Assisted Reproductive Technologies in Alberta: An Economic Analysis to Inform Policy Decision-Making

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Abstract

Objective: Regulation and public funding of assisted reproductive technologies (ARTs) vary across the Canadian provinces. In Alberta, neither of these exists. We conducted this study to evaluate the cost effectiveness and budget impact of providing ARTs in Alberta under three different policy scenarios (a "restrictive" policy, a policy based on Quebec's model, and a "permissive" policy) in comparison with the status quo.

Methods: To predict the cost effectiveness and budget impact of three policy options for publicly funded ARTs in Alberta, we developed an economic model by combining a state transition Markov model and a decision tree. The primary outcome was cost per healthy singleton. Probabilistic and one-way sensitivity analyses were conducted.

Results: The restrictive policy was the most cost effective option for two subgroups of age (< 35 years and 35 to 39 years), while the Quebec policy option was most cost-effective for the ≥ 40 years subgroup. Budget impact analysis extending up to the age of 18 years for the children in the model showed the cost savings of $8.33 million for the restrictive policy for the < 35 years subgroup. For the ≥ 40 years subgroup, the Quebec policy option resulted in total cost savings of $3.75 million. Sensitivity analyses showed that the model results were robust.

Conclusion: This economic modelling study shows that publicly funded and scientifically regulated ARTs could provide treatment access and save health care expenditures for the province.

Key Words: Assisted reproductive technologies, decision modelling, cost-effectiveness analysis, budget impact analysis

Competing Interests: None declared.

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Résumé

Objectif : La réglementation et le financement public des techniques de procréation assistée (TPA) varient d'une province canadienne à l'autre. En Alberta, les TPA ne sont ni réglementées ni financées par les deniers publics. Nous avons mené cette étude dans le but d'évaluer la rentabilité de l'offre de TPA en Alberta et les effets d'une telle mesure sur le budget albertain en fonction de trois scénarios de politique différents (une politique « restrictive », une politique fondée sur le modèle québécois et une politique « permissive »), par comparaison avec le statu quo.

Méthodes : Pour prédire la rentabilité de ces trois options de politique (prévoyant l'offre de TPA financées par les deniers publics en Alberta) et leurs effets sur le budget provincial, nous avons élaboré un modèle économique en combinant un modèle Markov (transitions d'état) et un arbre décisionnel. Le coût par nouveau-né en santé issu d'une grossesse monofœtale constituait le critère d'évaluation principal. Des analyses simples de la variance en matière de sensibilité et des analyses probabilistes ont été menées.

Résultats : La politique « restrictive » a constitué l'option la plus rentable dans deux sous-groupes d'âge (< 35 ans et 35-39 ans), tandis que la politique fondée sur l'approche québécoise a constitué l'option la plus rentable dans le sous-groupe des ≥ 40 ans. L'analyse des effets sur le budget (jusqu'à ce que les enfants générés par le modèle ait atteint l'âge de 18 ans) a indiqué l'obtention d'économies de 8,33 millions de dollars pour ce qui est de la politique « restrictive » dans le sous-groupe des < 35 ans. Dans le sous-groupe des ≥ 40 ans, l'option de la politique fondée sur l'approche québécoise a mené à l'obtention d'économies totales de 3,75 millions de dollars. Les analyses de la sensibilité ont indiqué que les résultats modélisés étaient robustes.

Conclusion : Cette étude de modélisation économique indique que l'offre de TPA financées par les deniers publics et faisant l'objet d'une réglementation scientifique pourrait assurer l'accès au traitement et permettre l'obtention d'économies pour la province.

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INTRODUCTION

In many societies, the desire for offspring is recognized as a common and important one. The inability to conceive can be emotionally devastating and can be a significant source of guilt, anger, depression, and withdrawal.[1–3] Infertility may be treated with the use of assisted reproductive technologies, such as intrauterine insemination and in vitro fertilization. In the developed world, ARTs are responsible for 1% to 3% of births each year.[4] However, there are concerns about the high rate of twins and higher order multiple births associated with ARTs; these result from the transfer of more than one embryo. While ARTs contribute to only 1% to 3% of singleton births in the United States, they are estimated to account for 30% to 50% of twin births and more than 75% of HOM.[5] In Canada, the overall incidence of multiple births grew from 2.2% in 1995 to 3.3% in 2011.[6]

Multiple pregnancy increases the risk of adverse events for both mothers and infants. The financial burden of multiple pregnancies may be high due to the immediate costs of prolonged antenatal hospitalization, long-term medical care, and rehabilitation and special education for those children who are born unhealthy.[7] Compared with a singleton pregnancy, the combined health care costs of mother and child have been estimated to be four times higher in a twin pregnancy and 10 times higher in a triplet pregnancy.[8] Internationally, many jurisdictions have introduced guidelines, legislation, or policies in an effort to reduce the number of multiple pregnancies produced as a result of the use of IVF.[9,10] These have been enforced through funding mechanisms which link reimbursement to compliance with procedural considerations and patient characteristics.[11] While the Society of Obstetricians and Gynaecologists of Canada and the Canadian Fertility and Andrology Society have also published guidelines,[12] there is no national legislation that governs the regulation or funding of ART services in Canada. Consequently, there are variations in regulation and funding between the provinces. In Alberta, ARTs are neither regulated nor publicly funded. With the exception of diagnostic testing and fertility counselling, which is provided by the province, patients pay out-of-pocket for all ART services. Further, decisions on the number of embryos to transfer and the upper maternal age limit for transfer are made by the individual clinics, fertility specialists, and patients.

Public funding of ART with restrictions on its use can reduce multiple birth rates.[13] However, whether the potential cost savings associated with reducing the number of multiple births (e.g., fewer obstetrical complications, fewer low birth weight, premature, and small for gestational age infants, shorter hospital stays, and reduced long-term disability costs) could offset the costs of funding ARTs remains unclear.

The objectives of this study were

1. to determine the cost-effectiveness of providing ARTs under each of the policy options in three subgroups of women (< 35, 35 to 39, and ≥ 40 years of age), identifying the most appropriate and cost-effective policy option for each subgroup; and
2. to determine the budget impact and additional costs or cost savings of providing ARTs in Alberta under three different policy scenarios, in comparison to the status quo (no funding and no restrictions).

ABBREVIATIONS

ART	assisted reproductive technology
DET	double embryo transfer
HOM	higher order multiple
PERT	program evaluation and review technique
SET	single embryo transfer

METHODS

Scope of the Economic Analysis

ARTs refer to a range of services. This analysis focuses on IVF, in which oocytes are fertilized by sperm outside the body prior to transfer of the embryo into the uterus. While IVF is recognized as one of the most clinically effective treatments, it is also one of the most expensive.[14] Therefore, to predict the cost-effectiveness and budget impact of publicly funded IVF in Alberta, we developed an economic model. Modelling uses evidence-based mathematical and statistical models to simulate real world events, providing information to support policy decisions.[15] The cost and outcomes of various policy options for regulating and funding ARTs in Alberta were modelled using internationally accepted published guidelines for conducting cost-effectiveness modelling and budget impact analyses.[16] A combination of a decision tree and Markov model was developed in Excel 2010 software (Microsoft Corp., Redmond WA) to compare the various policy options.

Policy Scenarios

Cost-effectiveness and budget impact analyses were performed for the following policy options (Table 1)

- current practice in Alberta of no funding and no restrictions (reference policy),
- funding with restrictions under a restrictive policy,

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