THE ECONOMIC IMPACT OF MULTIPLE-GESTATION PREGNANCIES AND THE CONTRIBUTION OF ASSISTED-REPRODUCTION TECHNIQUES TO THEIR INCIDENCE

TAMARA L. CALLAHAN, B.S., JANET E. HALL, M.D., SUSAN L. ETTNER, PH.D., CINDY L. CHRISTIANSEN, PH.D., MICHAEL F. GREENE, M.D., AND WILLIAM F. CROWLEY, JR., M.D.

Abstract Background. Although the medical complications associated with multiple-gestation pregnancies have been well documented, little is known about the effects of such pregnancies on the use of health care resources and the associated costs. This is an important issue because of the increasing use of assisted-reproduction techniques, which commonly result in multiple-gestation pregnancies.

Methods. We determined hospital charges and the use of assisted-reproduction techniques (such as induction of ovulation, in vitro fertilization, and gamete intrafallopian transfer) for 13,206 pregnant women (11,896 with singleton pregnancies, 1135 with twin pregnancies, and 85 with more than two fetuses) who were admitted for delivery to Brigham and Women’s Hospital, Boston, in 1986 through 1991 and their 14,033 neonates (11,671 singletons, 2144 twins, and 218 resulting from higher-order multiple gestations).

Results. After we controlled for variables known to affect hospital charges, the predicted total charges to the family in 1991 for a singleton delivery were $9,845, as compared with $37,947 for twins ($18,974 per baby) and $109,765 for triplets ($36,588 per baby). Assisted-reproduction techniques were used in 2 percent of singleton, 35 percent of twin, and 77 percent of higher-order multiple-gestation pregnancies; such procedures were approximately equally divided between induction of ovulation alone and in vitro fertilization or gamete intrafallopian transfer.

Conclusions. Multiple-gestation pregnancies, a high proportion of which result from the use of assisted-reproduction techniques, dramatically increase hospital charges. If all the multiple gestations resulting from assisted-reproduction techniques had been singleton pregnancies, the predicted savings to the health care delivery system in the study hospital alone would have been over $3 million per year. Although assisted reproduction provides tremendous benefits to families with infertility, the increased medical risks entailed by multiple-gestation pregnancies and the associated costs cannot be ignored. We suggest that more attention be paid to approaches to infertility that reduce the likelihood of multiple gestation.

(N Engl J Med 1994;331:244-9)

In the United States, 8.5 percent of married couples are infertile.1 Although the overall incidence of infertility did not increase between 1968 and 1982, the number of visits to physicians for treatment of infertility nearly tripled.1 This increase in visits to physicians was due in part to the availability of new treatment methods, including induction of ovulation by the administration of exogenous gonadotropins, in vitro fertilization, gamete intrafallopian transfer, egg and sperm donation, and surrogacy. Since the first baby was born as a result of in vitro fertilization in 1978, more than 14,000 have been born worldwide as a result of this technique alone.2

These treatments for infertility not only have the potential to alleviate infertility but also entail the risk of inducing multiple-gestation pregnancies. It is possible, however, for physicians to control this risk to a substantial extent. The incidence of multiple-gestation pregnancies ranges from 10 to 15 percent with the use of gonadotropins alone; the incidence is at least 15 to 20 percent when gonadotropins are used in combination with intrauterine insemination,3 and it is reported to be 15 to 30 percent with in vitro fertilization.4-7 These rates must be compared with the spontaneous twinning rate of 1.05 to 1.35 percent in the United States and the rate of 0.01 to 0.017 percent for the conception of triplets.8 Several recent national studies of the increasing incidence of multiple-gestation pregnancies indicate that the vast majority of higher-order multiple gestations (63 to 80 percent) are a direct result of the use of assisted reproduction.6,9-13

The accelerating rate of multiple births has been a cause for concern on the part of physicians and medical economists alike. The increased incidence of maternal and neonatal complications associated with multiple-gestation pregnancies has been well documented,9,11,13-16 and the greater likelihood of prematurity alone contributes substantially to neonatal risk.10,12,15,17,18 In spite of improvements in the outcome of multiple-gestation pregnancies as a result of advances in care,5,9,11,12,14,17 the perinatal mortality rate in such pregnancies remains 3 to 10 times that in singleton pregnancies.8,12,13,16,18-20

We investigated the economic impact of multiple-gestation pregnancies, controlling for variables known to affect hospital charges, and examined the contribution of assisted reproduction to the incidence of multiple pregnancies and the associated charges.

Methods

Patients

The study was approved by the human research committees of Brigham and Women’s Hospital and Massachusetts General Hospital. We examined the computerized medical and billing records of 13,206 pregnant women admitted for delivery at more than 20
weeks’ gestation to Brigham and Women’s Hospital from 1986 through 1991 and the records of their 14,033 neonates; data were obtained from the mother’s admission to the discharge of all family members from the hospital. All multiple-gestation pregnancies were identified and compared with a random sample of approximately 2000 singleton deliveries for each year. Only babies with medical records were included, and all babies who lived less than one day were excluded because of the inconsistency of coding for intrauterine deaths; one mother who died within one day of severe medical complications was also excluded. Analyses were performed on data for 11,986 women with singleton pregnancies, 1135 with twin pregnancies, and 85 with more than two fetuses and on data for 11,671 singleton neonates, 2144 twins, and 218 neonates delivered after higher-order multiple-gestation pregnancies.

The mother’s age, race or ethnic group, insurance coverage, type and length of gestation, type of delivery (vaginal or cesarean), and dates of admission and discharge and the neonate’s sex, dates of admission and discharge, admission to the intensive care unit, and health status and destination (community hospital, home, or another tertiary center) at discharge were obtained along with inpatient hospital charges for both the mother and the infant. The billing records did not include physicians’ charges, charges for outpatient prenatal care, actual costs of assisted-reproduction services, charges for hospitalizations before the admission for delivery, or charges for neonatal care if the infant was transferred to another hospital. Daily charges (total charges divided by the total length of stay) for the mother and infant were calculated as a measure of the intensity of treatment.

To examine the link between the use of assisted-reproduction techniques and the incidence of multiple gestation and to look for trends over time in our study population, we reviewed hospital charts and conducted follow-up telephone surveys for all multiple-gestation pregnancies with more than two fetuses in each year of the study and for a random sample of 100 singleton infants and all twins delivered in 1991. If assisted-reproduction techniques were used, the general type (ovulation-induction agents with or without intrauterine insemination vs. in vitro fertilization or gamete intrafallopian transfer) was noted.

Statistical Analysis

Frequency distributions according to the type of gestation (singleton, twin, or higher-order multiple) were determined for subgroups of the sample defined according to maternal age, race or ethnic group, type of insurance, year of admission, predelivery and post-delivery length of stay, need for cesarean section, duration of pregnancy, and the neonate’s sex, admission to the intensive care unit, and status at discharge. Neonatal mortality data were based on neonates coded as deceased at discharge and on comparison of maternal and neonatal records. Reviews of maternal records for all twins and higher-order multiple-gestation pregnancies for which corresponding neonatal information was missing confirmed the occurrence of intrauterine death in every case. Intrauterine death was also assumed to have occurred when the maternal records in singleton pregnancies lacked corresponding information on the neonate. Analysis of variance was used to test for significant differences according to the type of gestation.

Separate ordinary least-squares analyses of the logarithmic transformation of maternal and neonatal total charges, daily charges, and lengths of stay were performed as a function of type of gestation and the control variables. Predicted values for these outcomes were obtained through a retransformation algorithm and correction term in order to estimate the mean of the original distribution, as previously described.27 Maternal control variables included in the final analysis were age and the indicator variables for race or ethnic group (black, Hispanic, white, and other), type of insurance (commercial [private, fee-for-service], health maintenance organization [HMO], Medicaid, Medicare, or no insurance), and year of admission (to account for all trends over time, including inflation and trends in medical and insurance practice). Neonatal control variables included sex and the maternal characteristics. The reference value in the analyses of maternal data represents the estimated value of the dependent variable for a 29-year-old white (nonblack, non-Hispanic) woman with commercial insurance admitted for a singleton delivery in 1991. The reference value in the neonatal analyses represents the estimated value for a female neonate whose mother had the characteristics just described.

The percentage of singleton, twin, and higher-order multiple-gestation pregnancies conceived as a result of assisted reproduction in 1991 was analyzed according to type of gestation and method of assisted reproduction. The percentage of higher-order multiple-gestation pregnancies resulting from assisted-reproduction procedures was compared for the years from 1986 to 1991 according to year of admission.

RESULTS

The number of mothers who had twins delivered at Brigham and Women’s Hospital increased by an average of 9 percent per year, from 146 in 1986 to 221 in 1991, whereas higher-order multiple-gestation deliveries increased by approximately 19 percent per year, from 8 sets in 1986 to a peak of 23 sets in 1990.

Women with twin and higher-order multiple-gestation pregnancies were older than those with singleton pregnancies, were more likely to be white, and were more likely to have comprehensive health insurance (commercial insurance or HMO coverage) than mothers of singletons (Table 1). The sex distribution of the neonates was similar in all three gestational groups.

Maternal Outcomes

After we controlled for the mother’s age, race or ethnic group, type of insurance, and year of admission, there was a significant difference in the mean hospital charges among the mothers with singleton, twin, and higher-order multiple-gestation pregnancies (Fig. 1). Hospital charges for a 29-year-old white

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Singleton</th>
<th>Twin</th>
<th>Higher-Order Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>11,986</td>
<td>1135</td>
<td>85</td>
</tr>
<tr>
<td>Mean (±SD) age (yr)</td>
<td>28.5±5.9</td>
<td>29.9±5.4</td>
<td>31.22±4.4</td>
</tr>
<tr>
<td>Age group (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13–20 yr</td>
<td>11</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>21–30 yr</td>
<td>50</td>
<td>48</td>
<td>35</td>
</tr>
<tr>
<td>31–40 yr</td>
<td>37</td>
<td>46</td>
<td>61</td>
</tr>
<tr>
<td>41–47 yr</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Race or ethnic group (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>62</td>
<td>76</td>
<td>93</td>
</tr>
<tr>
<td>Black</td>
<td>18</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>13</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Insurance (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>43</td>
<td>53</td>
<td>64</td>
</tr>
<tr>
<td>HMO</td>
<td>30</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Medicaid</td>
<td>18</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Medicare</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>No coverage</td>
<td>8</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Neatones</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>11,671</td>
<td>2144</td>
<td>218</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>49</td>
<td>49</td>
<td>52</td>
</tr>
<tr>
<td>Male</td>
<td>51</td>
<td>51</td>
<td>48</td>
</tr>
</tbody>
</table>

*Because of rounding, percentages do not all total 100.
woman with a singleton pregnancy and commercial insurance who was admitted in 1991 (the reference value) were $4,838, as compared with $7,991 for a mother of twins and $15,379 for a mother with a higher-order multiple-gestation pregnancy (P<0.001).

Of the control variables used in the regression analysis (Table 2), an increase in total charges was seen with multiple gestation, maternal age over 29 years, insurance coverage by Medicaid or Medicare, and no insurance coverage. HMO coverage resulted in a decrease in these charges, whereas being black or Hispanic had no statistically significant effect. Charges increased an average of 11.8 percent per year from 1986 to 1991. There was a small difference in daily charges among women with singleton ($1,296), twin ($1,275), and higher-order multiple-gestation pregnancies ($1,174; P<0.001) (Fig. 2).

The average stay for the mother of a singleton neonate was 4.0 days, as compared with 6.8 days for the mother of twins and 14.1 days for the mother of higher-order multiple neonates (P<0.001) (Fig. 2). Multiple gestation, Medicare coverage, and age over 29 years increased the mother's length of stay, whereas Medicaid and HMO coverage decreased it (Table 2). Being Hispanic decreased the length of stay, whereas being black had no effect on this variable. Maternal lengths of stay decreased each year from 1986 to 1991.

Thus, the difference in total maternal charges can be attributed to the increased length of stay for the mothers of twins and higher-order multiple newborns, rather than to differences in daily charges. There was an increased incidence of cesarean section (24 percent, 59 percent, and 86 percent, for singleton, twin, and higher-order multiple-gestation deliveries, respectively) and delivery at less than 38 weeks (24 percent, 67 percent, and 93 percent, respectively; P<0.001).

**Neonatal Outcomes**

The total hospital charges for the average baby girl born in 1991 to a white, 29-year-old mother with commercial insurance coverage were $5,007, as compared with $14,978 for each twin neonate and $31,462 for each neonate born after a higher-order multiple-gestation pregnancy (P<0.001) (Fig. 1). Although being black had no effect on charges, being Hispanic, maternal age over 29 years, and HMO insurance coverage each resulted in a decrease in total neonatal charges; coverage by Medicaid or Medicare, a lack of insur-

---

**Table 2. The Effect of Maternal and Neonatal Characteristics on Charges and Length of Stay.**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>MATERNAL TOTAL CHARGES</th>
<th>MATERNAL LENGTH OF STAY</th>
<th>NEONATAL TOTAL CHARGES</th>
<th>NEONATAL LENGTH OF STAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference value*</td>
<td>$4,838</td>
<td>4.0 days</td>
<td>$5,007</td>
<td>4.6 days</td>
</tr>
<tr>
<td>Twin pregnancies</td>
<td>+65$</td>
<td>+70$</td>
<td>+199$</td>
<td>+78$</td>
</tr>
<tr>
<td>Higher-order multiple gestation</td>
<td>+218$</td>
<td>+253$</td>
<td>+528$</td>
<td>+172$</td>
</tr>
<tr>
<td>Black</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Hispanic</td>
<td>NS</td>
<td>-5$</td>
<td>-21$</td>
<td>NS</td>
</tr>
<tr>
<td>Maternal age</td>
<td>$5$</td>
<td>$4$</td>
<td>$8$**</td>
<td>NS</td>
</tr>
<tr>
<td>HMO enrollment</td>
<td>-9$</td>
<td>-10$</td>
<td>-22$</td>
<td>-11$</td>
</tr>
<tr>
<td>Medicaid coverage</td>
<td>+48$</td>
<td>-3$</td>
<td>+9$</td>
<td>NS</td>
</tr>
<tr>
<td>Medicare coverage</td>
<td>+62$</td>
<td>+43$</td>
<td>+109$</td>
<td>+61$</td>
</tr>
<tr>
<td>No coverage</td>
<td>+6$</td>
<td>NS</td>
<td>+11$</td>
<td>NS</td>
</tr>
<tr>
<td>1986 Admission</td>
<td>-21$</td>
<td>+18$</td>
<td>-52$</td>
<td>+19$</td>
</tr>
<tr>
<td>1987 Admission</td>
<td>-38$</td>
<td>+10$</td>
<td>-44$</td>
<td>+15$</td>
</tr>
<tr>
<td>1988 Admission</td>
<td>-27$</td>
<td>+10$</td>
<td>-33$</td>
<td>+12$</td>
</tr>
<tr>
<td>1989 Admission</td>
<td>-20$</td>
<td>NS</td>
<td>-22$</td>
<td>+7$</td>
</tr>
<tr>
<td>1990 Admission</td>
<td>-9$</td>
<td>+5$</td>
<td>-14$</td>
<td>NS</td>
</tr>
<tr>
<td>Male neonate</td>
<td>—</td>
<td>—</td>
<td>+14$</td>
<td>+3$</td>
</tr>
</tbody>
</table>

*The reference value represents the expected value for a 29-year-old white woman with commercial insurance admitted in 1991 or for her female neonate.

1The values shown reflect the percent changes from the reference value after retransformation. NS denotes no significant change.

†P<0.01.

‡P<0.05.

§Percent change = \( \frac{1}{0.0026^n - 2^n - 1} \), where n is the mother's age.

| Percent change = \( \frac{1}{0.0022^n - 2^n - 1} \), where n is the mother's age.

**Percent change = \( \frac{1}{0.9945^n - 2^n - 1} \), where n is the mother's age.**
ance coverage, and male sex resulted in an increase (Table 2). Daily charges increased from $591 for a singleton neonate to $996 for each twin, and to $1,715 for each infant born after a higher-order multiple-gestation pregnancy (P<0.001) (Fig. 2). Neonatal charges also increased each year from 1986 to 1991.

The average neonatal length of stay increased from 4.6 days for each singleton to 8.2 days for each twin and 10.0 days for each higher-order multiple neonate (P<0.001) (Fig. 2 and Table 2). Being black and male and coverage by Medicare increased the length of stay, which was, conversely, decreased by HMO coverage (Table 2). The length of stay was shorter for each successive year from 1986 to 1991.

Fifteen percent of singleton neonates were admitted to the neonatal intensive care unit, as compared with 48 percent of twins and 78 percent of higher-order multiple neonates (P<0.001). A higher percentage of twins and newborns delivered after higher-order multiple-gestation pregnancies were discharged to step-down or community nurseries than of singletons (6 percent of singletons vs. 24 percent of twins and 60 percent of higher-order multiple neonates; P<0.001). Charges for hospitalization after discharge from Brigham and Women’s Hospital were not included in the current study. In addition, 2.6 percent of singletons were either stillborn or died before discharge, as compared with 6.0 percent of twins and 13.7 percent of higher-order multiple neonates.

**Total Family Charges**

Because of the effects of multiple gestation on both maternal and neonatal charges, the most meaningful assessment of charges is obtained by combining the two and considering total family charges (Fig. 1). After we controlled for variables that might independently affect hospital charges, the total charge per family in 1991 was $9,845 for a 29-year-old white mother of a single neonate and her child, as compared with $37,947 for a mother of twins and her two children and $109,765 for a mother of triplets and her three children. If these charges are expressed in terms of the number of babies delivered, a twin delivery approximately doubles the maternal and neonatal charges from $9,845 for each baby to $18,974 per baby, whereas delivery of triplets would result in charges of $36,588 per baby.

**Use of Assisted-Reproduction Techniques**

The use of assisted-reproduction techniques was more frequent among women with twin and higher-order multiple-gestation pregnancies than among those with singleton gestations in 1991 (Fig. 3). Of the random sample of 100 singleton pregnancies in 1991, only 2 percent resulted from documented use of assisted-reproduction techniques. Of the 221 sets of twins delivered in 1991, 65 percent were conceived spontaneously, whereas 35 percent resulted from the use of assisted-reproduction procedures, which were equally divided between induction of ovulation alone and in vitro fertilization or gamete intrafallopian transfer. Only 23 percent of newborns delivered in 1991 after higher-order multiple-gestation pregnancies were conceived spontaneously, whereas 77 percent were conceived with reproductive assistance (ovulation-induction agents in 31 percent and in vitro fertilization or gamete intrafallopian transfer in 46 percent). Review of all higher-order multiple-gestation pregnancies from 1986 to 1991 indicated that a similar proportion resulted from the use of assisted-reproduction techniques in each of the six years of this study (75 to 86 percent per year).

**DISCUSSION**

Our study indicates that multiple-gestation pregnancies result in substantially increased hospital charges for both mothers and neonates, producing a dramatic increase in total medical costs as compared with the costs of singleton pregnancies. Even if many couples plan to have more than one child, a twin or triplet gestation is clearly disadvantageous from an economic standpoint alone. Our study also addresses the contribution of assisted-reproduction techniques to the incidence of multiple gestation; we found that 77 percent of the triplets and 35 percent of the twins delivered at the study hospital were conceived through the use of such techniques. The contribution of assisted reproduction to gestations of more than two fetuses was similar in each of the years of the study and was almost identical to that reported in a previous study at the same hospital for 1983 through 1987. In 1991, 10 of 13 sets of triplets and 77 of 221 sets of twins were conceived with the help of assisted-reproduction techniques. If each of these multiple pregnancies had been a singleton pregnancy, the savings would have been more than $3 million in this one hospital for one year.

We recognize that there is the possibility of bias in our analysis of charges as opposed to costs. Data on
The New England Journal of Medicine

The percentage of women treated with induction of ovulation, with or without intrauterine insemination, is indicated by the gray bar; the use of in vitro fertilization (IVF) or gamete intrafallopian transfer (GIFT) is indicated by the white bar.

Figure 3. Percentage of Pregnancies at the Study Hospital in 1991 Resulting from Assisted-Reproduction Techniques.

The New England Journal of Medicine

Copyright © 1994 Massachusetts Medical Society. All rights reserved.

Costs were not available, but even if the mix of services differed according to type of gestation, assuming that profit margins for all services are similar, the percent increase in costs due to multiple gestation should be similar to the percent increase in charges. An important additional feature of this analysis is that the neonatal and maternal charges in our study clearly underestimate overall charges associated with multiple-gestation pregnancies. A substantial percentage of twin and higher-order multiple neonates were transferred to step-down facilities. The additional hospital charges were not captured in the current analysis, nor were the physicians' fees or charges for in-home follow-up or long-term care of patients with disabilities associated with premature delivery and multiple gestation. In addition, the economic impact of the increase in neonatal mortality (6 percent among twins and 13.7 percent among neonates in higher-order multiple-gestation pregnancies in the current series) cannot be quantified. Maternal charges also do not include any physicians' charges (billed separately), charges associated with treatment of infertility, outpatient obstetrical management of high-risk pregnancies, loss of time from work for bed rest, or admissions before the admission for delivery.

It is likely that our analysis also underestimates the effects of multiple gestation on medical costs, since it was not possible to control for maternal health, socioeconomic status, or prenatal care, all of which are inversely related to health care costs and all of which would be expected to be good in patients receiving assisted-reproduction treatment. Maternal health, socioeconomic status, and prenatal care are also likely to explain the increased charges for mothers with Medicaid and Medicare coverage (in this age group, the Medicare category is likely to include only mothers who are disabled). Conversely, HMOs attract healthier people on average, and this selection bias may underlie the lower charges among families with HMO coverage.

Currently, there is substantial economic pressure and pressure from patients for infertility-treatment programs to increase their success rates. Among the strategies used are increasing the number of ovarian follicles matured by the administration of exogenous gonadotropin during induction of ovulation and increasing the number of embryos or gametes transferred in cases of in vitro fertilization or gamete intrafallopian transfer. Each of these strategies is aimed at increasing the percentage of successful pregnancies but also substantially increases the likelihood of multiple gestations. That increase, in turn, drives obstetrical and neonatal charges higher. Many fear that decreasing the number of follicles stimulated or the number of embryos transferred in order to reduce the number of multiple gestations will lead to lower success rates and an increase in the number of menstrual cycles of treatment needed to achieve a pregnancy. However, the cost for these additional cycles, though they are by no means inexpensive, may well be a tolerable trade-off for lowering the medical and economic costs of multiple-gestation pregnancies.

A number of strategies are also being used to improve the outcomes of multiple-gestation pregnancies, which commonly result in an increased incidence of prematurity. Selective fetal reduction has been used to achieve this end, but it presents an ethical problem for many couples, entails the risk of losing all fetuses being carried, and increases psychological stress for couples who have struggled through years of infertility. Other strategies that have focused on the prevention of premature delivery through intensive antenatal monitoring and interventions have been only partially successful in controlling the complications of multiple-gestation pregnancies. Neonatal intensive care units have been responsible for substantial improvements in the outcome of multiple-gestation pregnancies, but again with the obvious drawback of dramatically increased charges.

Each of these proposed methods of improving the outcome of multiple-gestation pregnancies relies on post hoc measures used after multiple gestation has been established. A preferable and more economical solution would be to avoid the conception of multiple fetuses. Several studies have shown that the number of multiple-gestation pregnancies can be decreased by the more judicious use of ovulation-induction agents and by increased monitoring, by reducing the number of embryos transferred in cases of in vitro fertilization and gamete intrafallopian transfer, and by the use of less common but safer agents to induce ovulation, such as pulsatile gonadotropin-releasing hormone.

Now that the risks, causes, and economic impact of multiple-gestation pregnancies have been identified and the women most likely to have such pregnancies...
have been characterized, physicians have a unique opportunity to institute strategies to reduce the number of multiple-gestation pregnancies. Such strategies necessitate the acknowledgment of the risks in twin gestations as well as higher-order multiple-gestation pregnancies, since the goal of these innovative techniques is to maximize the probability of a singleton pregnancy and the birth of a healthy infant to infertile couples while minimizing the morbidity, mortality, and expense associated with multiple-gestation pregnancies.

We are indebted to Katrina Pease for her invaluable assistance in setting up the data base, to the General Clinical Research Center at Massachusetts General Hospital (under grant M01RR01066), to Sharon Best for advice on data-base management, and to Michael McClure, Ph.D., at the National Institute on Child Health and Human Development for his support of these activities.

REFERENCES