

Retrospective Cohort Study

Outcomes of surrogate pregnancies in California and hospital economics of surrogate maternity and newborn care

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Abstract

AIM: To describe maternity and newborn charges for an economic analysis of surrogate pregnancies on the health care resource utilization.

METHODS: A retrospective chart review of all women identified as being surrogates and the infants born from these pregnancies was performed between January 1, 2012 and December 31, 2013. Selected maternity diagnoses, mode of delivery, duration of hospitalization, and hospital charges were collected together with infants' birth weights, gestational age, length of hospital stay, and hospital charges. Charges associated with the *in vitro* fertilization cycles, artificial insemination, or embryo(s) transfer into the surrogate were not considered in the maternity charges. A ratio contrasting the maternity hospital charges for the surrogate carrier was compared as a ratio to the mean charges for 2540 infants delivered in 2013 after natural

conception and adjusted to the baseline hospital charges for both maternity and newborn care

RESULTS: Analysis of sixty-nine infants delivered from both gestational and traditional surrogate women found an increased in multiple births, NICU admission, and length of stay with hospital charges several multiples beyond that of a term infant conceived naturally and provided care in our nursery. Among singletons and twins (per infant) hospital charges were increased 26 times ($P < 0.001$) and in triplets charges were increased 173 times ($P < 0.0001$) when compared to a term infant provided care in a normal nursery at our center.

CONCLUSION: Maternity costs for surrogates exceed those of women who conceive naturally, and these costs are especially magnified in women with triplets and multiple births.

Key words: Surrogacy pregnancy; Assisted reproductive technologies; Prematurity; Multiple gestations

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Core tip: Surrogate pregnancies result in higher maternity and newborn costs with increased rates of multiple births and creates a moral hazard for hospitals. This increase occurs despite of the fact that surrogate mothers are prescreened for health and reproductive ability. Reduction in multiple embryo transfer would reduce the adverse economic impact of surrogate pregnancy, maternity and newborn costs.

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INTRODUCTION

In the United States approximately 7.4% of married couples are affected by infertility^[1]. The causes of infertility are multiple and range from advanced maternal age, uterine malformation, hysterectomy, fallopian tube blockage, previous tubal ligation, lack of oocyte reserve in women, male factor infertility associated with oligospermia, previous vasectomy with failed reconstruction, and other causes. In addition to fertility, in our evolving society where non-traditional family models are increasingly accepted, more and more single adults, or adults in same-sex relationships or marriage also desire to become parents and rear a family. In many such situations prospective parents may enter into an agreement to obtain oocytes or

sperm, or use the surrogate's own egg and serve as a traditional surrogate for a pregnancy^[2]. In other situations, a couple that has genetically related embryos created through *in vitro* fertilization (IVF) requires another women, a gestational carrier, in whom an embryo(s) and fetus(es) may develop. After birth, through a contractual relationship arranged prior to pregnancy, the gestational carrier relinquishes the infant(s) to the intended parents^[2].

In many countries and in some United States states, traditional and gestational surrogacy is illegal. In the United States and its territories, a patchwork of laws regarding surrogacy exists^[3]. Some United States states, limit the use of surrogacy, or permit surrogate pregnancies or use of gestational carriers only among married couples or the use of gametes from relatives, and in most states surrogacy contracts and their enforcement are determined by case law. Nevertheless, surrogacy is gaining greater societal acceptance in the United States. For instance, in California, one of the most liberal United States states in this respect, the law permits both traditional and gestational surrogacy in exchange for payment, and designates independent legal counsel for the surrogate and the intended parents, and the creation of a contract with judicial review and approval under the Uniform Parentage Act as amended in 2012^[4]. However, the recruitment of women as traditional or as gestational surrogate carriers is unregulated in California. Further informed consent with thorough discussion of the risks associated with oocyte retrieval for some embryo transfers used in gestational surrogacy is unregulated in all states except California, and significant gaps have been identified in adherence to state statutes^[5]. Despite the growing popularity of surrogacy, the medical complications associated with surrogacy and the related costs have not been precisely quantified to date. While anecdotal evidence suggests that these complications and costs are much higher than in normal pregnancies no peer reviewed data are available for documentation. This is a critical question to explore since such complications have not only financial and social costs, but may raise ethical issues for prospective parents, physicians, and hospitals. These issues need to be quantified and clarified, so that proper information and counseling/guidance can be provided to the potential parents and to women wishing to be surrogates.

In 2012, the Society for Assisted Reproductive Technology reported that among 379 of their member clinics, 165172 cycles or procedures involving *in vitro* fertilization were performed, and that infants conceived using *in vitro* fertilization procedures constituted 1.5% of all births in the United States^[6]. However, the number of infants being born using either traditional or gestational surrogacy is not known. For 2009, the Centers for Disease Control and Prevention (CDC) released information regarding 145244 assisted reproductive procedures performed

in the United States. California ranked the highest with 18405 procedures performed, with 7545 infants born from the use of these technologies. Only 52.7% of the infants born were singletons - in contrast to 96.8% of naturally conceived infants^[7], and these data did not distinguish between surrogate and other IVF births.

IVF pregnancies are considered high-risk pregnancies due to the increased risk of prematurity, pregnancy related complications, and increased incidence of multiple gestations. These factors may directly relate to the increased medical charges associated with these pregnancies^[8]. There are multiple costs specific to surrogacy, many of which are beyond the purview of this report, which focuses on the hospital costs associated with surrogate births. For example, the costs of acquisition of surrogate or gestational carrier women (often through the use of agencies who advertise for eligible women), attorneys who specialize in preparing contracts between prospective parents and the surrogate, and other costs such as specialized social services, psychological counseling for the intended parents and often for the surrogate herself.

We hypothesized that hospital charges for maternity and newborn care would be significantly greater for women serving as surrogates than those delivering after natural conception and that the hospital charges for the infants would also be significantly greater than for infants delivered after natural conception and at term among naturally conceived infants. As a major medical center in Southern California we believe that baseline data from our center may be useful in informing those contemplating surrogacy pregnancies.

MATERIALS AND METHODS

The Institutional Review Board of Loma Linda University evaluated this study and determined that it was exempt from informed consent. Selected maternity diagnosis, mode of delivery, duration of hospitalization, and hospital charges were collected from women who were identified by their obstetrical provider as being a surrogate (traditional or gestational carrier). Infants born of these pregnancies had their birth weights, gestational age, length of hospital stay, and hospital charges tabulated, as well as their stay in either the normal nursery or neonatal intensive care unit between January 1, 2012 and December 31, 2013 tabulated from medical chart review. All hospital charges data were independently tabulated by the Office of Finance based on the surrogate's or infant's medical record number, as well as, the source of payment such as private payment, third party insurer, or charged to a national health insurance scheme for international surrogacy arrangements.

Charges associated with the IVF cycles, artificial insemination, or embryo(s) transfer into the surrogate were not considered in the maternity charges. A ratio contrasting the maternity hospital charges for the surrogate carrier was compared as a ratio to the mean

Table 1 Characteristics of Surrogate Women prior to surrogate pregnancy: mean, range and SD

Surrogates	Age (yr)	Gravidity	Parity
n = 45	27	2.7	2.3
Range	20-43	1-8	1-7
SD	4.6	3.6	3.3

charges for 2540 infants delivered in 2013 after natural conception. 2013 was chosen as the baseline hospital charges for both maternity and newborn care, as the electronic medical system and financial accounting system change occurred in late December 2012. Between 2012 and 2013 there was a 9% increase in hospital charges. Therefore hospital charges for both maternity care for 2012 were adjusted by this increase in hospital charges. Charges for infant care in "normal nursery" or in the Neonatal Intensive Care unit were similarly tabulated and charges for 2012 adjusted to charges in 2013 because of the increase in hospital charges.

RESULTS

According to the CDC, in 2011 and 2012 there were 1766 cycles in gestational carriers in the State of California that resulted in the birth of 1067 infants of whom 36% (in 2011) and 39% (in 2012) were born prematurely. Approximately 15% were multiple births (CDC)^[9]. Data from traditional surrogacy pregnancies or outcomes are not collected by either the CDC or by the California Department of Health Services.

At our center, 45 women served as surrogates (24 gestational and 21 traditional) from January 1, 2012 until December 31, 2013. These women averaged 27 (range 20-43) years of age with a mean of 2.7 prior pregnancies prior to being a surrogate during the 24 months of our study (range 0-8 previous pregnancies). These women had an average of 2.3 living children (range 1-7) prior to the surrogate pregnancy. These data (and standard deviations) are summarized in Table 1.

According to maternity documents, prenatal care began in the 4.5 wk of embryo transfer or artificial insemination. Among women delivering at our center with embryo transfers (genetically related or not) 55.5% were with multiple embryos. Sperm from the intended father^[7], donor semen^[3], or mixed sperm from one male couple were impregnated into the 21 traditional surrogates. The cesarean section rate was 52% for surrogate gestations contrasted to 33% among women who conceived naturally. This increased operative mode of delivery may account for the increased average length of hospitalization among women who were surrogates. Table 2 documents the births as singleton or plural births, surrogate length of stay (LOS) for maternity care pre and post birth, and hospital charges as a ratio to women who delivered after natural conception. In the only triplet gestation

Table 2 Maternal characteristics for surrogate pregnancies related to singleton, twin or triplet delivery

Surrogates	Maternity LOS (d)	Ratio	Hospital charges (± SD)	Ratio
Singleton births (n = 20)	4.2 (1.2)	1.3	\$31,115	1.2
Twin births (22)	3.5 (0.8)	1.1	\$29,692 (11892)	1.1
Triplet births	15	4.7	\$102,673	3.8

Hospital Length of Maternity Stay (LOS) and charges compare surrogate carrier charges related to LOS and maternity charges for naturally conceived term infants requiring normal nursery care (mean ± SD).

there was a significantly longer length of stay and her maternity charges were considerably higher than compared to either singleton, or twin gestations.

Sixty-nine live-born infants resulted from surrogate gestations. Four infants died soon after birth due to extreme prematurity (although the legalized parents refused resuscitation for 24 wk twins). There was one fetal death in a twin pair, and the surviving infant was classified as a singleton, and among a triplet gestation there was fetal reduction of one fetus, and the infants born were classified as twin. Among the 69 infants born, 78% were born prior to 37 completed wk and 17.4% were born less than 30 wk. The mortality rate was 5.7% among infant born using assisted reproduction technologies in contrast to 0.7% of naturally conceived infants and having their initial admission to the normal nursery. Table 3 documents the infant characteristics by birth weight, gestational age, length of hospitalization, and the ratio of charges compared to naturally conceived infants. Compared to naturally conceived singleton or twin infants admitted to the normal nursery with a mean length of stay of 2.1 d, infants delivered of surrogates had a substantially greater length of stay. This longer length of stay was undoubtedly associated with the greater number of infants admitted to the NICU after delivery to a surrogate. Hospital charges were increased 26 times for both singleton and twin deliveries (tabulated per infant) to surrogates, and 173 times for each triplet infant (the sole triplet set that were born alive).

DISCUSSION

Data regarding outcomes of surrogacy pregnancies in California using a gestational carrier and from our center (both gestational and traditional surrogates) reveal a higher rate of prematurity and lower birth weight than among pregnancies resulting from natural conception. The higher cesarean rate may be explained by the higher multiple gestation pregnancies among surrogates and is consistent with the report on the increasing cesarean section rate among twins^[10].

Charges for hospital services for these women and the infants delivered provide new information regarding the consumption of medical services

by these pregnancies. A discussion of healthcare economics is relevant to the data presented by our experience at a single center. While many healthcare economic discussions center on dwindling reimbursement, the issue is quite different with provision for services to surrogates. Commercial insurance coverage was available for all but one of the women serving as surrogates, and of the 69 infants all but 8 also had commercial insurance with the other women or infants classified as "self pay" resulting in a net profit for our center for maternity care. Newborns were similarly covered except that national health plans in France and Spain would not cover the costs of neonatal intensive care. Combining a well-insured population with a profitable service line such as neonatal intensive care at our center produces a favorable financial outcome for our center. However, in an environment where state-sponsored insurance payments are declining and more people are migrating towards lower-paying insurance exchanges, medical centers are inclined to protect their major sources of margin. This raises the concern of the "moral hazard" of surrogacy. As illustrated surrogate women and the infants delivered have greater rates of cesarean section, premature birth, and low birth weight infants at significantly higher rates than the population of infants born after natural conception. The same is true for IVF/Assisted Insemination pregnancies^[8]. Kissin *et al*^[11] recently calculated the increased medical costs attributed to Assisted Reproductive Technologies by state. California led with this economic burden for 2013 estimated at \$158800418.

A "moral hazard" occurs when the system that helps create the higher risk pregnancy also stands to profit from the additional care that the women and babies are likely to require. The interests of the 3 decision-making parties - intended parents, healthcare system and insurance system - are not aligned. Although gestational surrogacy represents a fraction of all IVF related births, these increased costs and potential profitability are not aligned with value-based health care. The overwhelming desire of prospective parents is to have a normal infant ideally delivered at term. In most cases, these couples, or even single adults will have attempted multiple other means of having a child before settling on the significantly more complicated method of hiring a surrogate. Most families will be paying cash for the surrogate pregnancy (\$20-30000 for a surrogate, if an egg donor is required another \$5-10000, the fertility clinic and reproductive endocrinologist \$15000 per cycle, the surrogacy agency \$10-20000) and attorneys fees of about \$10000^[12]. However, the cost for prenatal care, maternity charges, and expenses associated with neonatal intensive care may exhaust some intended parents resources. While many intended parents may be able to afford the \$50000 or so to begin a pregnancy with the assistance of a surrogate, we have encountered many who have been unprepared for the charges associated with the care of

Table 3 Infant characteristics after birth from surrogate pregnancy

Infant(s)	Birth weight	GA	LOS	Hospital charges	Ratio
Singleton (n = 19)	3798.3 ± 832.9	35.9 ± 2.9	11 ± 3	\$154874 ± 326415	26.2
Twins (n = 44)	2151.5 ± 750.5	33.8 ± 4.3	12.7 ± 4	\$154885 ± 339442	26.2
Triplets (n = 3)	1337.2 ± 91.8	30.0 ± 0	75.0 ± 0	\$1025927 ± 99097	173.8

Hospital charges are expressed as a ratio of hospital charges for per infant compared to hospital charges for a term infant provided care in the normal nursery (mean ± SD).

a complicated newborn born prematurely and requiring several days in a Neonatal Intensive Care unit. Nor are families necessarily prepared for all the implications of a multiple-birth and the associated short- and long-term costs. If a pregnancy has a lower than normal probability of success or more potential complications how extensive should physicians explain these risks? How much do intended parents need or want to know regarding potential complications in the newborns and the added financial costs associated with a premature infant or multiple births? These questions are central to the ethical debate that has surrounded surrogacy. Kissin *et al*^[13] has stressed that outcomes of assisted reproductive technologies should properly be assessed on the basis of the number of singleton infants born at term not simply based on live births.

An extension of the “moral hazard” concerns with surrogacy has been the misunderstandings that arise between intended parents and surrogates, and unforeseen events during such a pregnancy. Intended parents-surrogates disputes have arisen when the intended parents demand that the surrogate terminate a pregnancy when a significant fetal malformation is identified, or intended parents change their mind mid-gestation, *e.g.*, by initiating divorce proceedings, or when an intended parent dies. Surrogates may make greater demands on intended parents when multi-fetal gestations occur, or they may wish to engage in behaviors forbidden in their contract, or they may wish to parent the infant themselves. As noted by Andrew W. Vorzimer, a prominent attorney in arranging such contracts in Los Angeles, of 118 surrogacy cases in which a dispute arose 82 were cases in which the intended parents changes their mind and the remainder were by women serving as surrogates (many of whom were traditional surrogates providing her eggs and also carrying the infant) (Andrew W. Vorzimer, J.D., personal communication July 18, 2013).

Margalit^[14], an attorney, argues that surrogacy contracts are both desirable and necessary to ensure fairness and enforceability to the benefit of all parties involved. To increase the likelihood that these dual goals of fairness and enforceability are achieved, Margalit^[14] further argues that all parties should have independent legal representation from the start of the process as well as thorough, precise, medical guidance as to the risks and probabilities of various outcomes, including catastrophic outcomes. In addition, the paper argues that both sides should receive social and psychological

support, and the contract should comprehensively deal with all possible outcomes, including unhealthy newborn(s), premature birth, complications/chronic diseases, and the divorce/death of the intending parents. Finally, every effort should be made to ensure that the disparity in economic strength between the parties to the contract does not interfere with the parties decision to enter into the contract nor “interferes with their free will”. Additional legal/ethical risk may arise when prospective parents turn to off-shore surrogacy agencies (primarily in India, Thailand and Mexico) in an effort to cut costs. While these agencies often charge approximately half of what United States agencies do, some are not as reputable and engage in unethical practices and sometimes out-right fraud^[15].

Finally, what is the insurance company’s piece of this puzzle? By and large, families have borne the expense of the surrogacy, but the infant is now covered under the family’s insurance plan even though the parents have voluntarily assumed more than the usual risk. The health insurance industry has thus far been slow to adjust premiums to risk profiles. However, as responsibility for payment continues to shift over to patients through high-deductible plans and cost-sharing, it’s reasonable to expect that voluntary assumptions of greater risk will be looked at more critically by the insurance industry and by state health exchanges that must assume even greater risk.

A potential game-changer to the surrogacy moral hazard is an ongoing shift in how hospitals contract with insurers. Historically, they have been paid on a fee-for-service basis where they are paid a percentage of charges or a per diem rate. As their usage increases so does their payment. Medicare saw tremendous opportunity for abuse under their cost-plus reimbursement in the 70s and switched to a DRG-based case rate that also affects Medicaid (MediCal) hospital payment in California. Recently a number of state Medicaid programs followed suit with All Patient Refined DRG-based case rate payments. However, by and large, providers are still financially incentivized to increase rather than decrease the cost of care.

Increasingly health insurance policies are requiring consumers to be more accountable for their healthcare or they are charged larger premiums.

Another aspect of the “moral hazard” of surrogacy is that voluntary risk acceptance could come increasingly under extreme scrutiny. If a medical center stood not to gain, and rather potentially to lose a great

deal in the care of surrogate women and the infants from these pregnancies (as may occur in some cases of international prospective patents counting on reimbursement from their countries national health plan, especially countries that deem surrogacy illegal) how might this impact the market for the care of women surrogates, or their infants? All of these dynamic considerations make it imperative that prospective parents and medical providers have a full understanding of the risks and frequently unforeseen costs associated with surrogacy decisions.

In conclusion, data from California indicate that gestational surrogacy is increasing, and data highlight the substantial increase in multiple births, often born prematurely in California. We document at our single site the extensive requirement for neonatal intensive care and associated increased hospital charges for medical services for both surrogate (both gestational and traditional) and infants from surrogate pregnancies. In a value-based health care system, the "moral hazard" associated with promotion of surrogacy and the higher charges associated with maternity and infant care raises important issues in an area of health care services lacking regulation.

COMMENTS

Background

Surrogate pregnancies result in increased maternity costs in spite of pre-selected for maternal reproductive health primarily associated with an increase in multiple gestations that are associated with increased cesarean section rates, more preterm deliveries, increased neonatal intensive care with added neonatal morbidities.

Research frontiers

Surrogate pregnancies are permitted in several United States states, but the outcomes of these pregnancies have not been rigorously evaluated in terms of maternity or neonatal complications or hospital associated charges.

Innovations and breakthroughs

California has more surrogate pregnancies of any United States state and the impact on health economics is imperative for healthcare value with significantly greater multiples births than occur have natural conception.

Applications

Health economists and insurance providers are focused on health care value. Given the increased charges associated with surrogate pregnancies and the infants born thereof, surrogacy may come under additional scrutiny because of the moral hazard created by these gestations and the impact on health care resources.

Terminology

In this paper surrogacy includes both traditional and gestational surrogacy.

Peer-review

The authors have performed a good study, the manuscript is interesting.

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