Anesthesia Practices in the United States Common to In Vitro Fertilization (IVF) Centers

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Purpose: *Our purpose was to characterize and describe anesthesia practice in programs performing IVF in the United States.*
Methods: *We used a telephone survey requiring respondents to be either the program director, a physician, or a nurse familiar with the practice. Two hundred seven (78%) Society of Assisted Reproductive Technology (SART) registered programs agreed to participate. Programs were divided by geographic region and type of practice (academic versus private).*
Results: *Ninety-one private (68%) and 41 academic (56%) programs used personnel provided by the Department of Anesthesiology. Conscious sedation was performed most commonly (95%). The remaining 5% used primarily either general, regional, or local anesthesia. Typical recovery times were 90 to 120 min. Average costs of anesthetic administration were $300–$400 and were similar among groups except for the Eastern academic programs, with a higher mean cost of $543. Programs using personnel from anesthesiology reported higher costs compared to programs utilizing their own staff ($391 ± 15 vs $157 ± 11; $P < 0.05$). Complications were infrequent (<10%); no hospitalizations or serious life-threatening incidents were reported.*
Conclusions: *A large number of programs safely used their own trained personnel to deliver anesthesia, and realized a significant reduction in cost.*

KEY WORDS: anesthesia; in vitro fertilization; conscious sedation; Society of Assisted Reproductive Technology.

INTRODUCTION

Anesthesia is typically delivered for transvaginal puncture techniques. However, the method of delivery of anesthesia varies among practices. Few reports exist to define the current standard of care. Furthermore, there appears to be a lack of consensus among practitioners performing assisted reproductive procedures with respect to medications use. We specifically addressed anesthesia for ultrasound-guided oocyte retrievals.

In order to define better the standard of care for anesthesia practice in IVF programs in the United States, we surveyed SART registered programs nationwide. We focused on the practice and costs related to anesthesia administration, type of anesthesia given, medications used, recovery times, and complications.

MATERIALS AND METHODS

The study was reviewed and approved by the Institutional Review Board of Columbia University. Of 266 SART registered programs, 46 (17%) were unable to be contacted. Of the 220 programs contacted, 13 (5%) declined to participate. This resulted in 207 (78%) programs participating in the survey.

Our survey concerned procedures requiring only transvaginal aspiration and transcervical embryo transfer rather than gamete intrafallopian tubal transfer (GIFT), zygote intrafallopian tubal transfer (ZIFT), or tubal embryo transfer (TET). Data obtained were grouped according to the programs' location and whether they were primarily an academic or a private practice. Academic programs were defined as clinics that are university based, while private programs were defined as freestanding clinics.

Programs in this survey were as follows: Eastern academic programs ($n = 36$), 200 ± 36 (25–1200) procedures; Eastern private programs ($n = 47$), 259 ± 49 (17–2000) procedures; Central academic programs ($n = 28$), 118 ± 5 (17–448) procedures; Central private programs ($n = 47$), 178 ± 27 (27–1200) proce-

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dures; Western academic programs (n = 40), 124 ± 12 (15–400) procedures [mean ± SE (range)].

The survey was conducted by telephone and consisted of eight questions (Table I). Questions were directed to either the program director, a physician, or a nurse familiar with the respective practice.

Recovery times were considered the interval between the completion of the aspiration and the time of discharge. Twenty percent of groups using anesthesiology staff and 68% of programs using their own personnel stated that they had no separate cost for delivering anesthesia. In such cases, an estimated cost of $150.00 was assigned to represent costs of medication and iv fluids, based upon the approximate known costs for these materials.

Statistical analyses was performed using mean ± standard errors (SE) and ranges. Calculated were values for typical recovery times and costs. Data were analyzed according to region and type of practice. Multiple analysis of variance (ANOVA) and independent t tests were performed to evaluate differences. Statistical significance was achieved at $P < 0.05$.

RESULTS

All 207 programs that participated in this survey used some method of anesthesia and monitored their patients by pulse oximetry and blood pressure. Ninety-one (68%) of the private centers and 41 (56%) of the academic centers used personnel contracted through the Department of Anesthesiology near their center or within their respective institution. These individuals were either anesthesiologists or nurse anesthetists. In the other instances (36%), personnel were members of the infertility team (nurse, gynecologist, or reproductive endocrinologist). In all cases individuals giving anesthesia were either physicians or under direct physician supervision.

Conscious sedation was provided by 95% of the academic and private practices. The remaining 5% used either general, regional, or local anesthesia. Medications most commonly used were analgesics in combination with sedative–hypnotic agents. The majority of groups using their own personnel to deliver drugs typically provided meperidine and midazolam. The majority (90%) of personnel from anesthesiology used midazolam and/or propofol with fentanyl. Other medications delivered included diazepam, nitrous oxide, morphine sulfate, ketorolac tromethamine, halothane, thiopental sodium, and diethylaminoacetamide.

Typical recovery times and costs are listed in Table II. Recovery times were similar among the different programs, ranging from 90 to 120 min. Typical costs for providing anesthesia were $300–$400 and were also similar among groups except for the Eastern academic programs, with a higher mean cost. Costs for programs using personnel from anesthesiology versus infertility practice personnel were higher ($391 ± 15 vs $157 ± 11, respectively; $P < 0.05$).

Headaches, nausea, and vomiting were the most commonly reported complications. However, these problems were minimally experienced (<10%) and no hospitalizations occurred.

Table 1. Questions Composing the Survey

1.	Academic or private practice?
2.	Approximate number of aspirations in past year?
3.	The personnel administering anesthesia?
4.	Mode of anesthesia administered?
5.	Medications used?
6.	Typical recovery times following anesthesia?
7.	Fee for anesthesia?
8.	Type and Frequency of complications?

DISCUSSION

The utilization of general, conscious sedation, regional, and local anesthesia for transvaginal oocyte retrieval has been reported (1–4). Some anesthetic drugs (propofol, nitrous oxide, and midazolam) have been shown to be toxic to gametes and/or embryos in vitro (5–8). Toxicity tests on mouse and human oocytes and/or embryos and investigations of follicular fluid and/or serum concentrations have been done (9,10). Of concern is the associations of both gamete and embryotoxicity with different agents (1–3, 10–12). Thus, the appropriate selection of anesthetic agents and their dose, duration of use, and mode of delivery are critical to successful outcome.

We were compelled to pursue this study since the standard of care for delivering anesthesia during IVF procedures and the associated costs of this care have

Table 2. Recovery Times and Costs for Various Programs

Group	Recovery time (min) (X ± SE; range)	Cost (U.S. $) (X ± SE; range)
Eastern Academic	96 ± 9; 30–270	543 ± 40*; 25–900
Private	98 ± 8; 30–240	312 ± 32; 27–650
Central Academic	101 ± 10; 30–240	332 ± 46; 90–650
Private	98 ± 7; 30–210	368 ± 34; 20–800
Western Academic	117 ± 21; 30–210	287 ± 13; 50–300
Private	88 ± 7; 30–210	331 ± 22; 80–475

*Value is significantly different from other costs, $P < 0.05$.

not been described previously. We were able to ascertain how anesthesia is most commonly practiced nationwide. We suspected and confirmed that most programs use conscious sedation. This is not surprising since it is a reasonable selection given the nature of oocyte aspirations. Oocyte retrievals are short, are minimally invasive, and require only short recovery times. Patients may go home without needing wound care or pain relief. Furthermore, conscious sedation is easy to deliver. Drugs are well tolerated and few immediate- or long-term side effects occur with its proper use.

Our survey was directed only at IVF procedures rather than gamete intrafallopian tubal transfer (GIFT), zygote intrafallopian tubal transfer (ZIFT), or tubal embryo transfer (TET). Operative procedures are considerably more costly and some are of questionable therapeutic benefit (13,14). This is significant since it is important that medical management be cost effective today. Nonsurgical approaches to IVF reduces costs while maintaining efficiency and does not require an operating room or operating room staff, which significantly reduces expenditures. As outpatient care areas and surgicenters become more common, expensive hospital-based facilities and services will likely be used less and less.

Conscious sedation appears to be the method of choice, especially if center staff members can be trained to deliver the drugs and reduce the need to contract with outside consultants. It is our opinion that more centers should use infertility personnel from their own clinic to provide anesthesia. However, it is critical that all personnel providing conscious sedation be well trained in basic cardiac life support and be familiar with anesthetic agents delivered. Comprehensive training in anesthetic agent pharmacology and peer review of the procedure are essential for maintaining a good quality of care.

In conclusion, our survey demonstrates that all programs presently utilize anesthesia, typically choosing conscious sedation; although most commonly performed by anesthesia personnel, significant numbers of IVF clinics are giving their own anesthesia. Cost-effective choices need to be made with regard to the personnel delivering medication and the location at which procedures are performed.

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