertility problems can be attributed to an ovulatory dysfunction. Basal body temperature charts for diagnostic purposes, while having little or no cost, are time-consuming, inaccurate, and often difficult to interpret. Luteal-phase serum progesterone level or a luteal-phase endometrial biopsy are better predictors of this condition.^{11,17} For patients with amenorrhea in whom the underlying cause has been diagnosed accurately, therapy yields pregnancy rates comparable to those of the normal population.¹⁴ Unfortunately, patients with oligomenorrhea do not fair as well. Cumulative preg-

nancy rates of 38% to 63% have been reported after six cycles of gonadotropin therapy.^{14,20}

Sexually transmitted disease, ruptured appendix, septic abortion (legal abortion), use of an intrauterine device, ectopic pregnancy, and endometriosis are causes of tubal-factor infertility.¹¹ Hysterosalpingography is the "gold standard" for diagnosis. Treatment is based on the extent of disease, which can most accurately be assessed at the time of diagnostic laparoscopy. Patients with minimal disease can be managed surgically and can expect cumulative pregnancy rates of, at best, 60% to 65% within 1 year.²²

According to some series, however, only 25% to 50% of patients with tubal pathology are candidates for operative management.^{14,21} Surgery offers little chance of success in the cases of extensive tubal disease but does markedly increase the ectopic pregnancy rate. For these patients, IVF is the only alternative.^{14,20-23} Public health measures that affect the incidence of sexually transmitted disease also will affect their sequelae and, ideally, decrease the incidence of this largely preventable form of infertility.²³

Roughly 30% of infertile women are diagnosed as having endometriosis, which interferes with reproductive function in numerous ways. Patients with severe endometriosis may benefit from surgical management, with the operative goal being the restoration of normal pelvic anatomy.^{14,16,17} Whether minimal endometriosis affects fertility remains a matter of controversy. However, assisted reproductive technology generally is considered appropriate after 1 to 2 years of unsuccessful surgical or medical management.^{14,20,24} At this point, superovulation therapy with intrauterine insemination (IUI) can be initiated for as many as six cycles. If this method fails, then proceeding to IVF is appropriate. However, patients with moderate-to-severe endometriosis have lower pregnancy rates after IVF than do patients with minor disease.¹⁴

Preovulatory cervical mucus of poor quality, as assessed by postcoital testing, has been implicated in contributing to infertility. However, testing is considered by many to be inconsistent and unreliable.¹¹ If suspected, this condition is adequately treated with intrauterine sperm insemination with or without superovulation.^{11,14,17,24}

For 10% to 25% of patients undergoing an infertility evaluation, the cause of their infertility remains unexplained. However, numerous investigators advocate the use of immunologic, sperm-function, and bacteriologic testing in addition to the "conventional" work-up. With the addition of these studies, it is felt that the true incidence of unexplained infertility will

be shown to be less than 5%.^{14,20} Although 60% of couples with unexplained infertility of less than 3 years' duration can expect expectant management to result in a pregnancy within 3 years, a women's age may not allow for this practice.⁸ It is prudent to base treatment on an individual basis. Initial treatment consisting of superovulation with or without IUI for at least four cycles, followed by IVF, is reasonable.^{14,20} Patients with a history of unexplained infertility of greater than 5 years' duration have a 2-year cumulative pregnancy rate of 27%.²⁵

Fertilization rates for patients with male-factor infertility are markedly reduced relative to those for female-factor causes. Semen analysis is the most commonly used tool for confirming this diagnosis. All parameters of the semen analysis must be taken into account, as an abnormality in one does not absolutely result in decreased fertility.¹⁴ In addition, many authors suggest that an evaluation of sperm function be performed. Male impotence should be ruled out, and electroejaculation used, when appropriate. Although ligation of a large varicocele has been shown by some to increase pregnancy rates, this diagnosis and therapy remains controversial.^{11,17}

Depending on the degree of oligozoospermia, IUI, GIFT, and IVF have been shown to increase pregnancy rates.²⁴ In cases of profound oligozoospermia, IVF with micromanipulation has proved quite effective. Pregnancy rates of 39% per embryo transfer have been reported after intracytoplasmic sperm injection (ICSI).^{20,25} The impact of anti-sperm antibodies on infertility remains a point of contention. Although some investigators^{14,18,20,26} have shown lower rates of fertilization and of postfertilization development in the presence of anti-sperm antibodies, IUI, IVF or ICSI may be used in this case.

Conclusion

Providing care and coverage for infertile couples is a medical and economic challenge. With the rapid emergence of managed care, there is a strong onus to contain cost. We must explore avenues that would result in greater efficiency. Cutting overall physician salaries by 20% would only reduce healthcare expenditures by 2%. Because physician practice habits account for approximately 70% of healthcare spending, modifying physician management routines would more significantly reduce spending.¹ Evidence-based practice guidelines are essential. At the same time, researchers should pursue the development of less costly means of diagnosis and treatment. Novel techniques must not simply demonstrate an economic advantage but must establish their accuracy and reli-

ability as well. Future treatment modalities may enable physicians to more precisely select embryos with the highest likelihood of developing to term. Such advances would likely reduce the number of failed attempts and, therefore, decrease overall cost. A greater insight into the pathophysiology of infertility is essential, as a targeted approach to therapy is more cost-effective.

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