

Early Abortion in Ontario: Options and Costs

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Abstract

Objective: Early abortions have been predominantly surgical for many years, but medical options with comparable efficacy and safety are now available. This study compares the costs of two medical options and two surgical options.

Methods: We used a clinical model to compare the costs in Ontario of four options for early abortion: medical abortion using either mifepristone or methotrexate, and surgical abortion by vacuum aspiration in either a hospital or a free-standing clinic. The cost analysis was conducted from the perspectives of society, the health care system, and the patient.

Results: From all perspectives, total costs were highest for hospital surgical abortion, followed by surgical abortion in a clinic. From the patient's perspective, total costs were higher for surgical abortion but direct costs (mainly for medications) were higher for medical abortion. The total cost of mifepristone and methotrexate abortion was equal if the price of mifepristone (200 mg) was \$59.52. The model was robust but was sensitive to the price of mifepristone.

Conclusion: Early medical abortion costs less than early surgical abortion from the societal and health care system perspectives but more than surgical abortion from the patient's perspective. Surgical abortion costs more in hospitals than in free-standing clinics from the societal and health care system perspectives, but the costs are the same in both settings from the patient's perspective. No method for early abortion can be identified as best, and patients should be free to choose the option they prefer.

Résumé

Objectif : Bien que depuis de nombreuses années les avortements précoces aient été principalement effectués de façon chirurgicale, des options médicales présentant une efficacité et une innocuité comparables sont dorénavant disponibles. La présente étude compare les coûts de deux options médicales et de deux options chirurgicales.

Méthodes : Nous avons utilisé un modèle clinique pour comparer les coûts, en Ontario, associés à quatre options d'avortement précoce : l'avortement médical au moyen de mifépristone ou de méthotrexate et l'avortement chirurgical par aspiration à l'hôpital ou dans une clinique autonome. L'analyse des coûts a été menée des points de vue de la société, du système de soins de santé et de la patiente.

Key Words: Abortion, medical abortion, surgical abortion, mifepristone, methotrexate, misoprostol

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Résultats : De tous les points de vue, les coûts totaux étaient les plus élevés dans le cas de l'avortement chirurgical à l'hôpital, suivis de ceux de l'avortement chirurgical en clinique. Du point de vue de la patiente, bien que les coûts totaux aient été plus élevés dans le cas de l'avortement chirurgical, les coûts directs (principalement pour les médicaments) étaient en fait plus élevés dans le cas de l'avortement médical. Les coûts totaux de l'avortement au moyen de mifépristone et de celui effectué au moyen de méthotrexate étaient égaux lorsque le prix du mifépristone (200 mg) était de 59,52 \$. Le modèle était solide, mais sensible au prix du mifépristone.

Conclusion : Bien que, des points de vue de la société et du système de soins de santé, l'avortement médical précoce entraîne des coûts moins élevés que ceux qui sont associés à l'avortement chirurgical précoce, les coûts qui lui sont associés sont toutefois plus élevés que ceux de l'avortement chirurgical du point de vue de la patiente. Bien que, des points de vue de la société et du système de soins de santé, l'avortement chirurgical entraîne des coûts plus élevés lorsqu'il se déroule à l'hôpital plutôt que dans une clinique autonome, les coûts qui lui sont associés sont toutefois les mêmes dans les deux milieux du point de vue de la patiente. Il est impossible de déterminer laquelle des méthodes d'avortement précoce est la meilleure; les patientes devraient donc disposer de la liberté de choisir l'option qui leur convient.

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INTRODUCTION

Most first trimester induced abortions are surgical, performed by vacuum aspiration under local or general anaesthesia,¹ and the efficacy and safety of these methods are well established.² Over the past two decades, medical methods have evolved as alternatives to surgery for early abortion. The principal agents have been combinations of either mifepristone (also known as RU 486) or methotrexate with a prostaglandin analogue, usually misoprostol, or a prostaglandin analogue alone.³

Mifepristone in combination with misoprostol has been available for medical abortion in Europe since 1988, in China since 1991, and in the United States since 2000.¹ It is not approved in Canada although a recent Canadian multicentre clinical trial demonstrated its efficacy and safety.⁴ Methotrexate combined with misoprostol is also effective and safe for terminating early pregnancy,⁵ but it has not been approved for this indication,¹ and such use is

Table 1. Base case probability estimates

Variable	Base case	Range in literature	Range tested in sensitivity analysis
Probability of complete abortion with mifepristone and single dose misoprostol	0.9250	0.90–1.00	0.90–1.00
Probability of complete abortion with mifepristone after second dose misoprostol when incomplete after first dose	0.3600	0.90–1.00	0.00–1.00
Probability of no complications after abortion with mifepristone-misoprostol	0.9833		
Probability of excess bleeding complicating abortion with mifepristone-misoprostol	0.0127	0.008–0.0158	0.00–0.02
Probability of infection complicating abortion with mifepristone-misoprostol	0.0040	0.000–0.020	0.000–0.020
Probability of complete abortion with methotrexate and single dose misoprostol	0.7280	0.60–0.80	0.60–0.80
Probability of complete abortion with methotrexate after second dose misoprostol when incomplete after first dose	0.6700	0.38–0.853	0.40–1.00
Probability of no complications after abortion with methotrexate-misoprostol	0.9870		
Probability of excess bleeding complicating abortion with methotrexate-misoprostol	0.0050	0.0005–0.005	0.00–0.01
Probability of infection complicating abortion with methotrexate-misoprostol	0.0080	0.00–0.02	0.00–0.02
Probability of complete abortion after vacuum aspiration	0.9700	0.94–1.00	0.94–1.00
Probability of no complications after abortion with vacuum aspiration	0.9900		
Probability of excess bleeding complicating abortion with vacuum aspiration	0.0003	0.0000–0.002	0.0000–0.002
Probability of infection complicating abortion with vacuum aspiration	0.0097	0.00–0.02	0.00–0.02
Probability of administration of Rh immune globulin to patient undergoing abortion	0.15		

off-label. Prostaglandins used alone to induce abortion have generally been less effective and produced more side effects than the combinations.⁶

There has been limited study of the comparative costs of medical and surgical abortion in North America. Cost considerations are critical in Canada, where the health care system is challenged to meet the demands of a growing population in the face of constrained public funding. This study compares the costs of four options for early medical and surgical abortion in Ontario. Costs are considered from the perspectives of society, the health care system, and the patient.

METHODS

Our model considers a hypothetical female patient, at up to 63 days' gestation, presenting for one of four options for abortion: medical abortion using a combination of either mifepristone or methotrexate with misoprostol, or surgical abortion by vacuum aspiration in either a hospital or a free-standing clinic. The respective clinical pathways were developed after review of the literature and consultation with a panel of medical experts (three obstetrician-gynaecologists, two family physicians experienced in medical and surgical abortion, and an infectious disease

specialist). The pathways include provision for failure of the primary abortion procedure and for the main recognized, albeit rare, complications of excessive bleeding and infection.^{2,3} The probabilities assigned to the pathway events were derived from the literature^{4,7-23} and are shown in Table 1.

Each pathway begins with clinical evaluation, counselling, and appropriate laboratory testing. In the medical arms, the physician administers either oral mifepristone or intramuscular methotrexate. The patient self-administers misoprostol after the appropriate interval (24–48 hours after mifepristone; 5–7 days after methotrexate) and repeats the misoprostol 24 hours later if abortion is incomplete. We used the evidence-based doses of 200 mg for mifepristone, 50 mg/m² for methotrexate and 800 µg for each dose of intravaginal misoprostol.^{24,25} A follow-up physician visit occurs one to two weeks after the initial treatment to confirm the completeness of abortion by ultrasound examination and to initiate contraception as appropriate. If medical abortion fails, the patient undergoes surgical abortion by vacuum aspiration. The patient is assumed to seek and receive treatment for any complication in a hospital emergency department and to return to her initial physician for follow-up.

The events in the two surgical arms are similar although their place and timing differ somewhat, in keeping with prevailing practice. In the hospital option, the surgical procedure is separated in time from the initial physician visit, the procedure is performed under general anaesthesia, and the patient returns to her usual physician for follow-up. In the clinic scenario, however, the abortion procedure immediately follows the initial clinic physician assessment, it is performed under local anaesthesia, and the patient returns to her usual physician for follow-up. The completeness of surgical abortion is nearly always evident by the presence of discernible products of conception in the aspirate; very rarely, histologic examination, ultrasound, or human chorionic gonadotropin (HCG) assay may be needed. If the initial vacuum aspiration abortion is incomplete, a repeat procedure is assumed to be successful. As in the medical arms, a patient experiencing a complication is assumed to seek and receive treatment in a hospital emergency department and to return to her usual physician for follow-up.

In keeping with practice in Ontario, the patient bears the cost of all medications not administered within a hospital or clinic with the exception of Rh immune globulin (supplied by Canadian Blood Services and paid for by the health care system). The health care system bears the cost for all physician services and for all hospital or clinic services and medications. The cost of outpatient oral antibiotics prescribed in an emergency department is borne by the patient.

The analysis considered the direct costs associated with the interventions and also the indirect cost to patients of time lost from work within or outside the home.

Costs for physician and clinic diagnostic and laboratory services were based on the Ontario Health Insurance Plan (OHIP) 2003 Schedule of Benefits and Fees. Costs for medications were derived from the 2003 Ontario Drug Benefit Formulary wherever possible. For medications not on this formulary, representative prices from major Toronto retail pharmacies were used. The pharmacist dispensing fee was based on an estimate developed at the Faculty of Pharmacy of the University of Toronto. Because mifepristone is not available in Canada, we chose as the base cost the price charged by the US manufacturer, Danco,²⁶ and as alternates, the British National Formulary price to National Health Service hospitals²⁷ and prices in China and India reported in the literature.²⁶ Foreign currencies were converted to Canadian dollars at 2003 exchange rates (source: Royal Bank of Canada).

Hospital costs were based on 2001–2003 data from a large community hospital in the greater Toronto area participating in the Ontario Case Costing Initiative (OCCI). (OCCI hospitals have implemented a standardized case-costing methodology and have participated in a series of audits to

ensure the quality of the data.) The database provided total direct hospital costs by procedure and by principal diagnosis according to the International Classification of Diseases, version 9 (ICD-9) for 2001–2002 and version 10 (ICD-10) for 2002–2003, and excluded only physician fees covered by OHIP. Clinic costs were derived from data for the same period from a large clinic in Toronto. All costs were adjusted to 2003 levels using the Statistics Canada Consumer Price Index for health and personal care.

Time loss estimates were derived from a Canadian study of 151 women undergoing medical (with methotrexate–misoprostol) or surgical abortion in 1998 or 1999.²⁸ This study by Wiebe and Janssen is the only one describing such abortion-related time loss. We did not consider time lost before the abortion procedure since it presumably reflects a combination of wait time and inability to work because of pregnancy symptoms. Only time lost on the day of and the day after the abortion was included. Because Wiebe and Janssen's study did not include the mifepristone–misoprostol procedure, our model assumed equal time losses for the two medical abortion options. This may overstate the time loss with the mifepristone procedure because evidence suggests it results in a more rapid abortion than methotrexate.²² Time loss was valued using 2003 Statistics Canada data on hourly earnings for females in the relevant age group. Details of the base case cost estimates appear in Table 2.

One-way sensitivity analysis was performed for each of the outcome probabilities and for different costs of mifepristone, using the Data Professional program (Version 11) by TreeAge Software, Inc. Outcome probabilities were varied within ranges reported in the literature (Table 1).

RESULTS

The total cost of medical abortion is less than that of surgical abortion from all perspectives (Table 3). This is true even for medical abortion using mifepristone–misoprostol with mifepristone at the US price. If only direct costs to the patient are considered, early surgical abortion costs are relatively low and are limited essentially to those of over-the-counter analgesics.

The direct and total costs for methotrexate abortion are less than with mifepristone from the societal and patient's perspectives because mifepristone has a higher price and in our model the patient bears the cost of these drugs. Methotrexate abortion is slightly more costly to the health care system than mifepristone abortion, however, because it is slightly less efficacious and is therefore associated with a slightly higher need for surgical completion of the abortion.

Early surgical abortion is on average \$267.56 more costly to the health care system and to society when performed in

Table 2. Costs of resources

Item	Unit cost*
Physician Services	
Family practice general assessment	54.10
Family practice intermediate assessment	27.30
Family practice counselling	50.45
Obstetrician-gynaecologist consultation	57.30
Emergency room comprehensive assessment and care	31.75
Ultrasound, pelvic, limited, professional component	20.50
Injection	2.27
Induced abortion, curettage	110.20
General anaesthesia for induced abortion, curettage	70.62
Dilatation and curettage for incomplete abortion	91.20
General anaesthesia for dilatation and curettage for incomplete abortion	35.31
Paracervical block local anaesthesia	8.80
Laboratory and Diagnostic Tests	
Complete blood count	8.27
Hemoglobin-hematocrit	1.29
ABO and Rh blood typing	9.31
Rh blood typing	2.07
Gonorrhea culture	10.34
Chlamydia EIA test	15.51
Alanine aminotransferase (ALT)	2.59
Aspartate aminotransferase (AST)	2.59
Creatinine	2.59
β -Human chorionic gonadotropin	15.51
Ultrasound, pelvic, limited, technical fee	32.55
Pharmaceuticals	
Mifepristone 200 mg	118.42
Methotrexate 50 mg, 2 vials	35.68
Misoprostol 200 μ g, 8 tablets	2.32
Gatifloxacin 400 mg qd, 10 tablets	50.10
Acetaminophen 325 mg, 100 tablets	6.31
Acetaminophen 300 mg with codeine phosphate 30 mg, 10 tablets	0.46
Ibuprofen 200 mg, 50 tablets	4.02
Rh immune globulin 120 μ g	23.56
Pharmacist dispensing fee	8.99
Hospital and Clinic Costs	
Hospital average case cost for abortion by vacuum aspiration	419.00
Clinic average case cost for abortion by vacuum aspiration	233.83
Hospital average case cost for bleeding after abortion	646.68
Hospital average case cost for infection after abortion	1021.00
Earnings	
Average hourly earnings for women age 15–45	16.84

*Costs are in Canadian dollars.

Table 3. Cost of early abortion*

Procedure	Perspective				
	Society (Direct)	Society (Total)	Health care system (Direct/Total)	Patient (Direct)	Patient (Total)
Mifepristone-misoprostol	505.86	1233.34	361.93	143.93	871.41
Methotrexate-misoprostol	447.32	1174.81	385.77	61.55	789.04
Vacuum aspiration in hospital	849.51	1779.08	842.63	6.88	936.45
Vacuum aspiration in clinic	525.65	1455.22	518.77	6.88	936.45

*Direct costs include all costs directly associated with the abortion. Total costs include direct costs plus the indirect costs related to time lost from work in either the patient's workplace or home. In our model, the health care system does not experience these indirect costs. The societal perspective considers costs of all payers. Costs are in Canadian dollars.

hospital rather than in a clinic, but the costs to the patient of the two surgical options are identical.

The difference between total and direct societal costs illustrates the importance of lost time. Estimated productivity costs for medical and surgical options are \$727.48 and \$929.57, respectively, representing 59% to 62% of the total societal cost of medical abortion and 52% to 64% of the total societal cost of surgical abortion.

The cost of mifepristone is the only variable that, under sensitivity analysis, changes the relative ranking of the four options. We varied the price of the 200 mg base case dose of mifepristone between the price in India and the price in the US, respectively equivalent to \$9.21 and \$118.42. The Indian price reduces the cost of the mifepristone option by \$109.21, to a level below that of the methotrexate option from the societal and patient's perspectives. The indifference price of mifepristone, at which the costs of mifepristone and methotrexate abortions would be identical, is \$36.05 from the patient's perspective and \$59.89 from the societal perspective. If the health care system were to bear the cost of these drugs, the indifference price of mifepristone would be \$59.52.

DISCUSSION

In our model, the medical options for early abortion compare favourably with the surgical options in terms of total cost to society, the health care system, and the patient. For society and the health care system, the direct costs of medical abortion are also less than those of surgical abortion, but for patients the direct costs of medical abortion are higher. Although the procedures and outcomes for early surgical abortion are essentially identical in the hospital and clinic settings, the clinic has a cost advantage from the perspectives of both society and the health care system because of its lower overhead and its greater efficiency, which is due to specialization in a single procedure. From the patient's

perspective, however, the costs of the two surgical options are the same and are mostly indirect, the direct costs being limited essentially to those of over-the-counter analgesics.

Mifepristone and methotrexate are both highly efficacious agents for medical abortion, and both have low complication rates.⁴ If both are available, mifepristone is generally the preferred agent because it acts more quickly and can be used until a later stage of the first trimester.²² Methotrexate and misoprostol are both approved for other conditions and are therefore available for off-label use in termination of pregnancy. Mifepristone, however, has no approved use in Canada at this time and is therefore not available. Approval of mifepristone in Canada would significantly improve the medical option for early abortion for Canadian women.

Mifepristone's direct cost disadvantage may be offset by a relative indirect cost advantage because of reduced time loss associated with the abortion. (Our model does not capture such an advantage, however, because in the absence of data in the literature on time loss associated with mifepristone abortion, we have assumed equal time loss with both mifepristone and methotrexate.)

Misoprostol used alone has also been considered for early abortion, especially in developing countries.^{6,29,30} This method may have cost and convenience advantages, but the evidence on its efficacy is mixed,²⁹⁻³² and side effects may be greater than with a combined regimen.⁶ In addition, recent work suggests any cost advantage may be overstated.³³ Further study is needed to clarify this potential third option for medical abortion.

The literature suggests women are divided in their preference for, and satisfaction with, medical versus surgical abortion. When offered a choice of either medical or surgical methods, comparable proportions of women chose each,³⁴⁻³⁶ and levels of satisfaction are high with both options.^{14,34-38} Policymakers must consider the intangible

value of choice when evaluating the costs and benefits of offering both medical and surgical abortion. Our results notwithstanding, a policy favouring medical abortion and reducing the availability of surgery may decrease patient satisfaction. On the other hand, if patients must pay for abortion-related drugs, particularly mifepristone, some who would prefer a medical method may opt for surgery simply for financial reasons. This underscores the importance of considering patient incentives because the surgical options are more costly both for the health care system and for society as a whole.

Despite their clear cost advantage, dedicated free-standing clinics account for only one third of surgical abortions in Ontario. It may seem that shifting abortions from hospitals to clinics could provide savings to the health care system and at the same time free scarce hospital resources, thereby shortening wait times for other services. This may, however, be neither practical nor desirable. In less populated regions, demand may be insufficient to support such clinics. Women in rural areas may also desire the relative anonymity that the larger urban centres offer.

We have already alluded to the potential for the price of mifepristone to bias the patient's choice towards surgery. No such bias would exist if mifepristone were available in Canada at its indifference price of \$36.05 for 200 mg. Although well below the US price of US\$90 (\$118.42) for 200 mg, this indifference price is similar to the £13.94 (\$31.37) the British National Formulary charges hospitals in the National Health Service²⁷ and may not be unrealistic.

Certain limitations of our model must be acknowledged. It is based on the Ontario single payer health care system in which the vast majority of funding is public although a high proportion of service provision is private. In addition, we focus primarily on solo practitioner providers in keeping with prevailing practice in the province. These factors may limit the generalizability of our findings.

The treatment of indirect costs may be a further limitation. The analysis from the perspectives of society and the patient includes estimates for substantial indirect costs due to time and productivity losses at the time of and after the abortion. These costs may be overestimated for a number of reasons. First, our time loss estimates were derived from a single study, albeit the only such study in the literature. Second, women reporting time lost from work, especially work inside the home, may only be functioning at reduced capacity rather than not working at all. And third, our average earnings rate was based on aggregate data which included all women in the reproductive years (assumed to be ages 15 to 45 years), but most women undergoing abortion are between the ages of 20 and 29 years.³⁹

Despite these caveats, our examination of productivity costs is illuminating since from the patient's perspective their inclusion or exclusion determines whether medical or surgical abortion is more costly. Clearly, more research is needed on the time losses associated with all methods of abortion in order to understand their full cost implications.

CONCLUSION

In conclusion, none of the medical or surgical options appears to be an absolute best choice for early abortion. Many women have strong and compelling personal reasons for preferring one method over another, and they should have access to the method of their choice. The approval of mifepristone for early abortion in Canada would significantly improve the medical options, especially if its price were not a barrier.

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