ABSTRACT

This study compared the cost-effectiveness of midwife services provided in birth centres operating as pilot projects with current hospital-based medical services in the province of Quebec. One thousand midwives' clients were matched with 1,000 physicians' clients on the basis of socio-demographic characteristics and obstetrical risk. Direct costs for the prenatal, intrapartum and postpartum periods were estimated. Effectiveness was assessed on the basis of three clinical indicators and four indices related to the individualization of care as assessed by women. Results show that the costs of midwife services were barely lower than or equal to those of physician services, but cost-effectiveness ratios were to the advantage of the midwife group, except for one clinical indicator (neonatal ventilation). Overall, this study provides rational support for the process of legalizing midwifery in the province.

ABRÉGÉ

Cette étude a comparé le ratio coût/efficacité des services de sages-femmes offerts dans des maisons de naissance mises en place dans le cadre de projets pilotes et des services médicaux courants dispensés dans des hôpitaux au Québec. Mille clientes de sages-femmes ont été jumelées à 1 000 clientes de médecins sur la base de leurs caractéristiques sociodémographiques et de leur risque obstétrical. Les coûts directs encourus pendant les périodes prénatale, perinatale et postnatale ont été estimés. L'efficacité a été mesurée à l'aide de trois indicateurs cliniques et de quatre indices d'humanisation des soins tels que perçus par les femmes. Les résultats montrent que les coûts des services des sages-femmes sont à peine plus bas ou équivalents à ceux des services offerts par les médecins, mais les ratios coût-efficacité sont à l'avantage de l'option sage-femme, sauf pour un indicateur clinique (ventilation néonatale). Dans l'ensemble, cette étude apporte un appui rationnel au processus de légalisation de la pratique sage-femme au Québec.

Cost-effectiveness of Midwifery Services vs. Medical Services in Quebec

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Many reasons have contributed to the decision made by several Canadian provinces to legalize the practice of midwifery.¹ One obvious reason is the willingness of governments to offer an alternative to current maternity care, as has been requested by women's groups for some time. Another reason is the belief that midwifery is a cost-effective form of maternity care.² There is, however, no clear evidence in support of this view.³⁻⁵ Because costs have become such a preoccupation for policy makers in the health care system, information from a cost-effectiveness study is highly desirable to support the rationale for implementing a major change in perinatal practice.

The evaluation of the practice of midwifery through pilot projects in Quebec offered an opportunity to shed some light on the issue. One of the objectives of the evaluation of this experiment was to compare midwifery services and medical services in terms of cost and effectiveness as measured on the basis of several dimensions.^{6,7} The purpose of this paper is to present some key results on the cost-effectiveness of birth centre-based midwife

services as compared with current hospital-based medical services.

METHODS

Methods are presented in detail elsewhere.⁶⁻⁸ Briefly, 1,000 midwives' clients who gave birth between January 1995 and July 1996 were matched after delivery with 1,000 clients under the care of physicians. Matching was done according to several socio-demographic characteristics (age, parity, education, marital status, language and region of residence) and obstetrical risk retrospectively assessed using an adapted version of a standard tool.⁹

Among the numerous variables measured, seven outcome and process indicators, for which there were statistically significant differences between the two study groups, were selected for the cost-effectiveness analysis: three clinical measures (caesarean section rate, 3rd and 4th degree perineal tear, and neonatal ventilation for more than five minutes),⁸ and four indices related to the individualization of care over the prenatal, intrapartum and postpartum periods as assessed by the clients (quality of prenatal care, feeling of control over delivery, quality of care during delivery, and self-confidence in caring for the baby). The latter indices were composed of two to twelve items and had good reliability (Cronbach alpha equal to or greater than 0.71).

Five main data sources were used to document effectiveness indicators and services whose cost would be assessed: medical records used by physicians, perinatal records used by midwives, client self-administered postnatal questionnaires, physician billing data from the Régie de l'assurance maladie du Québec (RAMQ):

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Quebec health insurance board) and official documents from the local community service centres (CLSC) that were responsible for administering the budget allocated to the midwife birth centres. In addition, experts were consulted on certain procedures not documented in the main data sources, such as antibiotherapy used in neonatal intensive care units.

Costs for the prenatal, intrapartum and postpartum period (up to eight weeks) were divided according to four perspectives depending on the payer responsible for particular expenses: the Ministry of Health, the regional board, the client and her close relations. Only the first three perspectives were considered here and combined into a "social" perspective. No cost actualization was needed since services provided to each woman were spread over less than a year. Direct costs were considered, to which was added a valuation of the time the woman spent away from her normal activities and the time spent by significant others and non-health professionals who helped her during the various stages of her pregnancy.

Three sources were used to estimate physician costs. The amount paid to physicians working on a fee-for-service basis for the care provided to each woman participating in the study was directly obtained from the provincial health care plan (RAMQ). As newborns do not have a permanent RAMQ identification number, the RAMQ data banks could not be used for assessing the amount paid to the patients' paediatricians. Hospital files were therefore analyzed to retrieve the information on services received, and unit prices were taken from the billing manual of specialist physicians of the RAMQ. It may be noted that an assumption has been made, according to which all visits to healthy newborns have been provided by paediatricians. However, the results would certainly not have changed if family doctor fees had been used instead, as the difference in fees is rather small (less than \$2.00) and the weight of this item on the total cost quite marginal (less than 1%). Finally, the average salary paid by the RAMQ was used to value the time salaried physicians spent with clients.

Since it was impossible to attribute a unit price to every activity carried out in the birth

Perspective	Item	Midwife Group \$	Physician Group \$
Ministry of Health (provincial)	Physician fees for mother	324	919
	Physician fees for baby	18	26
	Subtotal	342	945
Regional Board (region)	Prenatal class	20	8
	Prenatal care in birth centres	1,042	0
	Consultations with non-physician providers	87	36
	Hospitalizations	395	1,652
	Neonatal intensive care	34	7
	Medication (mother and child)	< 1	3
	Ancillary services (mother and child)	119	139
	Subtotal	1,699	1,847
Clients	Consultations with non-physician providers	38	10
	Medication	16	15
	Transport-ambulance	199	205
	Subtotal	253	229
Total (direct costs)		2,294 (2,062-2,930)*	3,020 (3,016-3,027)

* Figures in parentheses represent lower and upper cost limits used in sensitivity analysis

Pilot project #	Midwife Group \$	Physician Group \$
1	1,980 (1,794-2,643)*	3,004 (3,001-3,019)
2	2,207 (2,077-2,787)	2,985 (2,977-3,007)
3	3,311 (2,732-3,904)	3,553 (3,549-3,563)
4	2,463 (2,117-3,199)	2,867 (2,862-2,907)
5	2,414 (2,113-3,145)	2,701 (2,696-2,716)
6	1,982 (1,885-2,515)	2,952 (2,946-2,971)
7	3,114 (2,512-3,893)	2,970 (2,969-2,973)

* Numbers in parentheses represent lower and upper cost limits used in sensitivity analysis

centres (all staff members are salaried), time spent by clients receiving services in birth centres was computed. The dollar value of this time was estimated using three bases: a base value corresponding to the average hourly rate of a midwife, a lower limit value corresponding to the average salary of a birth assistant, and a higher limit value composed of the average hourly rate over all seven pilot projects of the CLSCs' budget item corresponding to the birth centres.

The unit prices of the other conventional health care services were defined based on the average provincial cost of relevant activity centres, increased to account for support services by use of the direct allocation method.¹⁰

A range of fees suggested by the respective professional associations or colleges was used for valuing visits to non-physician professionals (e.g., chiropractor, dietitian). For prescription drugs, the price used was that of the least expensive generic equivalent (when available) on the RAMQ list or, when not reimbursed by the RAMQ, on the list of a group of Montreal hospitals. Finally, the Quebec minimum wage was used to price the woman's time and that of the relatives, friends and non-professionals who helped her.

Sensitivity analyses were performed on the consumption of services and on prices when some imprecision was apparent.

Figure 1. Ratio of effectiveness indicators to average cost of perinatal follow-up, by type of maternity care

RESULTS

Table I presents the average per client cost for the two study groups. Results suggest that the physician option (\$3,020) is somewhat more expensive than the midwife option (\$2,294). The difference is essentially attributable to more frequent use of physician services and longer and more expensive stays in hospitals than in birth centres. Yet sensitivity analysis reveals that the upper limit of the possible cost per midwife client (\$2,930) is only slightly lower than the lower limit of the cost per physician client (\$3,020).

Total costs were also calculated per pilot project. Table II indicates that three of them (nos. 1, 2 and 6) have the same profile as the overall results shown above (Table I): the midwife option is less expensive. However, in the four other projects, cost ranges overlap, indicating no real difference.

The monetary value of the help provided to women by relatives and friends during pregnancy, delivery and in the postpartum period was also calculated. Based on the data collected, this help has been estimated at \$7,856 for midwife clients vs. \$8,663 for physician patients. It is obvious that the meaning of the figures obtained is not easy to interpret and great care must be taken in

making comparison between the two study groups.

Many outcome and process indicators were measured as part of this evaluation study. Detailed results of the epidemiological aspects of midwives' and physicians' services and of the individualization and continuity of care as perceived by clients are presented elsewhere.^{6,8} Following is a summary of the results of the indicators used in the cost-effectiveness analysis and for which statistically significant differences were found between the two groups. The caesarean section rate was 6% in the midwife group and 13.2% in the physician group; 3rd and 4th degree perineal tear was also less frequent in the former group (1.7%) than in the latter group (5.9%). More babies needed ventilation for more than five minutes at birth (1.5% vs. 0.7%). Midwives' clients had a higher score than physicians' clients on the four selected indicators of individualization and continuity of care.

Figure 1 illustrates the relationship between cost and the selected clinical and individualization of care indicators for both study groups. It shows that the midwife option is more cost-effective for six of the seven indicators; the physician option gives superior results only for need for neonatal ventilation for more than five minutes.

DISCUSSION

The overall results of this study suggest that midwife care is less expensive than conventional medical care. However, when the analysis focusses on each individual pilot project, the difference between the two options is not so obvious. Indeed, only three pilot projects present lower costs for the midwife option that are robust to sensitivity analyses. We found that in these three pilot projects, the amount of time devoted by midwives to prenatal and postnatal care was the lowest among the seven projects. Thus we cannot exclude the possibility that at least in these three sites, the quantity of services provided by midwives was underreported. This finding suggests that the real cost of midwife services could be quite similar to that of medical services.

In any case, cost estimation in this study presented several difficulties. For example, it was not possible to divide expenses by activity centres in birth centres. The latter receive a global budget that does not allow breaking down the various practice components of a midwife. Only the time reported for each activity attributable to a given client could be computed. The intensity of work, which would have been better reflected in an itemized budget, could not be assessed as it is in a conventional medical

setting. As a consequence, particularly wide cost ranges, from \$16.23 to \$53.06 per hour of activity, had to be used to assign a cost to services provided by midwives.

Moreover, one cannot ignore the organizational and professional context surrounding the pilot projects.¹¹ The experimental conditions in which birth centres were operating probably had an impact on the cost of the midwife option. Many birth centres went through a period of adjustment during data collection and efficiency may not have been at its best. Midwife practice was highly regulated, yet collaboration with other health care professionals was not optimal. This experimental context can be illustrated by the fact that clients who were referred to specialists had to first see a family physician. Cost-wise at least, such a situation has unknown consequences. The use of two medical professionals should obviously be more costly than if a specialist is directly consulted. On the other hand, a gate of entry through a family physician may avoid unnecessary consultations and possibly higher cost investigation and procedures by specialists.

Finally, one may note that only short-term costs could be calculated. If after-effects that have costly consequences on the use of social and medical services in the long term, such as developmental delay, occur more frequently in one group, this could change the results obtained. One option could become clearly more costly than the other. However, the short follow-up that this study permitted prevents integrating this issue into the cost data. One cannot state from the experiment that the need for neonatal ventilation which is more prevalent in the midwives group will lead to permanent after-effects, and therefore that the results are biased against the medical option.

From a cost-effectiveness perspective, most results of this study are favourable to midwife care. In the case of one indicator (need for neonatal ventilation), the findings favour medical care. Whether greater collaboration between birth centres and physicians would have prevented this adverse outcome is a difficult question that cannot be answered by economic analysis. However, the analysis of the relationship between midwives and the other maternity care professionals tends to show that care in the pilot

projects was provided in conditions that were less than ideal.¹¹

One finding that needs to be underlined, although it is not the main focus of this study, is the contribution during the whole perinatal period, of relatives, friends and other individuals outside of the formal care personnel. Even though the translation of this help into dollars does not carry a fully valid meaning, our results give an idea of the magnitude of the mobilization of a person's social network needed to prepare for the arrival of a baby in this country. The social implications of such a finding should be explored in more depth.

Few previous studies can help put the current results into perspective. The organizational context in which the practice of midwifery was examined in those rare studies (essentially the hospital) is different.¹² In fact, contrary to the situation in the Quebec pilot projects, midwife practice is rarely restricted to out-of-hospital care. To our knowledge, no other study has rigorously matched midwives' clients and physicians' clients on demographic characteristics as well as obstetrical risk. More important, no study has looked at the whole episode of maternity care, including pregnancy, delivery and postpartum care. One Canadian study, conducted in Ontario, compared midwifery care and medical care, but did not compute all consumed services.¹³ Also, expenses incurred by clients were not considered. Beyond these differences in method, previous studies provided mixed results as to the cost-effectiveness of midwifery care.³⁻⁵

CONCLUSION

Despite the methodological limitations of this study, our results suggest quite clearly that midwifery care in the Quebec birth centres differs little from conventional medical care in terms of cost. In terms of several clinical outcomes, no option can definitely be shown to be superior. However, the midwife option seems to be advantageous from a subjective client perspective. Although no generalization to hospital or home practice can be made, the findings of this study should help authorities in their decision to legalize the practice of midwifery in Canada by offering a solid rationale to those who have long requested

major changes in the provision of services to pregnant women.

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