Markov modeling of vasectomy reversal and ART for infertility: how do obstructive interval and female partner age influence cost effectiveness?

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The study assessed the impact of obstructive interval and female partner age on fertility and the cost-effectiveness of vasectomy reversal versus assisted reproductive technology as treatment options for infertile men seeking paternity with post-vasectomy obstruction in the US setting. The study results showed that maternal age had a greater impact than obstructive interval in determining the more cost-effective treatment. Given the limited reporting of the sources of clinical and economic data used in the model, the quality of the evidence is hard to judge. Thus, caution should be exercised when interpreting the authors' conclusions.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective of the study was to determine the cost-effectiveness of vasectomy reversal versus assisted reproductive technology (ART) as treatment options for infertile men seeking paternity with post-vasectomy obstruction in the US setting. Specifically, the study assessed the role played by obstructive interval and female partner age on fertility and, thus, the cost-effectiveness of the two strategies.

Interventions
ART attempts were performed every 3 months. Vasectomy reversal consisted of a maximum of two attempts followed by ART in case of failure. The interval between the two vasectomy reversals was 1 year. A similar interval was considered between a second failed vasectomy reversal attempt and ART. Failed ART led to further ART attempts, with cycles performed every 3 months.

Location/setting
USA/university-based clinical practice.

Methods
Analytical approach:
The economic evaluation used a Markov model to determine the costs and benefits of the two strategies, based on a synthesis of the published evidence. The time horizon of the analysis was 3 years or pregnancy, whichever came first. The perspective of the analysis, although not explicitly stated, was implicitly that of the patient.

Effectiveness data:
The clinical data came from published sources as well as institutional sources, such as large retrospective reviews and expert opinions. Some assumptions were made in cases where published evidence was weak or absent. The authors did not state whether a review of the literature was undertaken to identify the primary studies. The key clinical end point was the probability of pregnancy after every attempt with ART or vasectomy reversal.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The summary benefit measure was the cumulative pregnancy rate. This was estimated using the decision model.
Cost data:
The analysis of the costs included out-of-pocket expenses borne by patients for in vitro fertilisation (IVF) cycles and vasectomy reversal. A breakdown of the cost items was not provided. The costs were derived from national averages and institutional costs. The price year was not reported. The costs were in US dollars ($).

Analysis of uncertainty:
One- and two-way sensitivity analyses were performed in order to calculate the threshold values at which variations in all model inputs changed the final decision on cost-effectiveness. The ranges of values used appear to have been derived from the same sources as those used in the base-case analysis.

Results
After 3 years, the cumulative pregnancy rate was 99.4% with immediate ART and 95.3% with vasectomy reversal first.

The mean costs were $31,399 with immediate ART and $29,274 with vasectomy reversal first.

An incremental cost-effectiveness ratio to compare the two strategies was not calculated. However, the authors estimated, that at a willingness-to-pay (WTP) of $65,000 or less, vasectomy reversal was the preferred option, while at higher WTP values ART was more cost-effective.

A tornado analysis showed that maternal age had a substantial impact on cost-effectiveness which was much stronger than obstructive interval. Even with small increases in maternal age, the net health benefit decreased for both options, suggesting a lower cost-effectiveness. In general, ART was more cost-effective as maternal age increased. For example, at a WTP of $100,000, ART was preferred to vasectomy reversal when maternal age was between 33.1 and 38 years. However, the model input with the strongest impact on the cost-effectiveness results was the IVF pregnancy rate. Other model inputs that had an impact on the base-case results were the cost per IVF cycle and vasectomy reversal, pregnancy rate after vasectomy reversal, length of time that couples spent on infertility treatment, and interval between IVF cycles.

Authors' conclusions
The authors concluded that maternal age represented the key to determining the more cost-effective treatment for male infertility in couples where the men had undergone a vasectomy.

CRD commentary
Interventions:
A justification was given for the choice of the comparators, which were relevant in the authors' setting. Clear descriptions of the two strategies were given.

Effectiveness/benefits:
The authors provided little information on the approach used to identify the primary studies. It was not stated whether a review of the literature had been undertaken and details of the primary studies were not reported in any detail. Selectively identified studies appear to have been used. The lack of detail limits the possibility of objectively assessing the validity of the primary data used in the analysis.

Costs:
The analysis of the costs included only those health service costs relevant to the patients. The costs were presented as macro-categories and were not reported in terms of single items. There was little information on the sources used to derive the costs and resource use. Furthermore, the price year was not reported and discounting was not applied, although it could have been relevant for costs incurred after the first year.

Analysis and results:
The approach used to synthesise the costs and benefits was not clear since it did not result in a final decision on the preferred option. The authors only reported some conclusions on the basis of different WTP values for a pregnancy. This was probably due to the fact that the objective of the study was to assess the impact of some parameters on the cost-effectiveness ratios, rather than to compare the two options. The issue of uncertainty was addressed as all model
inputs were varied in the sensitivity analysis. The results of both the base-case and sensitivity analyses were presented in detail. In terms of the generalisability of the study results, the authors noted that costs and pregnancy rates vary greatly among individual practices and geographical locations. The authors acknowledged some limitations of their analysis which, however, are common to other studies on ARTs, such as the fact that the main benefit measure was the pregnancy rate rather than the rate of live births and the assumption that male infertility was due only to obstruction.

Concluding remarks:
There are some potential limitations to the study validity, owing to the limited information reported on the sources of clinical and economic data used in the model. This precludes the possibility of judging the validity of these estimates, despite the extensive use of sensitivity analysis. The authors’ conclusions should be considered with caution.

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None stated.

Bibliographic details

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Age Factors; Computer Simulation; Cost-Benefit Analysis; Female; Fertility; Humans; Infertility, Male /economics /therapy; Male; Markov Chains; Pregnancy; Pregnancy Rate; Reproductive Techniques, Assisted /economics; Sensitivity and Specificity; Time Factors; Vasovasostomy /economics

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