What Is the Best Strategy for Presenting Results in Assisted Reproductive Technology?

The aim of every practitioner in assisted reproduction is to produce the best success rates for his/her patients. Their secondary aim is to present their unit in as good a light as possible. The need to have results available to prospective patients has been recognized for many years. The problem is

that these results can be expressed in many ways. In the simplest case, we have a numerator, the number of "pregnancies", and the denominator, reflecting how many patients or episodes of treatment were carried out. To produce the best scenario, one would report the number of pregnancies,

divided by the number of the patients who underwent treatment. This is how success rates were expressed in the early days of reproductive technology. For example Behrman, in one of the landmark papers on artificial insemination in 1954 (1), compared the success rates of 24 authors in this way, finding success rates between 40 and 100%. This of course is meaningless, as it does not allow for the number of attempts that each patient has had. This was corrected by Chong and Taymor (2) when they analyzed their experience by a monthly pregnancy rate, cumulating the outcome. This has been further refined by expressing results as a "life-table analysis." This originates from the interpretation of survivals of the treatment of cancer as described by Peto and colleagues (3) but changed to analyze conceptions instead of survival. The life table takes into consideration that we wish to compare patients who have differing durations of follow-up and thus varying numbers of exposure to treatment. This allows for what is likely to happen to those women who have not yet been treated, when they continue. The life-table analysis can then be graphed to give a visual impression of the cumulative chance of conception with repeated treatments. Its application to infertility therapy was described in detail by Guzick and Rock in 1981 (4). This became the accepted method of expressing the results of donor inseminations (5), ovulation induction (6), tubal surgery (7), and even in vitro fertilization (IVF) (8). Using life-table analysis we can tell a prospective couple what their chance of succeeding is if they plan to have a certain number of treatments.

Even if the results are expressed in a statistically correct life-table format, the results can vary by the way the numerator is expressed. For the "best results" one may call "pregnancy" a positive β -human chorionic gonadotropin test 14 days after treatment. The next level of discrimination is "clinical pregnancy," which is defined as a pregnancy visible on ultrasound, but this includes ectopic pregnancies and other early abortions. "Viable pregnancy" has also been used, defined by the presence of a normal fetal heart and the correct-size gestation sac for the weeks of gestation. Finally, we can express the results as "live births," often referred to as the "take-home baby" rate. The "success rate" can further be "improved" by expressing IVF rates "per transfer" rather than "per oocyte collection" or per "treatment cycle commenced." Thus when we compare units, we must be sure that the same numerator and denominator are used. Even then the results can reflect factors apart from clinical or

scientific skill. For example, we know that the chance of success is higher within the first few cycles. So if a program has mainly new patients, it will have better success rates. Similarly, younger women do better with all forms of treatment, and having a younger cohort will improve outcomes. In IVF treatment, the "cancellation rate" will affect the success rate inversely. If women with less than optimal follicles are canceled, the pregnancy rate per oocyte collection will improve by excluding those with a lower chance of pregnancy. Another critical factor is the number of embryos transferred. Those units that transfer high numbers of embryos will have a higher raw pregnancy rate per treatment than those that restrict their embryos per transfer to two or three.

In IVF treatment there is another complicating factor in the expression of results. With the practice of embryo freezing becoming routine, many couples conceive with a subsequent transfer of a thawed/frozen embryo. As the "risky" part of IVF is stimulation and oocyte collection, the pregnancy obtained with the frozen embryos should be credited back to the cycle in which the oocyte that created the embryo was collected. This is what should be described as the "compounded" pregnancy rate. Even this creates difficulty, as it is not possible to have complete results until all embryos in storage from any one cycle have been transferred. There is also difficulty in how to express the pregnancy rate when more than one pregnancy results from the one treatment cycle. In 1991, we reported on a couple who achieved three consecutive pregnancies from oocyte collection (9).

Another dilemma is how to interpret multiple pregnancies. If we assess success on a "take-home baby" basis, do we credit twins twice and triplets three times? Certainly, for infertile couples to have twins often is a very "cost-effective" solution to complete their family. However, from a perinatologist's point of view the "success" of a multiple pregnancy by assisted reproduction technology is often a pediatric disaster.

As "benchmarking" has become popular for quality assurance, it is important that if this is carried out, we are comparing units on a "level playing field." A possible way to do this is to define the "ideal couple," for example, a female partner 35 years old or younger, within the first three treatment cycles, with tubal infertility and no male factor. If the numerator and denominator are also defined, we can then compare different units' results for this reference group. The Reproductive Technology

Accreditation Committee of the Fertility Society of Australia planned to do this as a pilot study in 1998.

We still have the problem of how to explain to prospective couples their chance of pregnancy. It is impossible to inform them fully about all the factors that have been mentioned here, so a simplified format needs to be used. This should be based on either "viable pregnancies" or "take-home babies" and it should be clearly stated whether it is per oocyte collection or embryo transfer procedure.

REFERENCES

1. Behrman SJ: Artificial insemination. *Fertil Steril* 1959;3:248-258
2. Chong AP, Taymor ML: Sixteen years' experience with therapeutic donor insemination. *Fertil Steril* 1975;26:791-795
3. Peto R, Pike MC, Armitage P, Breslow NE, Cox DR, Howard SV, Mantel N, McPherson K, Peto J, Smith PG: Design and analysis of randomised clinical trials requiring prolonged observation of each patient. *Br J Cancer* 1977;35:1-39
4. Guzick DS, Rock JA: Estimation of a model of cumulative pregnancy following infertility therapy. *Am J Obstet Gynecol* 1981;140:573-578
5. Kovacs GT, Lording DW: Artificial insemination with donor semen. A review of 252 patients. *Med J Austral* 1980;2:609-612
6. Kovacs GT, Dennis PM, Shelton RJ, Outch KH, McLean RA, Healy DL, Burger HG: Induction of ovulation with human pituitary gonadotrophins: 12 years experience. *Med J Austral* 1984;140:575-579
7. Rock JA, Guzick DS, Katz E, Zacur HA, King TM: Tubal anastomosis: Pregnancy success following reversal of Falope ring or monopolar cautery sterilisation. *Fertil Steril* 1987;48:13-17
8. Kovacs GT, Rogers P, Leeton JF, Trounson AO, Wood C, Baker HWG: In-vitro fertilisation and embryo transfer. Prospects of pregnancy by life-table analysis. *Med J Austral* 1986;144:682-683
9. Kovacs GT, Downing BJ, Krins AJ, Freeman L: Triplets or sequential siblings? A case report of three children born after one episode of in vitro fertilization. *Fertil Steril* 1991;56:987-989

Gab Kovacs¹

Monash IVF

and

Department of Obstetrics and Gynaecology

Box Hill Hospital

Melbourne, Australia

¹ To whom correspondence should be addressed at Box Hill Hospital, P.O. Box 94, Box Hill, Victoria 3128, Australia.