Rural obstetrics: a 5-year prospective study of the outcomes of all pregnancies in a remote northern community

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Objective: To determine whether a small, isolated hospital that has no facilities to perform cesarean section and handles fewer than 50 deliveries annually can provide acceptably safe obstetric and perinatal care.
Design: Cohort study.
Setting: Southern region of the Queen Charlotte Islands, BC, served by a 21-bed hospital and medical clinic in Queen Charlotte City. The hospital and clinic are staffed by five family practitioners without local obstetric, pediatric, anesthetic or surgical support.
Patients: All women beyond 20 weeks' gestation who gave birth from Jan. 1, 1984, to Dec. 31, 1988; 33% were primiparous and 20% native. Of the 286 women 192 (67%) delivered locally, 33 (12%) were transferred after admission because of antepartum or intrapartum complications, and 61 (21%) delivered elsewhere by choice or on their physician's recommendation.
Outcome measures: Perinatal mortality rate and adverse perinatal outcome (death, birth weight of less than 2500 g, neonatal transfer or Apgar score of less than 7 at 5 minutes).
Main results: There were six perinatal deaths, for a perinatal mortality rate of 20.8 (95% confidence interval [CI] 4.4 to 37.2). The hospital-based rate of adverse perinatal outcome was 6.2% (12 of 193 newborns) (95% CI 2.8% to 9.6%).
Conclusions: The perinatal mortality rate is not a meaningful way to assess small populations; about 85 years of data would be required to decrease the 95% CIs from within 16 to within 4. The rate of adverse perinatal outcome in our study was consistent with the rate in other studies. Collaboration of small, rural hospitals is required to increase cohort size so that the correlation between the currently accepted standard, the perinatal mortality rate, and other outcome measures can be determined.

Objectif : Déterminer si un petit hôpital isolé qui n'a pas les installations nécessaires pour procéder à une césarienne et qui effectue moins de 50 accouchements par année peut offrir des soins obstétriques et périnataux d'une sécurité acceptable.
Conception : Étude de cohortes.
Contexte : Secteur sud des îles de la Reine Charlotte (C.-B.) desservi par un hôpital de 21 lits et une clinique médicale à Queen Charlotte City. L'hôpital et la clinique comptent cinq médecins de famille, mais aucun obstétricien, pédiatre, anesthésiste ou chirurgien local.
Patientes : Toutes les femmes ayant dépassé 20 semaines de grossesse qui ont accouché du 1er janvier 1984 au 31 décembre 1988; on y compte 33 % de primipares et 20 %

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d'autochtones. Parmi les 286 femmes, 192 (67 %) ont accouché dans la localité, 33 (12 %) ont été transférées après admission à cause de complications avant ou pendant l'accouchement et 61 (21 %) ont accouché ailleurs par choix ou sur la recommandation de leur médecin.

Mesures des résultats : Taux de mortalité périnatale et issue périnatale négative (mort, poids de naissance inférieur à 2 500 g, transfert néonatal ou indice d'Apgar inférieur à 7 à 5 minutes).

Principaux résultats : Il y a eu six décès périnataux, ce qui représente un taux de mortalité périnatale de 20,8 (intervalle de confiance [IC] de 95 % 4,4 à 37,2). Le taux hospitalier d'issue périnatale négative a atteint 6,2 % (12 sur 193 nouveau-nés) (IC de 95 % 2,8 % à 9,6 %).

Conclusions : Le taux de mortalité périnatale ne constitue pas une façon significative d'évaluer des populations restreintes; il faudrait environ 85 ans de données pour ramener l'IC à 95 % de moins de 16 à moins de 4. Le taux d'issues périnatales négatives établi par l'étude correspondait au taux révélé par d'autres études. La collaboration des petits hôpitaux ruraux s'impose si l'on veut augmenter la taille des cohortes afin de pouvoir établir le lien entre le taux de mortalité périnatale que l'on privilégie actuellement et d'autres mesures des résultats.

Can a small, isolated hospital that has no facilities to perform cesarean section and handles fewer than 50 deliveries a year provide acceptably safe obstetric and perinatal care? How can this be assessed? In 1985–86 there were 3745 deliveries in 126 Canadian hospital that each handled between 16 and 49 deliveries a year.[1] Most of the hospitals were small, rural and without the facilities to provide safe cesarean section.

Ryan[2] and Black and Gick[3] attempted to define the minimum services necessary for small hospitals to practise obstetrics. Ryan stated that level 1 units (small hospitals, usually in a rural setting and staffed by general practitioners) must be able to provide anesthesia and have the capability of allowing cesarean section to begin within 30 minutes after it has been deemed necessary. Black and Gick went further by stating that hospitals handling fewer than 100 deliveries per year do not have a sufficient caseload to be able to do safe cesarean sections and therefore should stop obstetric practice. Yet geographic and historical influences have led to maternity services in many small hospitals scattered across Canada's north. In 1987 Lessard and Kinloch[4] noted the disruption to family and community life from policies that discourage delivery in northern settlements.

The safety of obstetric care in level 1 hospitals has been examined in large population studies.[5,6] The perinatal mortality rate was used as the standard outcome measure. Small hospitals with limited facilities were found to provide safe perinatal care if backed up by a level 3 centre for high-risk pregnancies. In New Zealand birth-weight-specific perinatal mortality rates among neonates weighing 1500 to 2499 g or more than 2500 g were significantly lower in level 1 hospitals than in level 2 or 3 hospitals.[5] Black and Fyfe,[6] who subdivided hospitals in northern Ontario according to services provided, retrieved their data by place of residence rather than by hospital of delivery in order to assess the overall perinatal system, including referral patterns. They showed that populations served by small hospitals had perinatal loss rates similar to the rates in those served by larger secondary or tertiary care facilities, despite significantly lower rates of cesarean section and forceps extraction. These two studies have indicated that small hospitals operating within a regional referral system not only can provide a safe service but also seem to provide a better service to pregnant women at low risk.

The perinatal mortality rate is the number of deaths of fetuses (weighing more than 500 g) and neonates (weighing more than 500 g and less than 8 days old) per 1000 total births.[7] Although this rate has been the main outcome measure in assessing the safety of obstetric care, it needs large numbers of births to be meaningful. How can a small hospital with a limited number of births measure its safety? Perinatal morbidity, although a more frequent occurrence, is more difficult to define. Measurement of the Apgar score holds potential but suffers from a low degree of interrater reliability and a high degree of observer bias.[8] Lefevre, Williamson and Hector[9] defined adverse perinatal outcome as perinatal death, birth weight of less than 2500 g, an Apgar score of less than 7 at 5 minutes or newborn transfer to a secondary or tertiary care nursery. Franks and Eisenger[10] added any significant birth injury to the definition. Lemelin[11] suggested three other potentially useful measures of obstetric safety and quality of care in a small hospital: rate of antepartum or intrapartum referral to higher level facilities, rate of low-birth-weight infants delivered at the facility and rates of intervention.

We assessed whether the Queen Charlotte Islands General Hospital (QCIGH), a 21-bed hospital that has no facilities to perform cesarean section and handles fewer than 50 deliveries annually, is providing safe obstetric care to the population it serves.

Methods

The Queen Charlotte Islands form a remote, sparsely populated archipelago about 150 km off the northwest coast of British Columbia. There are two small hospitals on the islands; one is a 14-bed military unit at the north end, in Masset, and the other is 120 km to the south, in Queen Charlotte City (Fig. 1). Outpatient clinics and maternity services are offered in both locations. Deliveries are handled in the two hospitals, and the available interventions are the same. No other clinics are accessible except by plane or a 6-hour ferry ride. Our study population comprised all women beyond 20 weeks' gestation who lived on the Queen Charlotte Islands in an area south of a line drawn through Port Clements (a small village about midway between Masset and Queen Charlotte City). We included six women who did not live in the defined area but who travelled to Queen Charlotte City for prenatal care or delivery. The population served was estimated to be 3100.[12]

Community health care is administered by a nonprofit board, which hires physicians on a salaried basis. There is one full-time physician and four part-time physicians in Queen Charlotte City. The medical clinic is adjacent to the hospital, and the physicians share office space, staff and records. Three of the five physicians have each completed 3 to 6 months of additional postgraduate obstetric training, and four are certificants of the College of Family Physicians of Canada. All five physicians practise obstetrics and cover the emergency department. An obstetrician visits the community once every 3 months.

The lack of surgical and anesthetic expertise on the islands precludes delivery by means of cesarean section. Transfer time by small float plane to Prince Rupert, the nearest hospital with general surgical facilities, is 2 hours, daylight and weather permitting. The nearest centre with obstetricians and pediatricians is in Vancouver, transfer time being at least 4 hours by plane and accessible in all but the worst of weather.

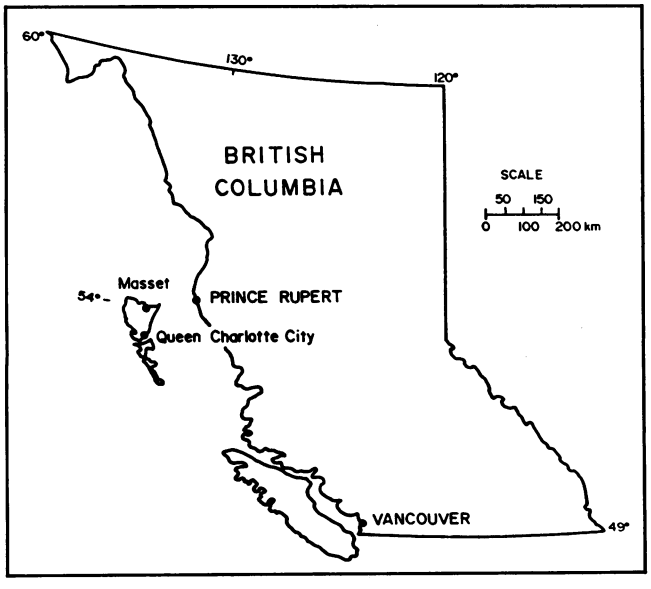

Fig. 1: Relation of Queen Charlotte City to referral centres, in Prince Rupert and Vancouver.

Two units of type O-negative blood are kept at the QCIGH at all times, and volunteer blood donors are called in when necessary. Laboratory and x-ray technicians are on call 24 hours a day. Ultrasonography is unavailable on the islands. Fetal well-being is followed during labour through intermittent auscultation. Labour and delivery take place in one room on an Adel birthing bed (model LD500; Adel Medical Inc., Portland, Ore.). Epidural blocks are unavailable. During labour support from family and friends is encouraged, and a noninterventionist but observant stance is taken. A second physician is called in for newborn resuscitation if problems are expected. Women are generally delivered by the physician who has been providing the prenatal care.

Study population

We prospectively collected obstetric data from the charts of all women attending the QCIGH and the Queen Charlotte City Medical Clinic who were beyond 20 weeks' gestation and gave birth between Jan. 1, 1984, and Dec. 31, 1988.

Two pregnant women residing in the catchment area who did not attend the hospital or clinic were identified and their data included retrospectively. A retrospective analysis of the residence of all women who gave birth in Masset from 1985 to 1988 (data were unavailable for 1984) was undertaken to decrease the likelihood that we had missed anyone who lived in the catchment area.

The type of data gathered was chosen on the basis of a preliminary retrospective audit of the hospital charts of maternal transfers from 1979 to 1983 and of women who gave birth at the hospital in 1982 and 1983. The preliminary data were tabulated and then reviewed by two consultant obstetricians familiar with the Queen Charlotte medical facility.

The women were divided into three groups: those who gave birth at the QCIGH (group 1), those who were transferred after admission to the QCIGH because of antepartum or intrapartum complications (group 2) and those who gave birth elsewhere by choice or on their physician's advice (group 3). The data collected for each group were as follows.

Group 1: Name, age, gravidity, parity, delivery date, gestational age at delivery, ultrasound and amniocentesis findings during pregnancy, length of first, second and third stages of labour, duration of

rupture of membranes, presence of meconium, fetal heart abnormalities during labour and delivery, use of synthetic oxytocin or artificial rupture of the membranes, medications during labour and delivery, episiotomy, forceps or vacuum extractor, degree of lacerations, postpartum hemorrhage, estimated amount of blood lost, transfusion, hemoglobin level on postpartum day 2, postpartum infection, neonate's Apgar scores, weight, sex, size for gestational age, feeding at discharge, perinatal morbidity and perinatal mortality, antenatal risk factors, obstetric history, and maternal and neonatal complications during and after delivery.

Group 2: Name, age, date of admission and delivery, gravidity, parity, gestational age at delivery, ultrasound and amniocentesis findings during pregnancy, spontaneous rupture of membranes before admission, length of first and second stages and duration of rupture of membranes before transfer, presence of meconium, fetal heart abnormalities, use of synthetic oxytocin or artificial rupture of the membranes, dilation of the cervix at transfer, attempted use of forceps or vacuum extraction before transfer, number of consultations and with whom, obstetric history, antenatal risk factors, transfer diagnosis, number of hours between admission and transfer, destination, method of delivery, neonate's weight and sex, perinatal mortality, and maternal and neonatal complications during and after delivery.

Group 3: Name, age, gravidity, parity, delivery date, gestational age at delivery, ultrasound and amniocentesis findings during pregnancy, obstetric history, antenatal risk factors, reason for planned delivery elsewhere, site of delivery, method of delivery, neonate's weight and sex, perinatal mortality, and maternal and neonatal complications during and after delivery.

Data were abstracted by two of us (S.C.W.G. and A.S.C.) from the standard British Columbia Labour and Delivery and Newborn records,[13,14] the progress notes of the physician and nurse and the standard British Columbia Prenatal Record.[15]

Prenatal risk was qualitatively assessed at the initial visit and updated at each prenatal visit thereafter. Clinic charts were used to follow up transfers and pregnancy outcomes of women who delivered elsewhere. Follow-up letters or telephone calls were undertaken if necessary.

The clinic nurse kept data on all women as they were seen. The files were cross-checked with the hospital records for accuracy. Interrater reliability was assessed by randomly selecting 11 charts and then reabstracting them.

We compared the characteristics of the native and non-native populations by χ^2 and Fisher's exact statistical tests of significance with the use of Epistat statistical software (copyright Tracy L. Gustafson, Richardson, Tex., 1986).

Results

During the study period there were 286 women beyond 20 weeks' gestation: 192 (67%) of them delivered locally (group 1), 33 (12%) were admitted to the QCIGH but were transferred because of antepartum or intrapartum complications (group 2), and 61 (21%) delivered elsewhere (group 3). Information on the method of delivery, the birth weight and the occurrence of perinatal death was known in all cases. The clinic nurse's lists were in agreement with the hospital records more than 99% of the time in identifying the women in groups 1 and 2. The interrater reliability was greater than 91% for 423 pieces of data from the 11 randomly selected charts.

The results were divided into two parts to allow

Table 1: Characteristics of six perinatal deaths in population of women on Queen Charlotte Islands, BC

Case no.	Weight, g	Gestational age, wk	Delivery site*	Cause of death	Maternal complications
1	1200	36	QCIGH	Congenital anomalies	None
2	560	23	Grace†	Prematurity	Premature rupture of membranes, infection
3	680	24.5	Grace†	Massive air embolism	Premature rupture of membranes, infection
4	880	25	Grace†	Prematurity	Vaginal bleeding
5	650	28	Grace‡	Placental transfusion syndrome	None
6	880	28	Grace‡	Placental transfusion syndrome	None

*QCIGH = Queen Charlotte Islands General Hospital, Queen Charlotte City, BC; Grace = Grace Maternity Hospital, Vancouver.
†Mother was transferred to and infant delivered at Grace Maternity Hospital.
‡Pregnancy managed at Grace Maternity Hospital from 21 to 28 weeks' gestation.

comparison with results of population-based and hospital-based studies. In the first section the results of the three groups were included and in the second section those of groups 1 and 2.

Population-based results

Of the 286 women in the three groups 94 (33%) were primiparous and 191 (67%) multiparous; parity was unknown in 1 case. The average age of the primiparous women was 24.1 years and the multiparous women 28.3 years. A total of 221 (77%) women were white, 56 (20%) Haida or other native and 9 (3%) Asian.

There were six perinatal deaths, for a rate of 20.8 (95% confidence interval [CI] 4.4 to 37.2) (Table 1). All six infants who died weighed less than 1500 g, and only one was born on the islands. Sixteen newborns weighed less than 2500 g (Table 2).

The rate of cesarean section was 8.7%, as compared with 15.5% in a population in northern Ontario served by hospitals whose size was similar to that of the QCIGH;[6] the rates for delivery by forceps were 9.5% and 10.0% respectively. In 1985–86 the cesarean section rate in Canada was 18.9% and in British Columbia 19.9%.[1] Spontaneous vaginal delivery occurred in 82% of the cases in our population.

There was no statistically significant difference between the native and non-native subjects in parity, risk assessment, site of delivery, number of cesarean sections or adverse perinatal outcome (Table 3). However, there was a tendency toward significance between these groups in the site of delivery (p = 0.129) and in the number of cesarean sections (p = 0.095).

Table 2: Distribution of low-birth-weight and very-low-birth-weight infants by study group

	Group; no. (and %) of infants		
Weight, g	1 (n = 193)	2 (n = 33)	3 (n = 62)
< 1500	3 (2)	3 (9)	3 (5)
1500–2499	3 (2)	4 (12)	1 (2)

Hospital-based results

Group 1: Of the 193 newborns (one set of twins) delivered at the QCIGH 12 had an adverse perinatal outcome, as defined by Lefevre and collaborators,[9] for a rate of 6.2% (95% CI 2.8% to 9.6%) (Table 4). Three were preterm infants transferred to a tertiary care facility within hours after birth: one was born at 29 weeks' gestation and weighed 1730 g, and the other two were previously identified twins who were born at 31 weeks' gestation and weighed 1080 and 1225 g respectively. The two women gave birth as a result of precipitous premature labour, and the infants went on to do well. Of the remaining 185 infants whose Apgar scores were recorded 4 had a score of 6 and 2 a score of 5 at 5 minutes. Two low-birth-weight infants were not identified in the preceding categories. There was one stillbirth, in an infant with congenital anomalies, probably trisomy 18.

There were no postpartum maternal transfers during the study period. Postpartum hemorrhage requiring transfusion occurred in 3% of the cases, all before 1986, when the criteria for transfusion changed. One of the women needed 4 units of blood, and the rest of them needed 2 units. Manual placental removal was necessary in 4% of the cases (after a third stage of labour lasting 60 minutes in general). Antibiotics were given to 9% of the women post partum, of whom one-third had endometritis.

The rates of analgesic use, augmentation, episiotomy and forceps use were generally low, as compared with the rates from other hospital-based studies (Table 5). The rate of spontaneous vaginal delivery in the QCIGH was 97%. In only one case was induction with synthetic oxytocin performed; the woman was multiparous and had prolonged rupture of the membranes and a favourable cervix. Of the women 36% were delivered with an intact perineum.

Table 3: Characteristics and outcome of native and non-native populations

	Population; no. (and %) of infants		
Variable	Native (n = 56)	Non-native (n = 230)	p value
Primiparous mother	20 (36)	70 (30)	0.760
High-risk pregnancy	8 (14)	45 (20)	0.463
Delivered in Queen Charlotte City	43 (77)	149 (65)	0.129
Delivered by cesarean section	2 (4)	23 (10)	0.095*
Adverse perinatal outcome	5 (9)	20 (9)	0.807

*Calculated by means of Fisher's exact test for significance.

Group 2: The antepartum or intrapartum transfer rate after admission to the QCIGH was 15% (33 of 225 women), as compared with 11% at the Gatineau Memorial Hospital,[11] a 31-bed hospital in Quebec, and 10.6% at the Indian Head Union Hospital,[16] a 24-bed hospital in Saskatchewan. Of the 33 women transferred 11 were in preterm labour or had premature rupture of the membranes. The remaining 22 were transferred after 37 weeks' gestation: 12 because of failure to progress during labour, 5 because of elevated blood pressure, 3 because of hemorrhage and 2 for induction because they were overdue. Six of the 12 women who failed to progress underwent cesarean section.

Three of the 33 neonates died (Table 1). Four infants had a birth weight of less than 2500 g: one weighed 2360 g at 35 weeks' gestation and had transient respiratory problems; the other three weighed 2280, 2200 and 1590 g respectively, and all did well. In one case a multigravid woman who had previously undergone cesarean section for cephalopelvic disproportion was scheduled to undergo a trial of labour under the care of the consultant obstetrician at the referral hospital. However, she

Table 4: Characteristics of infants with adverse perinatal outcome of women in group 1

Case no.	Sex	Weight, g	Gestational age, wk	Outcome
1	M	1200	36	Stillborn; multiple congenital anomalies, probably trisomy 18
2	M	1730	29	Precipitate premature labour and premature rupture of membranes despite use of isoxsuprine; transferred to tertiary care nursery; did well
3	F	1225	31	Previously recognized twin; premature rupture of membranes; Apgar scores 7 and 10 at 1 and 5 min; transferred to tertiary care nursery; did well
4	M	1080	31	Details the same as for case 3; Apgar scores 4 and 7 at 1 and 5 min
5	F	3325	40	Apgar scores 3, 6 and 8 at 1, 5 and 10 min; synthetic oxytocin used; oxygen therapy required because of umbilical cord around neck
6	M	3330	40	Apgar scores 4, 6 and 9 at 1, 5 and 10 min; second stage of labour lasted 2 h, with some decelerations; no meconium; oxygen therapy required
7	M	3890	42	Apgar scores 3, 5 and 9 at 1, 5 and 10 min; intrapartum analgesic (narcotic) used; transverse arrest; artificial rupture of membranes at 6 cm of cervical dilation; no meconium; endotracheal tube required briefly
8	M	3020	41	Apgar scores 4, 6 and 8 at 1, 5 and 10 min; analgesic (narcotic) used; artificial rupture of membranes at 9 cm of cervical dilation; meconium; late decelerations in second stage; endotracheal tube and cardiopulmonary resuscitation required briefly
9	M	3135	38	Apgar scores 2, 6 and 7 at 1, 5 and 10 min; precipitate breech delivery; Erb's palsy on left side, resolved at 1 mo
10	M	4150	41	Apgar scores 3 and 5 at 1 and 5 min; analgesic (narcotic) used; no meconium; endotracheal tube and suction required
11	M	2350	35	Apgar scores 6 and 8 at 1 and 5 min; oxygen therapy required
12	M	2180	37	Apgar scores 8 and 10 at 1 and 5 min; intrauterine growth retardation

went into labour at 39 weeks' gestation, just before she was to leave the islands, and because of a storm was unable to be transferred for 14.5 hours. Cesarean section was necessary, and the woman recovered without complications. The infant weighed 3340 g and has severe visual problems; the Apgar scores were 5, 5 and 8 at 1, 5 and 10 minutes respectively. The nature of the visual impairment and its relation, if any, to events surrounding the birth are unclear.

Three of the women were found to have endometritis, and one needed a transfusion for hemorrhage during cesarean section.

Discussion

The strength of our study is that it was population-based rather than hospital-based. This was possible because of the remote island location of the communities served. We made every effort to include all the pregnant women in the catchment area. It is very unlikely that in the small, close-knit communities served any woman could have had a baby without our knowledge.

A weakness of the study is that we were unable to determine the adverse perinatal outcome rate in groups 2 and 3 because the Apgar scores were not obtained in all cases. The occurrence of perinatal death or any other significant complication was included.

Are these results consistent with an acceptable standard of obstetric and perinatal care? Assuming that our perinatal mortality rate of 20.8 per 1000 births is accurate and using a formula described by Colton[18] 4913 deliveries would be needed to decrease our 95% CI from within 16 to within 4. At 57 deliveries a year it would take us 86 years to be able to speak with confidence of our perinatal mortality rate. When the cases of perinatal death are reviewed on an individual basis it is difficult to see any obvious errors of management.

If birth-weight-specific perinatal mortality rates among the infants weighing less than 1500 g are used our rate is 600 (95% CI 280 to 920). The rate during 1978–81 in New Zealand was 485.2 among infants of similar weight,[5] and in 1988 in British Columbia it was 350.[19] Our perinatal mortality rate among infants weighing more than 1500 g was 0. The perinatal mortality rate is clearly only a crude index of performance for a small hospital. Analysis of perinatal deaths on an individual basis with weight-specific criteria would be more meaningful.

The hospital-based rate of adverse perinatal outcome of 6.2% in group 1 seems to compare well with the rate of 4.4% among 6856 deliveries in a community hospital in upstate New York[10] and 7.4% among 635 pregnancies in a rural practice.[9] We chose to assign the adverse perinatal outcome to the newborn rather than to the pregnancy because our study sample contained one set of twins. Although this slightly increased our rate, from 5.7% to 6.2%, it seemed more accurate since the measures used refer to the newborn. Also, this would parallel the perinatal mortality rate, which is per 1000 births.

Lemelin[11] suggested that the number of low-birth-weight infants reflects the screening of pregnancies allowed to deliver in a small hospital. Of the elective deliveries undertaken at our hospital 2 (1%) of the 193 infants were unexpectedly between 1500 and 2500 g (Table 2).

Lemelin also suggested that transfer rates as a proportion of hospital admissions provide a way of comparing small rural hospitals. Although the Gatineau Memorial Hospital[11] and the Indian Head Union Hospital[16] were of a size comparable to that

Table 5: Rates of intervention by institution

Intervention	Study; rate, %			
	QCIGH (n = 192)	Lemelin[11] (n = 249)	Spooner et al[16] (n = 362)	Owen[17] (n = 10 588)
Analgesia				
Narcotic	16	20	NA	NA
Other	NA	NA	27	NA
Augmentation				
Artificial rupture of membranes	20	24	NA	12
Use of synthetic oxytocin	6	15	12	NA
Episiotomy	19	42	45	44–53
No episiotomy				
First-degree and second-degree tears	43	NA	28	NA
Third-degree and fourth-degree tears	3	NA	0.5	NA
Sutures	65	NA	74	NA
Forceps	2	9	16	6

of the QCIGH the decision to admit and transfer is influenced by site-specific geographic concerns that make it difficult to compare these rates meaningfully. A more useful comparison would perhaps be to look at the population-based ratio of the number of newborns at the local hospital to the number in the area serviced, a statistic that should not be too difficult to calculate and that would provide a firm denominator. The ratio in our study was 0.67 (193 of 288 newborns); this is comparable to the rate of 0.57 in hospitals in northern Ontario whose size is similar to that of the QCIGH[6] and 0.71 in level 1 hospitals in New Zealand.[5] The presentation of this rate would be a useful first step in the comparative analysis of obstetric data from level 1 hospitals.

The rates of intervention at our hospital were lower than those in other studies (Table 5). This reflects our cautious attitude toward intervening in labour unless necessary. Others[5,6,20-23] have observed the association of minimal intervention with good perinatal outcome in low-risk pregnancies.

Should a small, isolated hospital without the facilities to perform cesarean section offer obstetric care to pregnant women at low risk? At least one of the cases we have described is cause for concern: the woman with a history of cesarean section who went into labour before leaving the islands. One could argue that inclement weather and poor planning were contributing factors in this case. Otherwise, our results seem to suggest a reasonable standard of practice and reasonable outcomes. None of the perinatal deaths appeared to be related to the lack of capability to perform cesarean section.

It is difficult to assess the safety of obstetric practice in a small community hospital. The perinatal mortality rate only crudely reflects the experience of the small population and, when based on hospital data alone, will not be meaningful unless markedly elevated. Other measures that show the most promise in evaluating a small hospital's experience are adverse perinatal outcome, rates of elective deliveries of low-birth-weight infants and the ratio of the number of newborns delivered to the total number of newborns in the area served. Cases of perinatal death and significant morbidity should be reviewed on an individual basis with the use of birth-weight-specific criteria.

Collaboration of small, rural hospitals is required to increase cohort size so that the correlation between the outcome measures suggested and the currently accepted standard, the perinatal mortality rate, can be accurately determined.

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