

Assisted reproductive technology in the United States: 1998 results generated from the American Society for Reproductive Medicine/Society for Assisted Reproductive Technology Registry

Society for Assisted Reproductive Technology and the American Society for Reproductive Medicine

Birmingham, Alabama

Objective: To summarize the procedures and outcomes of ART initiated in the United States in 1998.

Design: Data were collected electronically by using the SART Clinical Outcome Reporting System software and submitted to the American Society for Reproductive Medicine/Society for Assisted Reproductive Technology Registry.

Participant(s): Three hundred and sixty programs submitted data on procedures performed in 1998. Data were collated after November 1999 so that the outcome of all pregnancies established would be known.

Main Outcome Measure(s): Incidence of clinical pregnancy, ectopic pregnancy, abortion, stillbirth, and delivery.

Results: Programs reported initiating 81,899 cycles of ART treatment. Of these, 58,937 cycles involved IVF (with and without micromanipulation), with a delivery rate per retrieval of 29.1%; 1,293 were cycles of gamete intrafallopian transfer, with a delivery rate per retrieval of 27.4%; 1,054 were cycles of zygote intrafallopian transfer with a delivery rate per retrieval of 29.6%. The following additional ART procedures were also initiated: 5,273 fresh donor oocyte cycles, with a delivery rate per transfer of 41.2%; 11,228 frozen embryo transfer procedures, with a delivery rate per transfer of 19.3%; 1,913 frozen embryo transfers using donated oocytes or embryos, with a delivery rate per transfer of 23.5%, and 809 cycles using a host uterus, with a delivery rate per transfer of 31.6%. In addition, 969 cycles were reported as combinations or more than one treatment type, 25 cycles as research, and 398 as embryo banking. As a result of all procedures, 20,241 deliveries were reported, resulting in 29,128 neonates.

Conclusions: In 1998, there were more programs reporting ART treatment and a significant (12.1%) increase in reported cycles compared with 1997. In comparable cycle types, the actual increase in overall success rate (deliveries per retrieval) was 1.4%, which represents an increase of 4.7% compared with the success rate in 1997. (Fertil Steril® 2002;77:18–31. ©2002 by American Society for Reproductive Medicine.)

Key Words: Assisted reproductive technology, in vitro fertilization, gamete intrafallopian transfer, zygote intrafallopian transfer, cryopreserved embryos, donor oocytes

In 1988, the Society for Assisted Reproductive Technology (SART) began publishing annual reports of ART activities (1). These annual reports were based on voluntary data submission by programs, and they provided a forum for sharing information early in the development of the technology. In 1992, the U.S. Congress passed the Fertility Clinic Success Rate and Certification Act (2), which requires the Centers for Disease Control and Prevention (CDC) to publish clinic-specific pregnancy

success rates for ART procedures in the United States. Through collaboration with SART and their data collection system, data from 1995 were first collected and published under the Act (3). In addition to the annual CDC report, SART has continued to review and analyze annual data to explore trends in ART activities in more detail. The purpose of the present report is to summarize the procedures and outcomes of ART procedures initiated in the United States in 1998.

Received and accepted
October 10, 2001.

Reprint requests: American
Society for Reproductive
Medicine, 1209
Montgomery Highway,
Birmingham, Alabama
35216 (FAX: 205-978-5005;
E-mail: jzeit@asrm.org).

0015-0282/02/\$22.00
PII S0015-0282(01)02985-5

The SART has prepared this report in conjunction with The American Society for Reproductive Medicine (ASRM) and the CDC. It represents mandatory reporting by 360 programs offering ART, 340 (94.4%) of which were members of SART. Each clinic's submitted data were tabulated and summarized by SART and subsequently verified by each clinic's medical director, and all such data were subject to validation through on-site visits and medical record review.

MATERIALS AND METHODS

Data collected retrospectively for ART treatments initiated from January 1, 1998, through December 31, 1998, form the basis for this report. Programs collected patient- and cycle-specific data in electronic form by using the SART Clinical Outcome Reporting System, a software program designed for ART data collection. The ART programs submitted the final data in January 2000 to permit reporting of outcomes of all pregnancies initiated in 1998. Each reporting clinic submitted an export diskette and a printed clinic summary that was verified as accurate by the medical director. The export diskette was created by using SART Clinical Outcome Reporting System and contained patient demographic characteristics, history, and diagnosis for each patient and medication, treatment methods, and outcomes for each cycle.

Data for patients who underwent more than one cycle of ART were collected and analyzed separately for each cycle. Therefore, the cycle number reported is always equal to or greater than the number of patients. The data were then tabulated by SART and compiled to create the annual clinic data set. Each clinic was also sent a clinic summary table so that it could reconfirm outcome and treatment data. Analysis was completed over the 10 months after data submission.

In addition, the CDC subsidized on-site data validation at 30 randomly selected clinics. Approximately 25 data elements in each of 50 randomly selected cycles were verified in the medical and laboratory records of the program by two members of the SART Validation Committee, who were occasionally accompanied by a CDC observer. The ART procedures were divided into several categories for reporting purposes: IVF, GIFT, ZIFT, cryopreserved embryo transfer, donor oocyte, cryopreserved embryo transfer from donor oocytes, and ART cycles for host uterus transfer. Programs also submitted information on cycles in which ICSI was performed. For reporting purposes, cycles were divided into four categories according to the age of the woman at the time of cycle start: <35 years, 35–37 years, 38–40 years, and >40 years. These age groups were then further categorized by reported primary diagnosis. Stimulated cycles (during which ovulation induction medications were used) and unstimulated cycles were combined in each of the categories described above. A clinical pregnancy was defined as the occurrence of at least one ultrasonography-confirmed gestational sac in the uterus (which excludes ectopic and bio-

chemical pregnancies but includes heterotopic pregnancies). Ectopic pregnancies were reported separately. A pregnancy loss was defined as a clinical pregnancy that did not result in a delivery.

The following definitions were used in measuring outcomes. A live birth was a cycle that resulted in at least one live born neonate, regardless of the number of other neonates and whether they were live born or stillborn. A stillbirth was a cycle that resulted in no live born neonates and one or more stillborn neonates. The number of deliveries was equal to the sum of live birth cycles plus stillbirth cycles, which was the same as the sum of cycles that resulted in one or more live born neonates plus cycles that resulted in all stillborn neonates. A live born neonate was one that showed signs of life after complete expulsion or extraction from its mother. Signs of life were breathing, beating of the heart, pulsation of the umbilical cord, or definite movement of the voluntary muscles regardless of gestational age at birth. Heartbeats were distinguished from transient cardiac contractions, and respirations were distinguished from fleeting respiratory efforts or gasps. A stillborn neonate was one born at 18 weeks or later from the date of transfer that showed no signs of life after complete expulsion or extraction from the mother and for whom no certificate of live birth was filed. The number of neonates (infants born) was equal to the sum of live born neonates plus stillborn neonates.

RESULTS

All ART Procedures

In 1998, 360 programs reported initiating 81,899 cycles of ART treatment. Of these cycles, 58,937 cycles used IVF and fresh transfer of embryos derived from the patient's own oocytes (nondonor), including 22,219 cycles that used ICSI. There were 1,293 cycles of fresh nondonor GIFT and 1,054 cycles of fresh nondonor ZIFT, of which 690 used ICSI. There were 5,273 cycles involving donor oocytes and fresh embryo transfer, including 1,657 that used ICSI and 809 cycles with embryo transfer to a host uterus. In addition, 11,228 nondonor cryopreserved embryo thaw procedures and 1,913 donor oocyte or embryo derived cryopreserved embryo thaw procedures were performed. A total of 969 combination cycles were performed. Twenty-five cycles were reported as research and 398 as embryo banking. All research cycles had research protocols and consent forms approved in advance by SART. As a result of all these procedures (all ART and all cryopreserved embryo transfers), 20,241 deliveries resulting in the birth of 29,128 neonates were reported.

Of all deliveries, 12,647 (62.5%) were singleton, 6,365 (31.4%) were twins, 1,166 (5.8%) were triplets, and 63 (0.3%) were deliveries of higher order than triplets. A total of 271 were reported as stillborn infants (9 per 1,000 neonates). Table 1 shows summary data, and Tables 2 and 3 shows the IVF and GIFT subsets, compared with the 1997 report.

TABLE 1

Comparison of reported outcomes for ART procedures.^a

Outcome	IVF	GIFT	ZIFT	Donor oocyte transfer ^b	CPE transfer ^c	CPEDO transfer	Host uterus transfer
No. of treatments ^d	58,937	1,293	1,054	5,273	11,228	1,913	809
Cancellations (%)	13.9	16.2	10.5	5.7	5.6	4.4	3.6
No. of retrievals	50,771	1,084	943	NA	NA	NA	780
No. of transfers	47,529	1,068	890	4,783	10,058	1,747	743
Transfers per retrieval (%)	93.6	98.5	94.4	NA	NA	NA	95.3
No. of clinical pregnancies	17,943	376	343	2,327	2,447	525	297
Rate of pregnancy loss	17.6	21.0	18.7	15.3	20.7	21.9	20.9
No. of deliveries	14,789	297	279	1,972	1,941	410	235
Deliveries per retrieval (%)	29.1	27.4	29.6	NA	NA	NA	30.1
Deliveries per transfer (%)	31.1	27.8	31.3	41.2	19.3	23.5	31.6
Singleton delivery (%)	61.8	64.3	62.4	56.2	73.1	72.7	54.5
No. of ectopic pregnancies	378	6	12	33	80	15	1
Rate of ectopic pregnancy (%)	2.1	1.6	3.5	1.4	1.6	2.9	0.3

Note: CPE = cryopreserved embryos; CPEDO = cryopreserved embryos donor oocytes; GIFT = gamete intrafallopian transfer; NA = not applicable; ZIFT = zygote intrafallopian transfer.

^a Except combination (n = 1,800), research (n = 25), and embryo banking (n = 398) cycles.

^b Includes known or anonymous but not host uterus or surrogate.

^c Cryopreserved ET cycles not done in combination with fresh ETs and not done with donor egg or embryo.

^d Includes all cycles, regardless of age and cause of infertility.

SART/ASRM. ASRM/SART registry: 1998 results. *Fertil Steril* 2002.

IVF

All Cycles

Of the 58,937 initiated cycles of IVF (with and without ICSI), 50,771 (86.1%) led to retrieval; the overall cancellation rate of 13.9%. Of the 50,771 retrievals, 47,529 (93.6%) led to a transfer. A total of 17,943 clinical pregnancies were reported, for a clinical pregnancy rate of 30.4% per initiated cycle, 35.3% per retrieval, and 37.8% per transfer. A total of

14,789 deliveries were reported, for a delivery rate of 25.1% per initiated cycle, 29.1% per retrieval, and 31.1% per transfer. The rate of clinical pregnancy loss was 17.6%. A total of 378 ectopic pregnancies were reported, which represented 2.1% of clinical pregnancies.

Overall, 61.8% of deliveries were singletons, 31.7% were twins, 6.2% were triplets, and 0.4% were higher-order multiple deliveries. There were 225 stillborn infants (10 per 1,000 neonates) reported, with 58 stillborn infants in single-

TABLE 2

IVF procedures (with and without ICSI), by age group and cause of infertility.

1998 IVF procedures	No. of retrievals	Canceled cycles (%)	Transfers per retrieval (%)	No. of pregnancies	No. of deliveries	Deliveries per retrieval (%)	Multiple births per delivery (%)
No male factor infertility							
Women <35 years of age	16,648	10.0	93.4	6,878	5,948	35.7	43.4
Women 35–37 years of age	8,524	14.7	94.2	3,109	2,543	29.8	37.9
Women 38–40 years of age	7,063	19.5	92.7	2,006	1,498	21.2	29.0
Women >40 years of age	4,348	24.6	89.9	721	446	10.3	20.2
Male factor infertility							
Women <35 years of age	7,546	7.7	94.7	3,042	2,647	35.1	40.3
Women 35 to 37 years of age	3,147	11.6	94.8	1,206	1,000	31.8	35.5
Women 38 to 40 years of age	2,366	14.6	92.9	750	563	23.8	31.8
Women >40 years of age	1,129	19.1	91.9	231	144	12.8	13.9
1998 totals	50,771	13.9	93.6	17,943	14,789	29.1	38.2
1997 totals	44,170	14.0	93.4	15,047	12,302	27.9	39.0

SART/ASRM. ASRM/SART registry: 1998 results. *Fertil Steril* 2002.

TABLE 3

GIFT, procedures, by age and cause of infertility.

1998 GIFT procedures	No. of retrievals	Canceled cycles (%)	Transfers per retrieval (%)	No. of pregnancies	No. of deliveries	Deliveries per retrieval (%)	Multiple births per delivery (%)
No male factor infertility							
Women <35 years of age	401	9.7	98.5	166	140	34.9	43.6
Women 35–37 years of age	219	14.8	97.3	82	68	31.1	26.5
Women 38–40 years of age	189	18.5	98.9	76	56	29.6	28.6
Women >40 years of age	198	25.6	99.5	33	18	9.1	33.3
Male factor infertility							
Women <35 years of age	27	10.0	100.0	6	6	22.2	16.4
Women 35–37 years of age	17	15.0	100.0	5	5	29.4	60.0
Women 38–40 years of age	15	21.1	100.0	3	2	13.3	50.0
Women >40 years of age	18	28.0	94.4	5	2	11.1	0.0
1998 totals	1,084	16.2	98.5	376	297	27.4	35.7
1997 totals	1,663	14.4	98.6	627	499	30.0	33.3

Note: GIFT = gamete intrafallopian transfer.

SART/ASRM. ASRM/SART registry: 1998 results. Fertil Steril 2002.

ton deliveries, 111 in twin deliveries, and 51 in triplet or higher-order deliveries.

Treatment Success Rates during 3 Consecutive Years

1998 is the third year that ART treatment and outcome data were reported exclusively through the SART Clinical Outcome Reporting System. Standardized reporting allows multiyear review of ART success rates. Since a preponderance of treatments during this period was fresh nondonor IVF, we present success rates from 1996, 1997, and 1998, stratified by age group.

For the youngest patient group, women <35 years of age at the start of cycle, success rates (deliveries per cycle) were 28.4%, 30.7%, and 32.2% for 1996, 1997, and 1998, respectively. Among women 35–37 years of age, success rates were 23.4%, 25.5%, and 26.1% for the three consecutive years. In women 38–40 years of age at cycle start, the success rates were 16.0%, 17.0% and 17.9%, and in women >40 years of age, rates were 6.4%, 7.3%, and 8.3%. Each age group experienced a significant increase in success rates during the 3-year period (Fig. 1).

IVF Cycles by Age and Male Factor

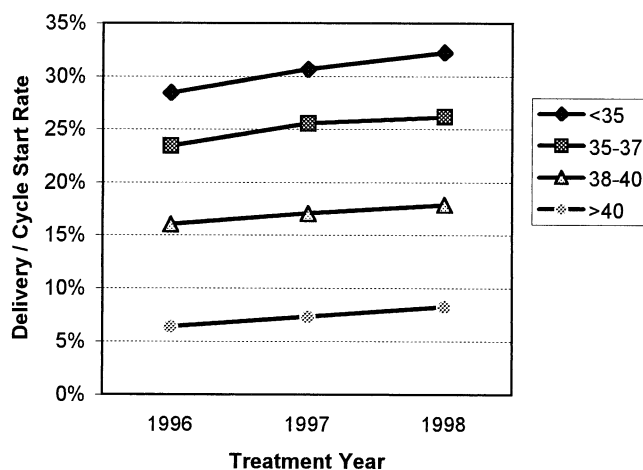
All 58,937 IVF cycles were analyzed by age of the woman at the time of retrieval and by presence or absence of male factor infertility. Overall, 45.3% of IVF cycles were initiated in women <35 years of age, 23.0% in women 35–37 years of age, 19.6% in women 38–40 years of age, and 12.1% in women >40 years of age. Male factor infertility was reported in 27.0% of all IVF cycles. Table 2 shows the analysis for standard IVF cycles, with and without ICSI.

Women with no male factor infertility. Among women <35 years of age with no male factor infertility, 18,505 cycles were initiated; the cancellation rate was 10.0%. The 16,648 retrievals and 15,675 transfers resulted in 6,878 pregnancies and 5,948 deliveries, for a delivery rate of 32.1% per initiated cycle, 35.7% per retrieval, and 37.9% per transfer. The rate of pregnancy loss was 13.5%.

There were 9,995 cycles in women 35–37 years of age

FIGURE 1

Delivery rates in 1996, 1997, and 1998.



SART/ASRM. ASRM/SART registry: 1998 results. Fertil Steril 2002.

TABLE 4

IVF according to quartiles cycle volume at individual clinics and by cycle volume in quartiles.

Clinic quartile ^a	Cycle volume	All cycles			Sample 1 ^b		Sample 2 ^c	
		Total cycles in quartile	No. of clinics in quartile	Median no. of cycles per clinic	No. of cycles in sample	Deliveries per cycle in sample (%)	No. of cycles in sample (%)	Deliveries per cycle in sample (%)
A	≤208	20,471	235	76	7,636	30.0	3,455	22.6
B	214–388	20,415	69	300	6,728	32.0	3,334	26.1
C	392–814	20,116	40	466	6,056	33.3	3,123	26.8
D	≥842	20,970	16	1,226	6,437	34.3	3,653	29.0
W	≤64	3,333	90	36	1,293	27.5	551	18.7
X	65–132	8,048	90	87	3,067	29.8	1,356	21.4
Y	134–300	17,969	90	183	6,238	31.1	2,780	26.4
Z	≥300	52,622	90	436	16,259	33.5	8,878	27.2

^a For explanation of quartiles, see text.

^b IVF treatment of women <35 years of age for all diagnoses.

^c IVF treatment of women 35–37 years of age for all diagnoses.

SART/ASRM. ASRM/SART registry: 1998 results. Fertil Steril 2002.

with no male factor infertility; the cancellation rate was 14.7%. The 8,524 retrievals and 8,032 transfers resulted in 3,109 pregnancies and 2,543 deliveries, for a delivery rate of 25.4% per initiated cycle, 29.8% per retrieval, and 31.7% per transfer. The rate of pregnancy loss was 18.2%.

Among women 38–40 years of age with no male factor infertility, 8,769 cycles were initiated; the cancellation rate was 19.5%. The 7,063 retrievals and 6,547 transfers resulted in 2,006 pregnancies and 1,498 deliveries, for a delivery rate of 17.1% per initiated cycle, 21.2% per retrieval, and 22.9% per transfer. The rate of pregnancy loss was 25.3%.

There were 5,765 cycles in women >40 years of age with no male factor infertility; the cancellation rate was 24.6%. The 4,348 retrievals and 3,910 transfers resulted in 721 clinical pregnancies and 446 deliveries, for a delivery rate of 7.7% per initiated cycle, 10.3% per retrieval, and 11.4% per transfer. The rate of pregnancy loss was 38.1%.

Women with male factor infertility. Among women <35 years of age with male factor infertility, 8,177 cycles were initiated; the cancellation rate was 7.7%. The 7,546 retrievals and 7,144 transfers resulted in 3,042 pregnancies and 2,647 deliveries, for a delivery rate of 32.4% per initiated cycle, 35.1% per retrieval, and 37.1% per transfer. The rate of pregnancy loss was 13.0%.

There were 3,559 cycles in women 35–37 years of age with male factor infertility; the cancellation rate was 11.6%. The 3,147 retrievals and 2,984 transfers resulted in 1,206 pregnancies and 1,000 deliveries, for a delivery rate of 28.1% per initiated cycle, 31.8% per retrieval, and 33.5% per transfer. The rate of pregnancy loss was 17.1%. Among women 38–40 years of age with male factor infertility, 2,772 cycles were initiated; the cancellation rate was 14.6%. The 2,366 retrievals and 2,199 transfers resulted in 750

pregnancies and 563 deliveries, for a delivery rate of 20.3% per initiated cycle, 23.8% per retrieval, and 25.6% per transfer. The rate of pregnancy loss was 24.9%. There were 1,395 cycles in women >40 years of age with male factor infertility; the cancellation rate was 19.1%. The 1,129 retrievals and 1,038 transfers resulted in 231 pregnancies and 144 births, for a delivery rate of 10.3% per initiated cycle, 12.8% per retrieval, and 13.9% per transfer. The rate of pregnancy loss was 37.7%.

Analysis of Clinics by ART Volume

Two analyses assessed the effect of clinic volume on outcomes. To standardize the comparison of clinics, success rates for two sample populations are presented; women <35 years of age and 35–37 years of age.

In the first analysis, the total number of ART cycles was divided into roughly equal quartiles of approximately 20,400 starts each (of all treatment types). Clinics were then distributed within the quartiles by clinic volume. Thus, quartile A consisted of a large number of the lowest-volume programs and quartile D consisted of a small number of the highest-volume programs. An ART program or clinic was defined as a legal entity practicing under state law, recognizable to the consumer, that provides ART to couples who have experienced infertility or are undergoing ART for other reasons. The number of treatments and the average delivery rate per cycle were compared among quartiles (Table 4).

In quartile A, 235 clinics performed 20,471 ART cycles, with a median volume of 76 cycles per clinic. Quartile A clinics reported 7,636 IVF cycles for patients <35 years of age (sample 1), with a delivery rate of 30.0% per cycle, and 3,455 cycles in patients 35–37 years of age (sample 2), with a delivery rate of 22.6%. The 69 clinics in quartile B reported

20,415 total cycles, with a median volume of 300 cycles. Quartile B reported 6,728 cycles in sample 1, with 32.0% of cycles resulting in a delivery, and 3,334 IVF cycles in sample 2, with a delivery rate of 26.1%. In the 40 clinics in quartile C, 20,116 cycles were performed, with a median volume of 466 cycles per clinic. Quartile C clinics performed 6,056 cycles in sample 1, with a delivery rate of 33.3% per cycle, and 3,213 treatments in sample 2, with a delivery rate of 26.8%. A total of 20,970 cycles were performed at the 16 clinics in quartile D; the median number of cycles per clinic was 1,228. Quartile D clinics performed 6,437 cycles in sample 1, with a delivery rate of 34.3% per cycle, and 3,653 cycles in sample 2, with a delivery rate of 29.0%.

In the second analysis of cycle volume, clinics were divided into four quartiles of 90 clinics each. Quartile W comprised clinics performing <64 cycles. These 90 clinics performed 3,333 total cycles, with a median volume of 36 cycles. Quartile W clinics reported 1,293 cycles in sample 1, with a delivery rate of 27.5% per cycle, and 551 cycles in sample 2, with a delivery rate of 18.7%. Quartile X contained clinics that performed 65–132 cycles; the total was 8,048 cycles and the median was 87 cycles. Quartile X clinics performed 3,067 cycles in sample 1, with a delivery rate of 29.8% per cycle, and 1,356 cycles in sample 2, with a delivery rate of 21.4%. Quartile Y comprised clinics that performed 134–300 cycles. A total of 17,969 cycles were performed in quartile Y clinics; the median was 183 cycles. Quartile Y clinics performed 6,238 cycles in sample 1, with a delivery rate of 31.1% per cycle, and 2,780 cycles in sample 2, with a delivery rate of 26.4%. Quartile Z included the 90 largest clinics (those reporting >300 cycles); these clinics performed 52,622 cycles (64.2% of all cycles), and the median cycle volume was 436 cycles. Quartile Z clinics performed 16,259 cycles in sample 1, with a delivery rate of 33.5% per cycle, and 8,878 cycles in sample 2, with a delivery rate of 27.2%.

ICSI

A total of 25,201 transfers involved embryos fertilized with ICSI. Overall, 9,361 clinical pregnancies were established, resulting in 7,712 deliveries (63.6% singleton, 30.6% twin, 5.5% triplet, and 0.3% higher-order gestations). The rate of pregnancy loss was 17.6%. There were 10,615 normal infants delivered, 203 infants with structural or functional abnormalities (18 per 1,000 neonates), and 102 neonatal deaths (9 per 1,000 neonates). One hundred forty-two ectopic pregnancies occurred.

Fertilization with ICSI was used in 23,604 of 58,937 IVF cycles (40.0%). The clinical pregnancy rate for IVF cycles using ICSI was 34.3% per retrieval, and 36.4% per embryo transfer (compared with 34.5% and 39.0%, respectively, in IVF cycles without ICSI). The delivery rate for IVF cycles using ICSI was 28.2% per retrieval, and 29.9% per embryo transfer (compared with 28.5%, and 32.2%, respectively, for

cycles without ICSI). In IVF cycles using ICSI, the cancellation rate was zero because the data entry software required reported cycles to progress to retrieval to report ICSI. Thus, the cancellation rate in non-ICSI IVF cycles (22.2%) is probably artificially high, since it is likely that ICSI was planned but cycles were canceled in several cases.

The average age of female patients in IVF cycles with ICSI was 34.5 years compared with 35.3 years in IVF cycles without ICSI. The rate of ectopic pregnancy among ICSI patients was 1.6% per clinical pregnancy compared with 2.5% among non-ICSI patients.

Of 1,054 initiated ZIFT cycles, 724 (68.7%) were performed with ICSI. The clinical pregnancy rate for ZIFT cycles using ICSI was 37.3% per retrieval, and 39.1% per embryo transfer (compared with 28.9%, and 36.5%, respectively, in ZIFT cycles without ICSI). The delivery rate for ZIFT cycles using ICSI was 30.5% per retrieval, and 32.0% per embryo transfer (compared with 22.9%, and 29.0%, respectively, in cycles without ICSI). In ZIFT cycles using ICSI, the rate of ectopic pregnancy was 3.0% per pregnancy (compared with 5.5% in ZIFT cycles without ICSI). The average age of the female patients in ZIFT cycles with ICSI was 33.7 years compared with 35.1 years in ZIFT cycles without ICSI.

Of 5,273 initiated fresh donor oocyte and fresh donor embryo cycles, 1,711 (31.4% of all fresh donor cycles) were performed with ICSI. The clinical pregnancy rate for donor cycles using ICSI was 44.3% per embryo transfer and the delivery rate was 37.3% per embryo transfer, compared with 36.5% and 29.0%, respectively, in cycles without ICSI. In donor cycles using ICSI, the rate of ectopic pregnancy was 0.7% per clinical pregnancy compared with 5.5% in cycles without ICSI, and the average age of the recipients was 41.1 years compared with 40.8 years, respectively.

In addition, 635 cycles were performed that used ICSI of other types (combinations, gestational carrier, and research).

GIFT

All Cycles

One hundred twenty-two programs reported 1,293 cycles of GIFT. A total of 1,084 retrievals (83.8% of cycles) and 1,068 transfers (98.5% of retrievals) were performed. These resulted in 376 clinical pregnancies, for a clinical pregnancy rate of 29.1% per initiated cycle, 34.7% per retrieval, and 35.2% per gamete transfer. There were 297 deliveries, for a delivery rate of 23.0% per initiated cycle, 27.4% per retrieval, and 27.8% per gamete transfer. Six ectopic pregnancies were reported, for a rate of 1.6% per clinical pregnancy. A total of 421 infants were born, of which 64.3% were singletons, 30.0% were twins, 5.4% were triplets, and 0.3% were greater than triplet deliveries. Three infants were stillborn.

GIFT Cycles by Age and Male Factor

Cycles of GIFT were stratified by age of the woman at retrieval and by presence or absence of male factor diagnosis. Overall, 36.7% of GIFT cycles were initiated in women <35 years of age, 21.4% in women 35–37 years of age, 19.4% in women 38–40 years of age, and 22.5% in women >40 years of age. Male factor diagnosis was reported in 7.3% of all GIFT cycles. Results in each category are shown in Table 3.

Women with no male factor infertility. In women <35 years of age with no male factor infertility, 444 cycles were initiated, with 401 retrievals (9.7% cancellation rate) and 395 gamete transfers; 166 clinical pregnancies and 140 deliveries resulted. The delivery rate in this subgroup was 31.5% per initiated cycle, 34.9% per retrieval, and 35.4% per gamete transfer. The rate of pregnancy loss was 15.7%. Women 35–37 years of age with no male factor infertility had 257 cycles initiated. There were 219 retrievals (14.8% cancellation rate) and 213 gamete transfers; 82 clinical pregnancies and 68 deliveries resulted. The delivery rate in this subgroup was 26.5% per initiated cycle, 31.1% per retrieval, and 31.9% per gamete transfer. The rate of pregnancy loss was 17.1%.

Women 38–40 years of age with no male factor infertility had 232 cycles initiated. There were 189 retrievals (18.5% cancellation rate) and 187 gamete transfers; 76 clinical pregnancies and 56 deliveries resulted. The delivery rate in this subgroup was 24.1% per initiated cycle, 26.9% per retrieval, and 29.9% per gamete transfer. The rate of pregnancy loss was 26.3%.

Women >40 years of age with no male factor infertility had 266 cycles initiated, 198 retrievals (25.6% cancellation rate), and 197 gamete transfers; 33 clinical pregnancies and 18 deliveries resulted. The delivery rate in this subgroup was 6.8% per initiated cycle, 9.1% per retrieval, and 9.1% per gamete transfer. The rate of pregnancy loss was 45.5%.

In 30 cycles initiated in women <35 years of age with male factor infertility, 27 retrievals (10.0% cancellation rate) and 27 gamete transfers occurred. Six clinical pregnancies and six deliveries were reported. The delivery rate in this subgroup was 20.0% per initiated cycle, 22.2% per retrieval, and 22.2% per gamete transfer. The rate of pregnancy loss was 0.0%.

Women with male factor infertility. In 20 cycles initiated in women 35–37 years of age with male factor infertility, 17 retrievals (15.0% cancellation rate) and 17 gamete transfers were performed. Five clinical pregnancies and five deliveries resulted. The delivery rate in the subgroup was 25.0% per initiated cycle, 29.4% per retrieval, and 29.4% per gamete transfer. The rate of pregnancy loss was 0.0%. In 19 cycles initiated in women 38–40 years of age with male factor infertility, 15 retrievals (21.1% cancellation rate) and 15

gamete transfers were performed. Three clinical pregnancies and two deliveries resulted. The delivery rate in the subgroup was 10.5% per initiated cycle, 13.3% per retrieval, and 13.3% per gamete transfer. The rate of pregnancy loss was 33.3%.

In 25 initiated cycles in women >40 years of age with male factor infertility, 18 retrievals (28.0% cancellation rate) and 17 gamete transfers occurred. Five clinical pregnancies and two deliveries were reported. The delivery rate in this subgroup was 8.0% per initiated cycle, 11.1% per retrieval, and 11.8% per gamete transfer. The rate of pregnancy loss was 60.0%.

Additional ART

Zygote Intrafallopian Transfer (ZIFT)

Seventy-five programs initiated 1,054 ZIFT cycles, with 943 retrievals, (10.5% cancellation rate) and 890 transfers (94.4% of retrievals). From this, 343 clinical pregnancies were established that resulted in 279 deliveries, for a delivery rate of 26.5% per initiated cycle, 29.6% per retrieval, and 31.3% per zygote transfer. Twelve ectopic pregnancies were reported (3.5% per clinical pregnancy). Of the deliveries, 62.4% were singletons, 31.2% were twins, 5.7% were triplets, and 0.7% were higher order deliveries. Two stillborn infants (5 per 1,000 neonates) were reported.

Donor Oocytes and Donor Embryos

Two hundred and sixty-nine programs reported use of donor oocytes. Known and anonymous donor cycles were reported together. A total of 5,273 cycles were initiated, and 4,783 transfers were performed. The number of cases in which one donor's oocytes were used for multiple recipients is unknown.

Clinical pregnancies were reported in 2,327 cycles, for a rate of 48.7% per embryo transfer. There were 1,972 deliveries (41.2% per transfer). A total of 2,945 neonates were reported, with 56.2% singleton, 38.5% twin, 5.1% triplet, and 0.2% higher-order deliveries. Thirty-three ectopic pregnancies were reported (1.4% per clinical pregnancy). Eighteen neonates were stillborn (6 per 1,000 neonates).

Transfer of Cryopreserved Embryos

Three hundred and thirty-two programs (92.2%) reported transfer of cryopreserved nondonor embryos as a separate procedure, using eggs obtained from the intended recipient, for 11,228 thaw and 10,551 transfer procedures (94.0% of thaws resulting in transfer). Clinical pregnancies resulted in 2,447 cycles (21.8% of thaw and 24.3% of transfer procedures), and there were 1,941 deliveries, for a rate of 17.3% per thaw and 19.3% per transfer procedure.

A total of 2,542 neonates resulted from 1,941 deliveries with known outcome from nondonor cryopreserved embryo transfers. There were 73.1% singleton, 22.9% twin, 4.0%

triplet, and <0.1% greater than triplet deliveries. Nineteen stillborn infants (7 per 1,000 neonates) were reported.

Transfer of Cryopreserved Embryos from Donated Oocytes

Cryopreserved embryo transfers from donated oocytes or embryos were used in 1,913 thaw and 1,747 transfer procedures, resulting in 525 clinical pregnancies (rates of 27.4% per thaw and 30.1% per transfer procedure) and 410 deliveries (rates of 21.4% per thaw and 23.5% per transfer procedure).

A total of 534 neonates resulted from 410 deliveries with known outcome from cryopreserved embryo transfers from donated oocytes or embryos. Four stillborn infants (7 per 1,000 neonates) were reported.

Host Uterus Transfer

One hundred and forty-eight programs reported performing host uterus cycles, in which embryos generated from the intended parenting couple were placed into a gestational carrier. A total of 809 cycles were initiated, resulting in 743 transfers. Clinical pregnancies were reported in 297 cycles, for a rate of 36.7% per initiated cycle and 40.0% per embryo transfer. A total of 235 deliveries were reported, including 61.8% singleton, 31.7% twin, 6.2% triplet, and 0.4% higher-order births. The delivery rate was 29.0% per initiated cycle and 31.6% per transfer. One ectopic pregnancy was reported. No infants were stillborn.

DISCUSSION

In conjunction with the CDC, SART has attempted to facilitate collection of data from all programs that provide ART services in the United States. Of 360 reporting programs, 340 (94.4%) were SART members. Twenty-nine medical practices performing ART did not report treatment and outcome data to SART. It is estimated that owing to compelling professional, public, and governmental concerns about ART, almost all programs performing ART now report their data. Annual reporting of data is a requirement of SART membership.

In 1998, there was a 20.0% increase in the number of programs reporting data to the ASRM/SART Registry and a 12.1% increase in the number of procedures reported compared with 1997 (4). In contrast, increases from 1996 to 1997 were 11.7% for the number of clinics reporting and 10.9% for procedures performed (4). In 1998, the number of IVF cycles increased by 14.8%, the number of GIFT cycles decreased by 33.5%, and the number of ZIFT cycles decreased by 4.5% compared with 1997.

In terms of deliveries per transfer, the success rates for all procedures (deliveries per transfer) increased from 28.6% in 1997 to 30.0% in 1998, for a relative increase of 4.7%. The success rate for IVF procedures increased in 1998 (29.1%)

compared with 1997 (27.9%). Delivery rates for GIFT cycles decreased to 27.4% per retrieval in 1998 compared with 30.0% in 1997. The delivery rate for ZIFT increased to 29.6% per retrieval in 1998 from 28.0% in 1997.

Although the difference is not statistically significant (χ^2 $P=.13$), 1998 is the first year in which the success rate of IVF was higher than that of GIFT. However, cycle profiles reveal different age distributions, different diagnostic categories, and differences in numbers of gametes or embryos transferred per patient. These and other factors may influence changes in success rates from year to year (5). The SART continues to work with the CDC to standardize definitions wherever possible and to collect and analyze data, so that registry data can be better analyzed from year to year for stability of results and trends. This approach will help SART identify clinically meaningful differences.

The 1998 cancellation rates (13.8% of all initiated IVF, GIFT, and ZIFT cycles) did not differ from 1997 rates (13.9%). The cancellation rate for IVF procedures (13.9%) in 1998 was similar to that reported in 1997 (14.0%). The rate of transfer per retrieval was highest with GIFT (98.5%), reflecting the fact that fertilization is not a prerequisite for transfer, whereas IVF and ZIFT yielded transfer rates of 93.6% and 94.4% per retrieval, respectively. Cancellation rates and transfers per retrieval were combined to determine the rate of transfer per initiated cycle. Cycles using GIFT and ZIFT had a higher transfer rate (84.4% and 82.6%, respectively) per initiated cycle than did IVF cycles (80.6%).

The 1998 data further demonstrate the profound effect of age on the success of ART. In IVF, GIFT, ZIFT, and nondonor cryopreserved embryo cycles, the likelihood of success (in terms of deliveries per transfer) in women in the oldest age group (>40 years of age) was 12.0% lower than that for women 38–40 years of age, 30.2% lower than that for women 35–37 years of age, and 38.8% lower than that for women <35 years of age. The likelihood of success in women 38–40 years of age group was 20.6% lower than that in women 35–37 years of age and 30.5% lower than that in women <35 years of age. The effect of age was also evident in the two youngest groups: Women 35–37 years of age had a 12.4% lower likelihood of success than did women <35 years of age. The greatest effect of age was seen in IVF cycles, in which women >40 years of age had a 53.9% lower success rate than did women 38–40 years of age. The ages of 35, 38, and 40 years at the time of retrieval were selected arbitrarily as division points; future efforts to analyze data by individual patient age will allow more precise determination of probabilities in women at each age. Age was less of a factor in determining success only in donor oocyte cycles (fresh or cryopreserved) and host uterus transfer cycles.

The effects of male factor infertility continue to be less evident than before 1995, suggesting that clinics with proficiency in ICSI may be able to mitigate the effects of this diagnosis. The technique was used in approximately 37.7%

of all IVF cycles, making 1998 the fourth consecutive year of widespread use of this more successful approach to treatment of male factor infertility. When all IVF cycles were classified by male factor infertility and other diagnosis, patients with male factor infertility had a higher delivery rate per retrieval (30.7%) than did those with other diagnoses (28.5%). Data were not collected on the ability of sperm function assays, morphology assessments, or antibodies to influence ART outcomes. None of these characteristics were included in the definition of male factor infertility for this reporting interval.

The incidence of ectopic pregnancies for all procedures was 0.8% per transfer and 2.1% per clinical pregnancy. This compares favorably to an estimated overall incidence of ectopic pregnancy in the United States of 2% per reported pregnancy (5). The incidence of multiple gestations was also determined. The percentage of singleton deliveries ranged from 74.5% for cryopreserved embryos from donated oocytes cycles to 54.5% for host uterus transfer cycles. Twin deliveries represented 83.8% of multiple deliveries reported and 31.4% of all deliveries. The remainder of deliveries were higher-order multiples. The 1,166 triplet deliveries accounted for 5.8% of all deliveries and 15.4% of all multiple deliveries, 62 quadruplet deliveries represented 0.3% of all deliveries and 0.8% of all multiple deliveries, and one quintuplet delivery represented <0.005% of all deliveries. The incidence of prematurity was not analyzed. The rate of multiple pregnancy was unchanged in 1998 compared with 1996 and 1997 (4, 6).

In IVF cycles, singletons represented 81.4% of deliveries in women >40 years of age group and 57.5% of deliveries in women <35 years of age. The number of embryos transferred averaged 3.5 and varied little by age group. The average number of embryos transferred was 3.3 in women <35 years of age, 3.5 in women 35–37 years of age, and 3.8 in women 38–40 or >40 years of age.

Concern about the higher incidence of adverse outcomes associated with multiple pregnancy has led SART to establish new guidelines recommending the number of embryos or oocytes to be transferred in certain patient groups (7). These guidelines are based on analysis of the U.S. experience as reported to SART (8). The impact of implementation of these guidelines, which were released in January 2000, will not be known for several years. Whether new technologies, such as blastocyst culture, will significantly affect the incidence of high-order multiple pregnancies is also yet to be determined.

SUMMARY

The number of programs reporting increased in 1998, as did the number of cycles of ART (12.1%), with an increased overall probability of success. The increase in number of

cycles reported is largely attributable to the increase in the number of clinics combined with an increase in numbers of treatments at many higher-volume clinics. This increased reporting activity probably relates to the implementation of the Federal Fertility Clinic Success Rate and Certification Act. The increase (20.0%) in clinics reporting may also be attributable to enforcement of the CDC's definition of a reporting clinic, which requires discrete business entities completing treatments at the same laboratory to report separately, as well as an increase in the number of new programs first reporting in 1998. The continued efforts of SART to ease the burden of ART reporting, the requirement of all SART member clinics to report their results, and the requirement to participate in the on-site validation process or lose their SART membership may have also increased compliance with reporting.

The overall delivery rate per transfer increased from 28.7% in 1997 to 29.9% in 1998. This represents a 1.2% absolute increase and 4.2% relative increase. Combined with a 12.6% increase in transfers, this resulted in 2,930 additional deliveries, for a 16.9% increase. The dominant adverse effect of female age on outcomes was corroborated, whereas male factor infertility now appears to have a limited effect on outcomes because of the availability of ICSI. The number of couples receiving fresh and frozen oocyte donation and cryopreserved embryo cycles (increases of 14.2%, 10.3%, and 20.8%, respectively) continues to increase. Rates of live birth per transfer with these three types of cycles were 3.0%, 2.9%, and 5.9% greater, respectively, than in 1997. Outcomes of IVF pregnancies are adversely affected by multiple pregnancies. Guidelines for embryo transfer and improved laboratory technology should help ameliorate this problem. Otherwise, the data do not suggest that outcomes matched for singletons, twins, or higher-order pregnancies differ from those in the general population, but improved long-term follow-up studies are needed to confirm this finding.

COMMENTS

This activity report for 1998 is the third in which ART outcome reporting was compiled solely from patient- and cycle-specific data submitted by ART programs to SART, in cooperation with the Centers for Disease Control and Prevention. The functions of data collection and validation are carried out under the auspices of the SART Executive Council and the CDC, with input from the SART Registry, Validation, Quality Assurance, and Research Committees, as well as the National Coalition for the Oversight of ART. The ASRM and SART believe that the efforts of the SART Executive Council and SART committees in data reporting and laboratory accreditation facilitate compliance by ART

programs with the Federal Fertility Clinic Success Rate and Certification Act of 1992.

Philip McNamee, M.D., and James P. Toner, M.D., Ph.D.
Past President, SART, and Past Chair, Registry Committee of SART

Acknowledgments: The Society for Assisted Reproductive Technology (SART) thanks its committees and the individuals involved in the generation of this report for their hard work and dedication. In particular, Joyce Zeitz, Executive Administrator, SART; C. Martin Beard, Matthew V. Scott, Juin Wang and Ethan Wantman, Redshift Technologies, Inc.; and Gary Jeng, Ph.D., Centers for Disease Control and Prevention are thanked for their invaluable assistance.

References

1. In vitro fertilization/embryo transfer in the United States: 1985 and 1986 results from the National IVF/ET Registry. Medical Research International. The American Fertility Society Special Interest Group. *Fertil Steril* 1988;42:212-5.
2. Fertility Clinic Success Rate and Certification Act of 1992 (FCSRCA) Pub L No. 102-493, October 24, 1992.
3. Centers for Disease Control and Prevention, American Society for Reproductive Medicine, Society for Assisted Reproductive Technology, RESOLVE. 1995 Assisted Reproductive Technology Success Rates. Atlanta: Centers for Disease Control and Prevention; 1997.
4. Assisted reproductive technology in the United States and Canada: 1997 results generated from the American Society for Reproductive Medicine/Society for Assisted Reproductive Technology Registry. Society for Assisted Reproductive Technology and the American Society for Reproductive Medicine. *Fertil Steril* 2000;74:641-54.
5. Chapko K, Weaver M, Chapko MC, Pasta D, Adamson GD. Stability of in vitro fertilization-embryo transfer success rates from the 1989,1990 and 1991 clinic specific outcome assessments. *Fertil Steril* 1995;64:757-63.
6. Assisted reproductive technology in the United States: 1996 results generated from the American Society for Reproductive Medicine/Society for Assisted Reproductive Technology Registry. Society for Assisted Reproductive Technology and the American Society for Reproductive Medicine. *Fertil Steril* 1999;71:798-807.
7. American Society for Reproductive Medicine. Guidelines on number of embryos transferred. Birmingham, AL: American Society for Reproductive Medicine; 1999.
8. Schieve LA, Peterson HB, Meikle SF, Jeng G, Danel I, Burnett NM, et al. Live birth rates and multiple birth risk using in vitro fertilization. *JAMA* 1999;282:1832-8.
9. From the Centers for Disease Control and Prevention. Ectopic pregnancy—United States, 1990-1992. *JAMA* 1995;273:533.

APPENDIX

The data for each reporting program were published separately, in the annual Clinic Specific Report for 1998. The programs that submitted data are listed below.

Alabama

ART Program of Alabama, Birmingham; University of Alabama at Birmingham, Birmingham; Center for Reproductive Medicine, Mobile; University of South Alabama IVF and ART Program, Mobile.

Arizona

Fertility Treatment Center, Chandler; West Valley Fertility Center, Glendale; IVF Phoenix, Phoenix; Samaritan Institute of Reproductive Medicine, Phoenix; Southwest Fer-

tility Center, Phoenix; Arizona Center for Fertility Studies, Scottsdale; Mayo Clinic Scottsdale, Scottsdale; University of Arizona Program of ART, Tucson.

Arkansas

Intravaginal Culture Fertilization of Arkansas, Little Rock; University of Arkansas for Medical Sciences IVF, Little Rock.

California

Gil N. Mileikowsky, M.D., Bel Air; Alta Bates In Vitro Fertilization Program, Berkeley; Reproductive Medicine and Surgery Associates, Beverly Hills; West Coast Infertility Medical Clinic, Inc., Beverly Hills; Fertility Care of Orange County, Brea; West Coast Fertility Centers, Fountain Valley; Werlin-Zarutskie Fertility Centers, Irvine; Reproductive Partners—San Diego, La Jolla; Reproductive Sciences Center, La Jolla; Scripps Clinic Fertility Center, La Jolla; Jane L. Frederick, M.D., Inc., Laguna Hills; Loma Linda University Center for Fertility and IVF, Loma Linda; Reproductive Partners—Long Beach, Long Beach; Tyler Medical Clinic, Los Angeles; University of California, Los Angeles, Fertility Center, Los Angeles; University of Southern California Reproductive Endocrinology and Infertility, Los Angeles; Brian Su, M.D., Monterey Park; Reproductive Specialty Medical Center, Newport Beach; Southern California Center for Reproductive Medicine, Newport Beach; Northridge Center For Reproductive Medicine, Northridge; Susan P. Willman, M.D., Orinda; Nova In Vitro Fertilization, Palo Alto; Huntington Reproductive Center, Pasadena; North State Women's Center, Redding; Reproductive Partners—Redondo Beach, Redondo Beach; Northern California Fertility Medical Center, Roseville; University of California, Davis, Assisted Reproductive Technology Program, Sacramento; IGO Medical Group of San Diego, San Diego; Infertility Clinic Naval Medical Center, San Diego, San Diego; Minh N. Ho, M.D., San Diego; Reproductive Endocrine Associates, San Diego; Sharp Fertility Center, San Diego; Smotrich Center For Reproductive Enhancement, San Diego; Astarte Fertility Center, San Francisco; Pacific Fertility Center—San Francisco, San Francisco; San Francisco Center for Reproductive Medicine, San Francisco; Simon R. Henderson, M.D., San Francisco; University of California, San Francisco; In Vitro Fertilization Program, San Francisco; Carmelo S. Sgarlata, M.D., San Jose; Fertility Physicians of Northern California, San Jose; Reproductive Science Center of The San Francisco Bay Area, San Ramon; Center for Assisted Reproductive Medicine/CFA, Santa Monica; Parker-Rosenman-Rodi Gyn & Infertility Medical Group, Santa Monica; North Bay Fertility Center, Inc., Santa Rosa; Valley Center For Reproductive Health, Sherman Oaks; Stanford University IVF/ART Program, Stanford; Infertility and Gynecology Institute, Tarzana; The Center For Fertility and Gynecology Vermesh/Ben-Ozer Center for Fertility, Tarzana; The Fertility Institutes, Jeffrey Steinberg, M.D., Inc., Tarzana; Greater Valley Center for Reproductive Med-

icine, Thousand Oaks; Pacific Reproductive Center, Torrance.

Colorado

Colorado Springs Center for Reproductive Health, Colorado Springs; Center for Reproductive Medicine University of Colorado, Denver; Colorado IVF at Rose, Denver; Reproductive Genetics In Vitro, Denver; The Colorado Center For Reproductive Medicine, Englewood; Rocky Mountain Center for Reproductive Medicine, Fort Collins; Conceptions Reproductive Associates, Littleton.

Connecticut

The Center for Advanced Reproductive Services At The University of Connecticut Health Center, Farmington; Yale University School of Medicine In-Vitro Fertilization Program, New Haven; Michael B. Doyle, M.D., Norwalk; New England Fertility Institute, Stamford; The Stamford Hospital, Stamford.

Delaware

The Center for Human Reproduction–De, P.A., Newark; Reproductive Associates of Delaware, Wilmington.

District of Columbia

Columbia Hospital for Women ART Program; Reproductive Science Center Walter Reed Army Medical Center; The George Washington University Medical Center.

Florida

BocaFertility, Boca Raton; Palm Beach Fertility Center, Boca Raton; Advanced Reproductive Care Center, P.A., Boynton Beach; The Center for Human Reproduction, Clearwater; Florida Institute for Reproductive Sciences and Technologies, Cooper City; Specialists in Reproductive Medicine & Surgery, P.A., Fort Myers; University of Florida/Park Avenue Women's Center, Gainesville; Fertility Institute of Northwest Florida, Gulf Breeze; Florida Institute for Reproductive Medicine, Jacksonville; IVF Florida, Margate; Women's Healthcare Specialists IVF Miami, Miami Beach; Fertility & IVF Center of Miami, Miami; South Florida Institute for Reproductive Medicine, Miami; Arnold Palmer Hospital Fertility Center, Orlando; Center for Infertility & Reproductive Medicine, PA, Orlando; Reproductive Medicine and Fertility Center, Orlando; University of Florida–Pensacola, Pensacola; Center for Advanced Reproductive Endocrinology, P.A., Plantation; Fertility Institute of Fort Lauderdale, Plantation; Fertility Center of Sarasota, Julio E. Pabon, M.D., P.A., Sarasota; Advanced Reproductive Technologies Program at University Community Hospital, Drs. Verkauf, Bernhisel and Tarantino, Tampa; Genetics & IVF of Florida, West Palm Beach.

Georgia

Emory Center for Reproductive Medicine and Fertility, Atlanta; Reproductive Biology Associates, Atlanta; Augusta Reproductive Biology Associates, Augusta.

Hawaii

Pacific In Vitro Fertilization Institute, Honolulu; Tripler Army Medical Center.

Illinois

Advanced Institute of Fertility, Arlington Heights; Rush–Copley Center for Reproductive Health, Aurora; Center for Human Reproduction–IL, Chicago; IVF Illinois, Inc., Chicago; Northwestern University, Chicago; Rush Center for Advanced Reproductive Care, Chicago; Watertown Women's Center, L.L.C., Chicago; Midwest Fertility Center, Downers Grove; Advanced Fertility Center of Chicago, Gurnee; Highland Park Hospital IVF Center, Highland Park; Hinsdale Center for Reproduction, Hinsdale; Reproductive Health Specialists, Ltd., Joliet; Reproductive Health and Fertility Center at Rockford Health System, Loves Park; Oak Brook Fertility Center, Oak Brook; Reena Jabamoni M.D., S.C., Oak Brook; Lutheran General Hospital IVF Program, Park Ridge; Advanced Reproductive Center, Rockford; Rush North Shore Center for Advanced Reproductive Care, Skokie; Department of Obstetrics and Gynecology, Southern Illinois University School of Medicine, Springfield; Reproductive Endocrinology Associates, S.C., Springfield; Midwest Reproductive Medicine: Champaign/Urbana, Urbana.

Indiana

Associated Fertility & Gynecology, Fort Wayne; Advanced Fertility Group, Indianapolis; Family Beginnings, Indianapolis; Indiana University Hospital, Indianapolis; Midwest Reproductive Medicine, Indianapolis; Reproductive Endocrinology Associates, Indianapolis; Reproductive Surgery & Medicine, P.C., Indianapolis; Center for Assisted Reproduction, South Bend.

Iowa

McFarland Clinic, P.C. Assisted Reproduction, Ames; University of Iowa Hospitals and Clinics Center for Advanced Reproductive Care, Iowa City; Mid-Iowa Fertility, P.C., West Des Moines.

Kansas

University of Kansas Medical Center Women's Reproductive Center, Kansas City; Reproductive Resource Center of Greater Kansas City, Overland Park; Reproductive Medicine & Infertility Shawnee Mission Medical Center, Shawnee Mission; The Center for Reproductive Medicine, Wichita.

Kentucky

Fertility and Endocrine Associates, Lexington; James W. Akin, Lexington; University of Kentucky, Lexington; Fertility Program of The Alliant Health System, Louisville.

Louisiana

Fertility and Laser Center, Metairie; The Center for Fertility and Advanced Reproductive Care, Metairie; Fertility Clinic Tulane University Hospital and Clinic, New Orleans; Fertility Institute of New Orleans, New Orleans; Ochsner

Clinic Reproductive Medicine, New Orleans; Center for Fertility & Reproductive Health, Shreveport.

Maryland

GBMC Fertility Center, Baltimore; Helix Center for ART, Baltimore; Johns Hopkins Fertility Center, Baltimore; University of Maryland Medical School—Center for Advanced Reproductive Tech, Baltimore; Center for Human Reproduction of The MidAtlantic, Bethesda; Center for Reproductive Medicine, Rockville; Shady Grove Fertility Center, Rockville; Fertility Center of Maryland, Towson.

Massachusetts

Center for Assisted Reproduction, Boston; Faulkner Centre for Reproductive Medicine, Boston; Massachusetts General Hospital Vincent IVF Unit, Boston; New England Fertility and Endocrinology Associates, Brookline; Hallmark Health Fertility Services, Malden; Fertility Center of New England, Inc., New England Clinic of Reproductive Medicine, Reading; Baystate IVF, Springfield; Boston IVF, Waltham; The Reproductive Science Center of Boston, Waltham.

Michigan

University of Michigan, Ann Arbor; Center for Reproductive Medicine Oakwood Hospital, Dearborn; Hutzel Hospital/Wayne State University ART Program, Detroit; The Center for Reproductive Medicine Hurley Medical Center, Flint; Grand Rapids Fertility/Spectrum Health East, Grand Rapids; Michigan Reproductive & IVF Center, Grand Rapids; West Michigan Reproductive Institute, P.C., Grand Rapids; Infertility and Gynecology Center of Lansing, P.C., Lansing; Michigan State University Center for Assisted Reproductive Technology, Lansing; Fakih Institute of Reproductive Science & Technology, Rochester Hills; The Center for Reproductive Medicine, at Rochester Hills, MI, Rochester Hills; Beaumont Center for Fertility and Reproductive Med, Royal Oak; Henry Ford Reproductive Medicine, Troy; Ann Arbor Reproductive Medicine Associates, P.C., Ypsilanti.

Minnesota

Center for Reproductive Medicine, Minneapolis; The Midwest Center for Reproductive Health, PA, Minneapolis; Mayo Clinic Assisted Reproductive Technologies, Rochester; Reproductive Health Associates, P.A., St. Paul.

Mississippi

University of Mississippi Medical Center, Jackson.

Missouri

Advanced Reproductive Specialists, Chesterfield; Infertility Institute, Chesterfield; Mid-Missouri Center for Reproductive Health, Columbia; University of Missouri Hospital and Clinics IVF Embryology Laboratory, Columbia; Advanced Assisted Reproductive Technologies Program, Saint Louis; Infertility Center of St. Louis, St. Louis; Infertility & IVF Center, St. Louis.

Nebraska

Center for Reproductive Medicine, Omaha; Reproductive Endocrinology/Infertility, Omaha.

Nevada

Fertility Center of Las Vegas, Las Vegas; University Institute for Fertility, Las Vegas.

New Hampshire

Dartmouth-Hitchcock Medical Center, Lebanon.

New Jersey

Shore Institute for Reproductive Medicine, Brick; Reproductive Gynecologists, P.C., Cherry Hill; IVF of North Jersey, P.A., Clifton; Center for Advanced Reproductive Medicine and Fertility, Edison; North Hudson IVF Center for Fertility and Gynecology, Englewood Cliffs; Center for Reproductive Medicine at Hackensack University Medical Center, Hasbrouck Heights; Princeton Center for Infertility & Reproductive Medicine, Lawrenceville; East Coast Infertility and IVF, P.C., Little Silver; Institute for Reproductive Medicine and Science, Saint Barnabas Medical Center, Livingston; Cooper Center for In Vitro Fertilization, P.C., Marlton; Delaware Valley Institute of Fertility and Genetics, Marlton; South Jersey Fertility Center, P.A., Marlton; Diamond Institute for Infertility, Millburn; Robert Wood Johnson Medical School IVF Program, New Brunswick; IVF New Jersey, Somerset; Center for Human Reproduction of New Jersey, Westwood.

New Mexico

Center for Reproductive Medicine of New Mexico, Albuquerque; Southwest Fertility Services, Albuquerque.

New York

Albany IVF, Fertility and Gynecology, Albany; Leading Institute for Fertility Enhancement (Life), Albany; Women's Health Center of Albany Medical Center, Albany; Brooklyn IVF, Brooklyn; The Fertility Institute at The Brooklyn Hospital, Brooklyn; Montefiore's Fertility and Hormone Center, Dobbs Ferry; Garden City Center for Advanced Reproductive Technologies Yu-Kang, M.D., P.C., Garden City; North Shore University Hospital Center for Human Reproduction, Manhasset; Reproductive Science Associates, Mineola; Advanced Fertility Services, New York; Brandeis Center for Reproductive Health, New York; Brooklyn Fertility Center, New York; Columbia Presbyterian Medical Center, New York; Dr. Lillian D. Nash, New York; Dr. Nabil Husami, New York; New York Fertility Institute, New York; New York Medical Services for Reproductive Medicine, New York; New York University Medical Center—Program for In Vitro Fertilization, New York; offices for Fertility and Reproductive Medicine, New York; The Center for Reproductive Medicine & Infertility Weill Medical College of Cornell University, New York; The Capital Region Genetics & IVF Center, Niskayuna; Long Island IVF Associates, Port Jefferson; Institute for Reproductive Health and Infertility, Roch-

ester; Strong Infertility and IVF Center, Rochester; Children's Hospital IVF Program, Snyder; Division of Reproductive Endocrinology and Infertility, Stony Brook; Central New York Fertility Center, Syracuse; Westchester Fertility and Reproductive Endocrinology, White Plains; Reproductive Medicine/IVF, Williamsville.

North Carolina

North Carolina Center for Reproductive Medicine The Talbert Fertility Institute, Cary; University of North Carolina ART Clinic, Chapel Hill; Institute for Assisted Reproduction, Charlotte; Program for Assisted Reproduction, Carolinas Medical Center, Charlotte; Duke University Medical Center Division of Reproductive Endocrinology and Infertility, Durham; East Carolina University Women's Physicians, Greenville; Wake Forest University Program for Assisted Reproduction, Winston-Salem.

North Dakota

MeritCare Medical Group-Fertility Center, Fargo.

Ohio

Akron City Hospital IVF Center, Summa Health System, Akron; Fertility Unlimited, Inc., Akron; Bethesda Center for Reproductive Health & Fertility, Cincinnati; Center for Reproductive Health, Cincinnati; Greater Cincinnati Institute for Reproductive Health, Cincinnati; Cleveland Clinic Foundation, Cleveland; MetroHealth Medical Center, Cleveland; University Hospitals of Cleveland-IVF Program, Cleveland; Ohio Reproductive Medicine, Columbus; University Fertility Institute, Columbus; Genetics & IVF Institute of Ohio, Dayton; Miami Valley Hospital Fertility Center, Dayton; Fertility Center of NW Ohio, Toledo; The Reproductive Center, Youngstown.

Oklahoma

Henry G. Bennett, Jr. Fertility Institute, Oklahoma City; Presbyterian Hospital Laboratory for Assisted Reproductive Technologies, Oklahoma City; Tulsa Center for Fertility & Women's Health, Tulsa.

Oregon

Northwest Fertility Center, Portland; University Fertility Consultants-Oregon Health Sciences University, Portland.

Pennsylvania

Toll Center for Reproductive Sciences, Abington; Infertility Solutions, P.C., Allentown; Lehigh Valley Hospital Section of Reproductive Endocrinology and Infertility, Allentown; Reprotech, Inc., Allentown; Family Fertility Center, Bethlehem; Center for Reproductive Medicine at The Bryn Mawr Hospital, Bryn Mawr; Geisinger Medical Center Fertility Program, Danville; Penn State Geisinger Health System at Hershey, Hershey; Jenkintown Reproductive Endocrine & Gynecology Associates P.C., Jenkintown; Northern Fertility and Reproductive Associates, Meadow-

brook; Pennsylvania Reproductive Associates Women's Institute for Fertility, Endocrinology, and Menopause, Philadelphia; Thomas Jefferson IVF Program, Philadelphia; University of Pennsylvania, Philadelphia; Allegheny General Hospital-IVF Program, Pittsburgh; The Fertility Center at St. Clair, Pittsburgh; University Womens Health Care Associates, Pittsburgh; Women's Clinic, Ltd., Reading; Reproductive Endocrinology and Fertility Center, Upland; Reproductive Science Center of Greater Philadelphia, Wayne.

Puerto Rico

Centro de Fertilidad del Caribe, Rio Piedras.

Rhode Island

Women & Infants' IVF Program, Providence.

South Carolina

Reproductive Endocrinology and Infertility, Greenville; Southeastern Fertility Center, P.A., Mount Pleasant.

South Dakota

University Physicians Fertility Specialists, Sioux Falls.

Tennessee

Center for Reproductive Medicine and Fertility, Chattanooga; Appalachian Fertility and Endocrinology Center, Kingsport; University of Tennessee Fertility Center, Knoxville; University Fertility Associates, Memphis; Nashville Fertility Center, Nashville; The Center for Reproductive Health, Nashville.

Texas

Dr. Harold Brumley, Austin; Dr. Jeffrey Youngkin, Austin Fertility Center, Austin; Texas Fertility Center, Austin; Reproductive Science Center of Dallas, Carrollton; Baylor Center for Reproductive Health, Dallas; Dallas In Vitro Associates, Dallas; National Fertility Center of Texas, P.A., Dallas; University of Texas, Southwestern Fertility Associates, Dallas; Center for Assisted Reproduction, Fort Worth; Baylor Assisted Reproductive Technology, Houston; Center for Reproduction at Gramercy, Houston; Center for Women's Healthcare and Research, Houston; North Houston Center for Reproductive Medicine, P.A., Houston; Obstetrical & Gynecological Associates, Houston; University of Texas Women's Health Center, Houston; Wilford Hall Medical Center, Lackland Air Force Base; Texas Tech University Health Science Center-IVF Program, Lubbock; The Centre for Reproductive Medicine, Lubbock; Fertility Center of San Antonio, San Antonio; Fertility Concepts, San Antonio; Institute for Women's Health Advanced Fertility Laboratory, San Antonio; South Texas Fertility Center University of Texas Health Science Center at San Antonio, San Antonio; The Center of Reproductive Medicine, Webster.

Utah

Center for Advanced Reproductive Medicine, Pleasant Grove; Reproductive Care Center, Salt Lake City; Utah Center for Reproductive Medicine, Salt Lake City.

Vermont

University of Vermont–IVF Program, Burlington.

Virginia

The Fertility and Reproductive Health Center, Annandale; Dominion Fertility and Endocrinology, Arlington; University of Virginia ART Program, Charlottesville; Jones Institute for Reproductive Medicine, Norfolk; Fertility Institute of Virginia, Richmond; Lifesource Fertility Center, Richmond; Medical College of Virginia/Virginia Commonwealth University IVF/GIFT, Richmond; The New Hope Center for Reproductive Medicine, Virginia Beach.

Washington

Washington Center for Reproductive Medicine, Bellevue; Bellingham IVF, Bellingham; Olympia Women's Health, Olympia; Pacific Gynecology Specialists, Seattle; University of Washington Fertility & Endocrine Center, Seattle; Virginia Mason Center for Fertility and Reproductive Endocri-

nology, Seattle; The Center for Reproductive Endocrinology and Fertility, Spokane; GYFT Clinic, P.L.L.C., Tacoma.

West Virginia

Center for Reproductive Medicine West Virginia University Health Science Center, Charleston.

Wisconsin

Family Fertility Program Appleton Medical Center, Appleton; Gundersen/Lutheran Medical Center, La Crosse; University of Wisconsin–Madison Women's Endocrine Services, Madison; Advanced Institute of Fertility, Milwaukee; Medical College of Wisconsin Department of Ob/Gyn, Milwaukee; Reproductive Specialty Center at IVF Columbia, Columbia Hospital, Milwaukee; Women's Health Care, S.C., Waukesha; Womenscare, Gloria M. Halverson, M.D., S.C., Waukesha; Clinic of Obstetrics & Gynecology, Ltd., West Allis.