The safety of obstetric services in small communities in northern Ontario

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The safety of the obstetric care system in the small hospitals of northern Ontario was assessed by analysing the outcomes of all obstetric cases over a 2-year period. Information was retrieved by place of residence rather than hospital of delivery so that the overall perinatal system, including the referral patterns, would be assessed. There was little difference in perinatal loss rate (stillbirths and neonatal deaths up to 28 days per 1000 births) for residents of areas served by different levels of obstetric care. Areas served by units where cesarean sections are done regularly but which do not have specialists in obstetrics or pediatrics had a perinatal loss rate of 10.43, whereas areas served by units staffed with two or more specialists in both obstetrics and pediatrics and handling more than 1000 deliveries per year had a perinatal loss rate of 12.13. Although many of the smaller hospitals did not have the minimum capabilities suggested for obstetric units relatively safe care was being provided. These results do not support the need for further centralization of obstetric services in northern Ontario.

La sûreté du système de soins d'obstétrique dans les petits hôpitaux du nord de l'Ontario a été évaluée en analysant les résultats de tous les cas d'obstétrique au cours d'une période de 2 ans. Des informations ont été obtenues d'après le lieu de résidence plutôt que d'après l'hôpital d'accouchement afin d'assurer que le système périnatal global y compris les caractéristiques d'orientation soit évalué. Le taux de mortalité périnatale (naissances de mort-nés et décès néonatals jusqu'à 28 jours après l'accouchement par 1000 naissances) variait peu d'une région à l'autre quoi que soit le niveau de soins d'obstétrique disponible. Les régions desservies par des unités s'occupant habituellement d'opérations césariennes mais n'ayant pas de spécialistes ni en obstétrique ni en pédiatrie avaient un taux de mortalité périnatale de 10,43, alors que les régions desservies par des unités possédant deux spécialistes ou plus en obstétrique ainsi qu'en pédiatrie et s'occupant de plus de 1000 accouchements par année avaient un taux de mortalité périnatale de 12,13. Bien que plusieurs des plus petits hôpitaux ne possédaient pas les capacités minimums suggérées pour les unités de soins d'obstétrique, ils fournissaient des soins relativement sûrs. Ces résultats ne vont pas dans le sens d'une centralisation plus poussée des services d'obstétrique dans le nord de l'Ontario.

In recent years there has been a great deal of discussion about the benefits of regionalized obstetric services. Many such projects are thought to have improved the delivery of perinatal care.[1-5] In Nova Scotia, for example, as a regional system was being implemented between 1971 and 1980, perinatal mortality was halved.[4]

Plans for regionalized obstetric services are often threatening to small communities and their hospitals. Services for high-risk patients will become centralized, and some small units may be closed or downgraded. On the other hand, the overall services can be improved by providing support to the smaller units. The Nova Scotia results were achieved with only a small reduction in the number of deliveries handled in community hospitals.[4] The degree to which services should be centralized and the number of units that should be closed are controversial questions.

Plans for regionalization call for the development of perinatal care in three types of units. Level III units are generally in tertiary care, university-based centres that are prepared to handle the more complex problems and the high-risk patients. Level II units are equipped to handle the majority of complications and to deal with moderate-risk patients. Level I units are prepared to look after normal deliveries.

In contrast to the guidelines established for patient volume, staffing and equipment in level II and III units, which have been relatively well defined, there are few guidelines for level I units. It is accepted that, wherever possible, level I units should be combined with level II or III units and should be independent only when it is geographically necessary. What constitutes geographic necessity is unclear. The Ontario Advisory Committee on Reproductive Medical Care[6] suggested in 1979 that a travel time of 30 minutes justifies a separate unit but recognized that this standard might have to be modified

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in nonurban areas. While the committee said that level II should have at least 1000 deliveries per year they did not consider it appropriate to set a minimum for level I units, as they are justified primarily by geographic necessity.

Level I units should, of course, be able to look after low-risk pregnancies, deliveries and newborns, but they must also be able to deal with emergencies.[6] The Ontario committee did not specify what would be needed to provide this capability, but a 1977 American report[5] recommended that level I hospitals have electronic fetal-monitoring equipment, type O Rh-negative blood and fresh frozen plasma on hand, cross-matched blood available 24 hours a day, the capability to provide anesthesia and to begin a cesarean section within 30 minutes of the decision to proceed, and laboratory and radiology services available 24 hours a day.

From the experience of one small unit it has been suggested that because of the number of unexpected complications all obstetric units should be able to handle emergencies.[7] More specifically, they should be able to cross-match blood, give anesthetics and do cesarean sections. It was judged that these services could be adequately maintained only in a unit handling at least 100 deliveries per year. Consequently, it was suggested that hospitals with fewer than this number should discontinue all elective deliveries, except in cases of extreme isolation.

At present many hospitals in Canada have obstetric units but are unable to meet the suggested standards. Many have fewer than 100 deliveries per year. In most of these small hospitals, and even in some larger ones, cesarean sections are not done. In some cases anesthesia or cross-matching of blood is unavailable. If the standards suggested in the literature were to be implemented most of these small units would have to close.

Small hospitals usually react defensively to suggestions that they should close their obstetric units. The pressures to close are seen to be coming from outsiders who do not understand the needs of small communities and from obstetricians and pediatricians who have a vested interest in centralizing perinatal services. Few dispute the assumption that specialized units offer safer care for the mother and child. Arguments for the maintenance of small units tend to focus on the more personal care that they provide, the reluctance of mothers to leave their families to go to a distant city and the importance of the obstetric service to the continued existence of the hospital.

We need to know more about the safety of small obstetric units before recommending that they either upgrade their services or close. With proper control and careful selection of patients, small units may be safe. In Nova Scotia the community hospitals as a group had the highest perinatal mortality rate before regionalization but the lowest following full implementation of the program.[4]

We also need to know if the care provided in small hospitals doing cesarean sections and using anesthetics is safer than the care provided in the hospitals where all patients requiring these interventions are transferred to larger centres.

Two major problems make it difficult to assess the safety of a small obstetric unit. First, the small number of cases makes it difficult to accurately estimate the rates at which relatively rare events such as stillbirth and neonatal death occur. Second, the referral pattern, which is an important aspect of perinatal care, has to be taken into account. Small hospitals often have low mortality rates because they refer their more difficult cases. However, if patients reach a critical stage before they are transferred (i.e., if fetal distress has appeared) there could be excess perinatal losses, which would not be attributed to the referring hospital. Conversely, a small hospital that refers fewer patients and is prepared to handle many of the complications may have a higher mortality rate yet still be providing safer service to its community.

The first problem can be overcome by grouping small hospitals for analysis. The second problem can be overcome by examining the outcomes of all residents of a community, whether their infants are delivered in the local hospital or at a regional centre.

The following study was undertaken in an effort to determine the relationship between the level of services provided in small communities and the obstetric and neonatal outcomes. The specific questions we sought to answer were:

- Is safe care being provided in communities served by obstetric units that do not meet standards suggested for level I units?
- Is safe care being provided in communities where cesarean sections are undertaken without the services of specialists in obstetrics or pediatrics?

Answers to these questions are essential if small hospitals are to rationally plan their services and if we are to determine the form that regionalization should take. The answers will also have obvious implications for the training of physicians who are going to practise in these communities.

Method

Classification of hospitals

On the basis of data obtained during a 1981 survey of small hospitals in northern Ontario[8] and by personal communication with nonresponders, the hospitals were divided into six classes according to the level of service they provided. This classification was consistent with that used by the Advisory Committee on Reproductive Medical Care[6] but subdivides level I into four subgroups. When there was more than one hospital with an obstetric service in a community, the services and the numbers of deliveries were grouped, and one level of service was determined for that community. The classes were:

Level 0: no deliveries handled electively.

Level IA: deliveries handled electively, but anesthesia not available.

Level IB: anesthesia available, but cesarean sections not done or done fewer than five times per year.

Level IC: cesarean sections done regularly (five or more times per year), but specialists in obstetrics or pediatrics not on staff.

Level ID: at least one specialist in obstetrics or

pediatrics on staff, but fewer than 1000 deliveries per year.

Level II: two or more specialists in both obstetrics and pediatrics on staff, and more than 1000 deliveries per year.

Determination of community type

We used a modified gravity model to divide northern Ontario (that part of the province lying north and west of the French River and Lake Nipissing) into hospital service areas. The boundaries were determined with respect to the number of active treatment beds in each community.[9] For example, if two communities 60 km apart had hospitals with 100 and 50 beds respectively the dividing line for their service areas would be placed 40 km from the larger and 20 km from the smaller. Road patterns and other means of transportation were taken into account.

Each community allocated a residence code by the Ontario Ministry of Health was located on a map and assigned to a community type corresponding to the class of hospital serving the community. The residence codes are specific for each city, town, township or Indian reserve, but the codes for unorganized territories sometimes apply to large areas. When such a territory fell into more than one service area it was assigned to a community type on the basis of the hospital serving the largest portion of that territory. In this way all of the residents of northern Ontario could be assigned to one of six types of community.

Collection of data

Information on all newborn and obstetric patients assigned a code indicating residence in northern Ontario and discharged between Apr. 1, 1980 and Mar. 31, 1982 was extracted from the Hospital Medical Records Institute (HMRI) files. Since all hospitals in Ontario participate in the HMRI data system, the records for patients admitted to any Ontario hospital were studied. The only births to residents of northern Ontario that could not be included were those that took place in hospitals outside of Ontario, at home or in nursing stations. Also, a few patients from northern Ontario (71 newborns) had residence codes that were not specific enough to place them within one community type.

The numbers of perinatal deaths and instrumental deliveries for each community were obtained in the same manner. An effort was made to determine the incidence of a variety of obstetric and neonatal complications, but the lack of consistent definitions used in the diagnosis of these events rendered these data unreliable, and they were not analysed.

All the information was retrieved by place of residence and not by hospital of delivery. Information was not available on the practice of the individual hospitals because of the confidential nature of the data. However, the total number of newborns resident in the north who were admitted to each class of hospital was obtained.

Derivation of perinatal loss rate

The lack of a standard minimum weight for a stillborn infant precluded direct calculation of perinatal mortality rates (PMRs) from the HMRI data that would conform with the recommendations of the World Health Organization, as interpreted by the Canadian Paediatric Society's fetus and newborn committee.[10]

The perinatal loss rate was defined as the number of stillbirths and of deaths within 28 days after birth (in hospital) per 1000 newborn admissions.

Although this definition should not have introduced any bias, comparisons of loss rates determined from this study with those reported elsewhere should be made cautiously, with account taken of differences in definition and derivation. We compared our rates with those published by the Ontario registrar general for 1980.[11]

Results

The perinatal loss rates derived from the HMRI file for the fiscal year 1980–81 and the registrar general's data for the same area and for southern Ontario for the calendar year 1980 are presented in Table I. The rates derived from the HMRI data apparently underestimated the true mortality, probably owing to the exclusion of deaths that took place outside of hospital.

An overview of the existing obstetric services in northern Ontario (Table II) shows that during the 2-year study period 24 524 newborns from the north were admitted to Ontario hospitals; 98.6% of these were admitted to hospitals in the north.

Three towns had hospitals classed as level 0 (no

Table I—Perinatal loss rates in Ontario hospitals in 1980

Region; source of data	No. of births	Perinatal deaths: No. (and no./1000 deaths) Stillbirths	< 8 days after birth	8–28 days after birth	Total no./1000 births
Northern Ontario					
HMRI files*	12 391	84 (6.78)	54 (4.36)	3 (0.24)	11.38
Registrar general	12 626	95 (7.52)	73 (5.78)	12 (0.95)	14.25
Southern Ontario					
Registrar general	110 690	857 (7.74)	600 (5.42)	99 (0.89)	14.05

*Data from the Hospital Medical Records Institute covering the fiscal year Apr. 1, 1980 to Mar. 31, 1981.

elective deliveries) that potentially served 1% of the newborn population. All of these towns were close to a centre with a level II unit. The small number of patients in this group makes it difficult to obtain accurate estimates of the variables under study.

The level I hospitals together had 39% of the newborn population within their service areas. They were usually quite isolated, averaging more than 200 km from level II centres (Table II). As the size of the service population increased there was a corresponding increase in the level of service and the proportion of the potential patients who were cared for locally. The level IA hospitals admitted 57% of the newborns from their service areas, whereas the level IB hospitals admitted 80%. At the level IC hospitals the number of newborns admitted almost equalled the total number of newborns from their service areas. This suggests that the number of obstetric patients referred to other centres from the level IC hospitals was equalled by the number of patients coming from outside their service areas. The referral pattern at the level ID and level II hospitals resulted in a net increase.

Hospitals in the southern part of the province cared for 332 newborns from the north, including those whose mothers had been referred to the tertiary care centres. These patients' outcomes are included in the results.

The perinatal loss rates in each of the six types of community were not significantly different (Table III). The probability of a type II error cannot be estimated precisely, but the small differences observed from very large samples strongly suggest that the true differences, if any, were likely to be small.

Perinatal loss rates for Indian reserves and communities isolated from hospitals were calculated separately to see if their inclusion had influenced the results. There were 1237 hospital births to residents of reserves; the perinatal loss rate was 14.55/1000. More than half of these residents had come from reserves more than 1 hour's travel from a hospital (in most cases the "fly-in" reserves). The perinatal loss rate in this subgroup was 10.26/1000. The nonreserve communities more than 1 hour's travel from a hospital accounted for 636 newborns and had a perinatal loss rate of 25.15/1000.

There was little difference in the cesarean section rates between community types except that they were higher for residents of areas served by level II hospitals (Table IV). When the numbers of instrumental deliveries and cesarean sections were combined, 31.5% of the deliveries in the areas served by obstetricians (levels 0, ID and II) and 21.3% of those in communities without obstetricians (levels IA, IB and IC) were found to be operative. The difference was statistically significant (χ^2_1

Table II—Service and referral characteristics of hospitals serving northern Ontario

Level of service	No. of communities with hospitals	Mean road distance to a level II centre (km)	Total no. of newborns* (and annual mean per area or centre)		No. of newborns admitted to local hospitals/ no. of newborns from service area
			From service areas	Admitted to local hospitals	
0	3	59	216 (36)	11 (1.8)	0.05
IA	9	249	1 165 (65)	663 (36.8)	0.57
IB	8†	197	2 115 (131)	1 685 (105.3)	0.80
IC	11	229	4 313 (196)	4 279 (194.5)	0.99
ID	4	249§	1 808 (226)	1 916 (239.5)	1.06
II	5‡	–	14 836 (1484)	15 638 (1563.8)	1.05
Total	40		24 524	24 192	0.986

*Total for 2-year period; 71 newborns were not assigned to any level of service.
†One community had two hospitals with obstetric services.
‡Three communities each had two hospitals with obstetric services.
§One community had no road connection; the direct distance was used.

Table III—Perinatal loss rates in communities of northern Ontario

Community type	No. of newborns from community	No. of perinatal deaths			Total per 1000 newborn admissions* (and 95% confidence limits)
		Stillbirths	Neonatal deaths		
			< 8 days after birth	8–28 days after birth	
0	216	1	2	0	13.89 (2.87; 40.60)
IA	1 165	8	6	2	13.73 (7.85; 22.30)
IB	2 115	20	10	1	14.66 (9.58; 20.80)
IC	4 313	31	14	0	10.43 (7.61; 13.96)
ID	1 808	14	9	0	12.72 (8.06; 19.09)
II	14 836	111	68	1	12.13 (10.37; 13.89)
Unassigned	71	3	0	0	42.25 (8.71; 123.52)
Total	24 524	188	109	4	12.27 (10.89; 13.65)

*Comparison of the various types of communities showed no statistically significant differences whether the rate for the unassigned admissions was included ($\chi^2_6 = 7.76$) or not ($\chi^2_5 = 2.50$).

Table IV—Frequency of intervention in northern Ontario deliveries

Community type	No. of births to residents	Proportion of deliveries involving intervention (%)		
		Instrumental delivery	Cesarean section	Total (and 95% confidence limits)
0	216	23.6	13.9	37.5 (31.0; 44.0)
IA	1 165	10.0	15.5	25.5 (23.0; 28.0)
IB	2 115	6.6	11.1	17.7 (16.1; 19.3)
IC	4 313	7.7	14.2	21.9 (20.7; 23.1)
ID	1 808	19.5	12.4	31.9 (29.8; 34.0)
II	14 836	13.8	17.6	31.4 (30.7; 32.1)
Total	24 453	12.4	15.9	28.3 (27.7; 28.9)

= 269.6, $p < 0.001$). The perinatal loss rates in the same groups of communities were 12.22 and 12.11/1000 respectively.

Discussion

In this study the perinatal loss rates were determined for communities grouped according to the level of obstetric service available locally. The rates determined by place of residence rather than place of hospitalization better represent the safety of the whole perinatal care system. Different rates may reflect differences in prenatal care, services at the local hospital, referral patterns, transportation and services at the referral centre. Rates may also be affected by demographic differences.

In northern Ontario many communities are isolated from specialist services and have hospitals that do not meet the standards suggested for obstetric units. In spite of this, the overall perinatal mortality rates for northern and southern Ontario were similar.

The specialized obstetric and pediatric services available in northern Ontario were concentrated in five level II centres. These directly served 60% of the region's population. The communities with direct access to these specialized services had a perinatal loss rate almost identical to that seen in communities served by level I hospitals.

The level I hospitals served 39% of northern Ontario's population. Because this population was widely scattered these hospitals were quite isolated and had small patient loads. On average, level I units were more than 2 hours' travel away from level II centres. Many of these smaller hospitals had very limited services and did not meet the suggested standards. However, residents of the communities served by these hospitals appeared to receive obstetric care that was as safe as that provided in the large centres. The subgroup of communities served by the level IC hospitals had the lowest perinatal loss rate of all, although the differences were small.

It would appear that inclusion of the Indian population did not adversely affect the mortality rate for any community type. The residents of isolated reserves who were admitted to hospital had a perinatal loss rate better than the mean. However, it is possible that there were more stillbirths among deliveries taking place out of hospital. In contrast, the hospitalized residents of non-Indian communities isolated from hospitals had a loss rate higher than the mean.

One major problem with the use of data obtained from hospitals is the possible lack of consistent coding of diagnosis. The HMRI does not provide specific definitions for use by hospitals, and not all hospitals weigh fetuses, so there was no clear distinction between a stillborn infant and an abortus. While the lack of a

Posting notices to patients

If you sometimes feel you would like to post general announcements to your patients regarding immunization schedules, flu vaccines, stop smoking courses or the like, but are not sure how to do it effectively, consider setting up an easel-mounted flip chart in your waiting room. Bulletin boards are often used for this purpose, but they are all too often ignored. An easel, on the other hand, attracts the eye and stimulates curiousity. Your important announcements are more likely to be noticed.

definition of stillbirth makes these figures less reliable there is no reason to believe that there was a systematic difference in the coding practices of the different levels of hospitals.

It is of interest to speculate on why residents of the larger communities, who had direct access to specialized obstetric and neonatal services, did not have better outcomes than the residents of the smaller communities. It may be that the populations were not comparable. It is possible that there was a greater proportion of high-risk patients in the larger communities. However, there is no evidence available to support this hypothesis. An alternative explanation might be that the more aggressive approach to obstetrics, with more frequent operative deliveries, resulted in risks that negated the advantages of better monitoring and intensive care.

Conclusions

Relatively safe perinatal care is being provided in the small hospitals of northern Ontario, even though they do not meet the standards suggested for level I hospitals. The pattern of practice in these hospitals, which includes the judicious transfer of patients to larger centres, results in care that is as safe as that provided to patients who have direct access to the larger, specialized hospitals.

Relatively safe care may be provided in small hospitals that do not have specialists in obstetrics or pediatrics but where cesarean sections are done regularly and from which only a small proportion of patients are referred to larger centres. Our study has not provided enough information to determine which hospitals should adopt this policy; a certain minimum case load is probably required.

Physicians who work in small isolated hospitals where obstetrics is practised should receive appropriate training in anesthesia and in the management of those obstetric and neonatal complications that cannot always be predicted. In some of these hospitals physicians should also be competent to perform cesarean sections.

While these results do not support greater centralization of obstetric services in northern Ontario, neither do they mean that a regional program should not be developed. Such a program could bring beneficial changes by focusing on the improvement of services in units of all levels and on better communication, education and transportation.

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