Cost-effectiveness analysis comparing continuation of assisted reproductive technology with conversion to intrauterine insemination in patients with low follicle numbers

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Objective: To compare the cost effectiveness of proceeding with oocyte retrieval vs. converting to intrauterine insemination (IUI) in patients with ≤4 mature follicles during assisted reproductive technology (ART) cycles.
Design: Probabilistic decision analysis. The cost effectiveness of completing ART cycles in poor responders was compared to that for converting the cycles to IUI.
Setting: Not applicable.
Patient(s): Not applicable.
Intervention(s): Cost-effectiveness analysis.
Main Outcome Measure(s): Cost effectiveness, which was defined as the average direct medical costs per ongoing pregnancy.
Result(s): In patients with 1–3 mature follicles, completing ART was more cost effective if the cost of a single ART cycle was between $10,000 and $25,000. For patients with 4 mature follicles, if an ART cycle cost <$18,025, it was more cost effective to continue with oocyte retrieval than to convert to IUI.
Conclusion(s): In patients with ≤4 mature follicles following ovarian stimulation in ART cycles, it was on average more cost effective to proceed with oocyte retrieval rather than convert to IUI. However, important factors, such as age, prior ART failures, other fertility factors, and medications used in each individual case need to be considered before this analysis model can be adapted by individual practices. (Fertil Steril® 2014;102:435–9. ©2014 by American Society for Reproductive Medicine.)
Key Words: Poor responders, intrauterine insemination, assisted reproductive technologies, cost effectiveness

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Many patients undergoing assisted reproductive technology (ART) respond poorly to ovarian stimulation with gonadotropins, for a number of reasons (1–4). Patients with ART cycles resulting in ≤4 follicles over 14 millimeters are often referred to as poor responders (5–7). These ART cycles are usually associated with very low pregnancy

rates and high cancellation rates (8). Moreover, a large percentage of poor responders continue to respond poorly in subsequent ART cycles (9). Management options for poor responders include: cancellation, conversion to intrauterine insemination (IUI), or continuation with the ART cycle by proceeding to oocyte retrieval. This decision process is often difficult for both patients and physicians and involves clinical, financial, logistic, and emotional considerations.

The objective of this study was to identify which procedure is more cost effective in patients with ≤ 4 mature follicles during ART: conversion to IUI or continuation with oocyte retrieval. This study was conducted based on average outcome data in the literature and the average direct medical costs in clinics across the United States. However, the model used may be individualized to assist both patients and physicians in deciding whether to proceed with oocyte retrieval or convert to IUI in these patients.

MATERIALS AND METHODS

Since all probabilities and costs for the decision analysis were obtained from existing publications and publicly available information, this study was exempt from review by institutional review board. A decision-tree model (Fig. 1) was created to compare the societal costs of achieving an ongoing pregnancy with ART cycles that were converted to an IUI vs. with ART cycles that continued through oocyte retrieval in patients with 1–4 mature follicles. Patients with this number of mature follicles were assumed to have ART cycles that were either continued or converted to IUI; in addition, some of the ART cycles that proceeded through oocyte retrieval were assumed to have ended without an embryo for transfer. The cost and probability of each scenario contributed to the final cost analysis. One-way sensitivity analysis was conducted by varying either the ongoing pregnancy rates or the individual procedural costs.

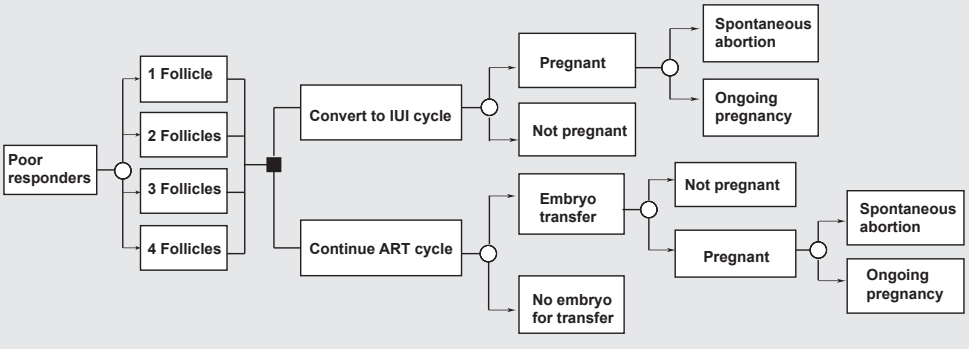
A computerized literature search in the MEDLINE, EMBASE, and randomized controlled trial registries, covering the period up to December 2013, on ART or IUI in poor responders or patients with low follicle numbers, was conducted. No language limitations were applied. The outcome data used in the decision-tree model originated from the published peer-reviewed articles identified in this literature review (8, 10–21). Costs were estimated by averaging the charges that were published on 21 fertility-center websites throughout the United States in various geographic regions. These 21 fertility centers were randomly chosen from the largest IVF clinics with estimated charges available online.

The charges included costs for: physician visits, ultrasounds, lab tests, and medications for both groups; and oocyte retrieval; embryo transfer (ET); and embryology lab in ART group, or IUI in IUI conversion group. Costs for gonadotropins and human chorionic gonadotropin (hCG) were estimated using the listed pricing of the Freedom Fertility Pharmacy. Clinic charges in 2010 US dollars were used as surrogates for direct costs and then converted to 2013 US dollars by adjusting for inflation using the US Department of Labor, Bureau of Labor Statistics consumer price index inflation calculator (www.bls.gov/data/inflation_calculator.htm). The ranges used in the sensitivity analyses were based on data from the same public sources.

Based on websites from clinics across the United States, the median cost of ART cycles up to and including the hCG trigger was estimated to be $9,000 in poor responders, with a range from $5,500 to $10,500. The median charges for remaining cycles were estimated to be $5,000 for completion of ART cycles, with a range from $3,500 to $10,000; and $500 for converted IUI cycles, with a range from $275 to $700. Therefore, the median cost for the continuation of the ART group was $14,000, which included the cost for ovarian stimulation ($9,000) plus oocyte retrieval and the rest of the ART cycle ($5,000); for the IUI conversion group, the median cost was $9,500, which included the cost for ovarian stimulation ($9,000) plus completion of the cycle with IUI ($500).

The cost analysis was conducted using the overall average cost to achieve one ongoing pregnancy, which is different from the healthcare cost for an individual patient. Using average pregnancy rates from published studies on poor responders, a calculation was made of the average total cost per ongoing pregnancy for ART patients that were converted to IUI vs. ART patients that proceeded with oocyte retrieval, grouped by the number of mature follicles at the time of the hCG trigger. One-way sensitivity analyses were completed for each follicle group to determine the average cost per

FIGURE 1



Decision-tree model. *Empty circle* denotes chance node. *Filled square* denotes decision node.

Yu. Cost effectiveness in poor responders. Fertil Steril 2014.