

Obstetric maternal outcomes at Bella Coola General Hospital: 1940 to 2001

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Objective: To describe obstetric procedures (episiotomy, forceps, vacuum extraction, caesarean section) and maternal outcomes for patients who gave birth in an isolated, rural hospital.
Design: A retrospective cohort study.
Study population: Women beyond 20 weeks' gestation who gave birth between Mar. 7, 1940, and June 9, 2001, inclusive, at the Bella Coola General Hospital (BCGH).
Main outcome measures: Data collected included maternal age, date of delivery, mode of delivery (vaginal delivery v. cesarean section), whether an episiotomy was performed or not, if forceps or vacuum extraction were used, whether analgesia, sedation or anesthesia was used, and maternal mortality.
Results: There were 2373 deliveries, including 12 sets of twins. There were no maternal mortalities. Cesarean sections were not routinely performed until the 1970s. Since then, there has been an increase in cesarean section rates to 11% of all deliveries in the 1990s. In the 1940s 28% of deliveries involved an episiotomy. This increased to 47% in the 1970s and was followed by a sharp decline to 4% in the 1990s. There was an increase, followed by a more gradual decrease in the use of forceps, and there was a recent increase in the use of vacuum extraction. The changes in procedure rates appear to reflect best practice guidelines of the times. In the case of episiotomies, the data suggest rural physicians are capable of rapid incorporation of recent recommendations. Rates for all procedures tended to be lower than those reported elsewhere in Canada and the United States. Narcotics, sedatives, inhalation agents and regional anesthetics were used to relieve the pain of labour and delivery throughout the study period.
Conclusions: Women giving birth in the low technology environment of the BCGH experienced relatively low obstetric procedural rates with excellent maternal outcomes.

Objectif : Décrire les interventions en obstétrique (épisiotomie, forceps, succion, césarienne) et les résultats pour les patientes qui accouchent dans un hôpital isolé en milieu rural.
Conception : Étude de cohorte rétrospective.
Population étudiée : Des femmes enceintes de plus de 20 semaines qui ont accouché entre le 7 mars 1940 et le 9 juin 2001 inclusivement au Bella Coola General Hospital (BCGH).
Principales mesures de résultats : Les données recueillies comprennent l'âge de la mère, la date et le genre d'accouchement (vaginal ou par césarienne) et précisent s'il y a eu ou non recours à l'épisiotomie, aux forceps, à la succion, ainsi qu'à l'analgésie, la sédation ou l'anesthésie, et si la mère est décédée.
Résultats : Il y a eu 2373 accouchements dont 12 paires de jumeaux. Il n'y a eu aucune mortalité maternelle. La césarienne n'était pas pratiquée de routine avant les années 1970. Le taux de césariennes atteint ensuite 11 % de tous les accouchements pendant les années 1990. Au cours des années 1940, 28 % des accouchements comprennent une épisiotomie. Le taux grimpe à 47 % dans les années 1970 et chute à 4 % dans les

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années 1990. Le recours aux forceps augmente pour diminuer ensuite plus graduellement, et la succion est à la hausse récemment. L'évolution des taux d'intervention semble refléter les lignes directrices sur les pratiques exemplaires de l'époque. Dans le cas de l'épisiotomie, les données laissent entendre que les médecins en milieu rural peuvent rapidement intégrer les recommandations récentes. Les taux de toutes les interventions avaient tendance à être inférieurs à ceux déclarés ailleurs au Canada et aux États-Unis. Au cours de la période à l'étude, des stupéfiants, des sédatifs, des agents inhalés et l'anesthésie locale ont servi à soulager la douleur pendant le travail et la naissance.
Conclusion : L'étude révèle des taux d'intervention en obstétrique relativement faibles et d'excellents résultats pour les femmes qui accouchent à l'hôpital BCGH à faible technologie.

Introduction

The practice of obstetrics in rural Canadian communities is undergoing profound change.[1,2] Fewer family doctors starting their practices are taking on obstetrics, and the average age of physicians who do practise obstetrics is close to the age of retirement.[2] Some remote and rural communities now have no local access to maternity care services.[3] Rural women are affected particularly hard by losses in local obstetric services because they must travel and be separated from family and friends when they give birth.[4–6]

Loss of maternity services affects not only women giving birth but the health and sustainability of rural communities. Communities without maternity services have difficulty attracting families, which in turn limits economic development and economic opportunities.[7,8]

Specific reasons given by physicians for discontinuing obstetrical services are many and varied. Some physicians cite family/social reasons; that is, delivering babies interfers with family time and social occasions. Others state that delivering babies is just too stressful. Some state that they quit obstetrics because having to leave the office during office hours to deliver a baby disrupts their practice too much. Inadequate training, medicolegal concerns, inadequate remuneration, lack of confidence, lack of professional support, and the cost of malpractice insurance are other reasons for giving up obstetrics. Centralization of health care, which in turn decreases certain services to rural areas such as locally available obstetricians, cesarean section (C-section) capability, general surgery capability, ultrasonography capacity and epidural anesthetics, are also believed to be contributing factors.[2,6,9–14]

There is a widespread belief among rural physicians that competency in obstetrics is related to the number of babies delivered per year, and is also related to the mastery and necessary continuous updating of advanced maternity skills (e.g., forceps delivery, manual extraction of placenta, repair of severe vaginal lacerations, and the administration of anesthetic agents).[11,15,16] Since these advanced maternity skills are used so infrequently, it is easy to see how rural physicians make the decision to refer obstetric deliveries to secondary and tertiary care facilities.

Intuitively it makes sense that being managed by a highly skilled obstetrics team will result in lower maternal mortality and morbidity. However, studies suggest "low risk" women living in rural communities have just as good outcomes if they choose to deliver their babies in local primary care facilities, as opposed to delivering them in a rural primary care facility. In fact, when maternity care is not available locally and women must travel for that care, negative outcomes are more common.[10,17–21] These women tend to have higher rates of complicated deliveries, higher rates of prematurity, and a greater need for neonatal care as compared to women who deliver in their local community.

Admittedly, the limitations of studies published so far are their small sample sizes and the short time periods they cover. Hidden away in a safe located in the Bella Coola General Hospital (BCGH), Bella Coola, British Columbia (BC), were case room record books that document the details surrounding births that took place between Mar. 7, 1940, and June 9, 2001, inclusive, except for the period from Mar. 22, 1967, through to Jan. 7, 1969, inclusive. (There was no evident explanation for the missing data.) As far as we can tell, the data from these case room record books represent one of the longest rural hospital data sets available on the topic of obstetrical outcomes and procedural usage rates. This paper reviews and summarizes the information in this birth registry in an attempt to answer the following questions.

1. What procedures were being done by the rural physicians over this time period?
2. How do BCGH's obstetrical outcomes and procedural usage rates over time compare to provincial, national and international trends?

Methodology

This research project was carried out in a participatory fashion and followed the recommendations outlined in the Society of Obstetricians and Gynaecologists of Canada (SOGC) 2001 policy statement "A Guide for Health Professionals Working with Aboriginal Peoples."[22–24] Prior to collecting data we obtained letters of support from the Nuxalk Band Council, the Bella Coola Transitional Health Authority and the Central Coast Regional District for a comprehensive study on a broad range of determinants of health for people living in the Bella Coola Valley. Ethics approval to collect these data was then obtained from research ethics committees located at both the University of British Columbia and the University of Northern British Columbia. The results and the manuscript were reviewed and approved for publication by both Nuxalk Health professionals and health professionals from the United Church Health Services, which owns and operates BCGH.

Bella Coola Valley is located in the central coast region of BC (Fig. 1). A detailed geographic description of the Valley appears in the accompanying Original Article[25] on page 22 of this issue. The isolation of this region is such that almost everyone who lives in the Bella Coola Valley has either a clinic chart or emergency room record. This makes the Valley an ideal region in which to study population-based issues. Details of the medical services available in this region have previously been reported.[26,27] According to the 2001 Census 2289 people live in the Bella Coola Valley and at least 40% of these people are of Aboriginal descent.[28,29] Bella Coola Valley is part of the traditional territory of the Nuxalk Nation, a tribe of Salish-speaking Coastal Indians.[30–33]

The study population consisted of Aboriginal and non-Aboriginal women beyond 20 weeks' gestation who delivered at the BCGH between Mar. 7, 1940, and June 9, 2001, inclusive (except for the aforementioned missing period), according to hospital labour and delivery case room books. Information collected included maternal age, ethnicity, maternal mortality, analgesia, anesthesia, sedation, episiotomy, forceps and vacuum delivery, and C-sections.

In Canada, 3 groups of Aboriginal people are recognized: First Nations (formerly referred to as Indians), Métis and Inuit.[34] First Nations people can, in turn, be separated into Status Indian and non-Status Indian populations. Status Indians are First Nations people who have registered and are entitled to receive provisions outlined by the *Indian Act*. An estimated 3.6% of the entire BC population is Aboriginal.

Information used to determine Aboriginal status of Bella Coola Valley women came from multiple sources: 1) 1920, 1979, 1989 and 2001 Nuxalk Band lists; 2) access to birth and death vital statistics information for the Nuxalk Band members back to the 1920s; and 3) consultation with Nuxalk elders (a comprehensive genealogy of the Nuxalk people was constructed in the 1990s). There were Aboriginal people living in the Bella Coola Valley who were not associated with Nuxalk people. These people were identified from a review of their clinic charts, from their response to a survey question asking about Aboriginal status, or by asking directly whether they had Aboriginal ancestry. The lead author used this information to assign Aboriginal status to each woman. A long-time resident and medical clinic staff person then reviewed and verified or queried whether Aboriginal status assigned to each woman was correct. There were only a few alterations made after consultation with the medical clinic staff person.

The data were entered into an electronic Excel



Fig. 1. Detailed map of the Bella Coola Valley.

spreadsheet and later transferred to a statistical program (SPSS) for statistical analyses, summary and graphing.[35] Differences in the outcomes were evaluated using Pearson's chi-square with a significance level of $p \leq 0.05$ for each outcome measure.[36]

Results

There were 2373 deliveries between Mar. 7, 1940, and June 9, 2001, that were recorded in the BCGH labour and delivery case room books. This included 12 twin deliveries. Aboriginal women accounted for 47% of the deliveries. There was a steady increase in births until the early 1960s and then a decline throughout the '60s and '70s, with another increase in the early '80s, followed by a gradual decline thereafter. The years with the highest birth rates (> 60/yr) were 1960, 1963, 1983 and 1992. The years with the lowest rates (< 30/yr) were 1945, 1971 and 1995.

Table 1. Analgesia given to 2361 women in labour at Bella Coola General Hospital during the study period, 1940–2001

Analgesia	No. of women who received this agent	Time period
Inhalation agents		
Chloroform	246	1940–1953
Ether	413	1940–1953
Trilene	215	1956–1977
Cyclopropane	34	1959–1964
Nitrous oxide	69	1958–1981
Entonox	145	1984–2001
Narcotic		
Heroin	24	1940–1945
Morphine	36	1941–1961
Codeine	13	1942–1967
Demerol	869	1946–2001
Sedatives		
Benzodizepines	5	1960–1992
Sodium amytal	206	1940–1957
Nembutol	95	1941–1955
Seconal	216	1946–1964
Pentothal	22	1959–1964

There were no reported maternal deaths in the BCGH during the recorded study period. Narcotics, sedatives, inhalation agents and regional anesthetics were all used during labour and delivery. A descriptive summary of the inhalation agents, narcotics, and sedatives used is presented in Table 1. The use of regional anesthetics during the study period is summarized in Table 2.

The number of recorded obstetric procedures (episiotomy, forceps, vacuum delivery, C-section) performed is shown in Table 3.

Episiotomies

The data show a gradually increasing episiotomy rate into the 1970s (47%), after which it dropped to < 5% in the 1990s (Table 3).

Operative deliveries (forceps / vacuum extraction)

BCGH's recorded forceps and vacuum extraction rates indicate a reduction in the rate of forceps use from the 1960s to the 1980s, with a marked decrease from the '80s to the '90s. Vacuum extraction deliveries were not used in BCGH prior to the 1980s. Operative deliveries prior to that time denote the exclusive use of forceps (Table 3).

Cesarean sections

Up until the 1970s there was only one C-section done in the BCGH according to the data available to us. It was an emergency C-section done in 1959 because the patient was hemorrhaging from a ruptured uterus. From the 1970s onward there has been a gradual rise in the rate of C-sections (Table 3). Reasons for the increase are summarized in Table 4; they include failure to progress, repeat C-sections, breech delivery and fetal distress.

Statistic analyses

Pearson's chi-squared statistical analyses reveals

Table 2. Regional anesthetics given during the study period, 1940 to 2001

Procedures	Decade						Total
	1940s	1950s	1960s	1970s	1980s	1990s	
Spinal anesthesia	0	2	0	6	0	24	32
Pudendal nerve block	0	4	9	17	21	2	53
Epidural anesthesia	0	0	12	19	88	55	174
Cesarean section	0	1	0	13	42	44	100
Regional + C-section	0	0	0	8	39	39	86

that the likelihood of any of the interventions — episiotomy, operative delivery (forceps and vacuum extraction), C-section — being used varied significantly with the decade of birth ($p < 0.05$).

Discussion

With Canada's vast geographic area and large rural base there is an obvious need for rural obstetrical care. Studies report better labour and delivery outcomes if "low risk" rural woman give birth in their own community surrounded by family and friends. The Joint Position Paper of the SOGC, the Society of Rural Physicians of Canada (SRPC) and the College of Family Physicians of Canada (CFPC) states that maternity care should be provided as close as possible to the rural patient's home location, within the limits of safe practice, regardless of on-site C-section support.[10,11]

The BCGH is located in the isolated, rural, remote community of Bella Coola, and women have been delivering their babies there since the first hospital was built in 1908.[27,32] The data described in this paper cover a 60-year time period, from 1940 to 2001, and the results support the aforementioned Joint Position Paper of the SOGC, SRPC and CFPC.

There were no reported maternal deaths in the BCGH during the recorded study period. Maternal mortality rate (MMR) can be defined as the number of maternal deaths due to delivery and complications of pregnancy, childbirth and the puerperium, per 10 000 live births.[9] MMRs have decreased throughout the decades. The MMR was 31/10 000 live births in BC compared with 40/10 000 in Canada as a whole for 1940.[37] Current MMRs in Canada are in the order of 0.3/ to 0.5/10 000.

Data from the BCGH obstetric case room books reveal that women have been receiving narcotics, sedatives, inhalation anesthetics and regional anesthetics since the 1940s. The specific agents used have changed over the years, but the broad category of analgesic agents has not — for example, demerol is given today instead of heroin, entonox gas instead of ether gas, and benzodiazepines are given instead of barbiturates.[38]

A review of the literature suggests wide variations in use of pain management in Canada in the 1980s. In a study of anesthesia availability in cities across Canada, epidural anesthesia was unavailable in Edmonton, whereas in Toronto the rate of use was 58.7%.[39] Epidural anesthesia was offered routinely in BCGH during the 1980s, but this practice may not be representative of other rural community hospitals. The literature suggests that the use of epidural anesthesia in rural and remote area hospitals is rather low and may be related to fewer deliv-

Table 3. Obstetric procedure usage rates during the study period, 1940 to 2001

	Decade						
BCGH	1940s	1950s	1960s	1970s	1980s	1990s	Overall
No. of women	251	443	425	368	475	399	2361
No. of births	253	447	426	370	478	399	2373
Episiotomy, %	28	33	36	47	35	4	31
Operative delivery, %							
Forceps	7	6	8	10	9	2.5	7
Vacuum	0	0	0	0	7	9	3
Forceps + Vacuum	7	6	8	10	16	12	10
Cesarean section, %	0	0.2	0	4	9	11	4

BCGH = Bella Coola General Hospital

Table 4. Reasons for cesarean section, per decade

	Decade, no. of women						
Reason	1940s	1950s	1960s	1970s	1980s	1990s	Total
Failure to progress	0	0	0	8	14	24	46
Breech delivery	0	0	0	3	7	7	17
Repeat C-section	0	0	0	0	9	10	19
Fetal distress	0	0	0	0	3	5	8
Miscellaneous	0	1	0	0	6	1	8
No information in records	0	0	0	2	3	1	6

eries, and fewer personnel resources to perform the procedure.[40]

Episiotomies

Episiotomies were introduced in the 18th century with the intent of improving maternal outcomes.[41] In the 1920s the episiotomy was introduced as a routine procedure in the belief that it would shorten the second stage of labour, lower perinatal mortality and morbidity, reduce severity of perineal tears, improve sexual function, and reduce the possibility of urine and fecal incontinence.[41–44] The routine use of episiotomies was introduced without strong scientific evidence of its benefits.

Recent studies indicate the use of episiotomies may result in the following: 1) a decrease in muscle strength of vaginal muscles; 2) slower wound healing; 3) more pain during sexual intercourse; and 4) higher rates of urinary and fecal incontinence. The only North American randomized controlled trial of episiotomy was conducted and published in Canada. It showed that midline episiotomy caused the very trauma that it was supposed to prevent.[45] Third- or 4th-degree tears took place in the presence of episiotomy. Moreover, the physicians who employed it routinely were responsible for most of the severe trauma, with 3rd- and 4th-degree tear rates reaching 20% in the first births.[45–47] As a result of these studies, and as the result of an initial review of the literature in 1983 illustrating the disadvantages and lack of advantages of episiotomies, there has been a noticeable decline in prevalence of episiotomies in Canada.[33,48,49] The figures from the 2003 Canadian Perinatal Surveillance System (CPSS) show how the Canadian episiotomy rate has declined — from 49% in 1991/1992 fiscal year to 24% in 1999/2000.[49] An earlier Canadian study revealed that the episiotomy rate declined from 66.8% in 1981/1982 to 37.7 % of all women giving birth vaginally in 1993/1994.[48] The World Health Organization (WHO) recognizes the reasons for performing an episiotomy but also recognizes that episiotomies are frequently used inappropriately.[50] WHO recommends an overall episiotomy rate of around 10% because of the evidence suggesting that liberal use of episiotomies causes more harm than good. Restrictive use of episiotomies is seen as a positive initiative in relation to evidence-based recommendations.[48] Episiotomy rates at BCGH seem to follow best practice recommendations; its rate of less than 5% in the 1990s is significantly lower than other provincial, national and international rates.

Forceps

Trends in forceps delivery rates in BCGH reflect Canadian and international studies that report decreases in forceps usage since the 1970s, along with increases in vacuum extraction rates.[10,51–53] BCGH's rate of the use of forceps, when compared to BC and Canadian data, indicates that BCGH has a rate that falls far below the national and provincial averages for both the 1980s and the 1990s. Reported forceps usage rates in Canada range from 6.5% to 21%.[9,49] In BC, forceps delivery declined from 13% in 1987 to 7.4% in 1995, and use of vacuum devices increased from 0.8% in 1987 to 4.9% in 1995.[54]

Cesarean section

In some ways, the C-section has become an icon of all the medical advances made in obstetrics. Today, C-sections are used as both a medical intervention and a mode of choice for women who prefer it as an alternative to vaginal birth. Worldwide trends illustrate marked differences in C-section rates. Among the developed countries, the US and Canada have relatively high C-section rates (19%–23%).[49,55] In contrast, some Eastern European (e.g., former Czechoslovakia and Hungary), some Western European (e.g., the Netherlands), some Scandinavian countries (e.g., Iceland and Sweden) and Japan report relatively low rates of C-sections (5%–10%).[56,57] According to US statistics, the C-section is now the most common major operation performed in the US, with rates of 22.9% and 26.1% reported for the years 2000 and 2002, respectively.[58] In comparison, BCGH has C-section rates that are lower than provincial, national and international rates.[59,60] The WHO recommends a C-section rate of 10%–15%, which is exactly the rate reported for BCGH.

Early Canadian data from the '60s, '70s and '80s show an increasing C-section trend. In Canada the rate increased from 4.8/100 in 1968 to 12.1/100 in 1977.[54,60] Figures from the 2003 CPSS reveal that Canada's C-section delivery rate increased from 18% in the 1991/1992 fiscal year to 21% in 1999/2000.[49] As with other hospitals around the world, the BCGH data show there has been gradual rise in the rate of C-sections since the 1970s — from 0% to < 15%. Klein concludes that all studies indicate a rising C-section rate in Canada and notes this rising rate is not associated with improved fetal health.[56]

The indications for C-sections are vast. One

account[61] states that a C-section is indicated whenever a practitioner makes the judgement that "the risk of vaginal delivery exceeds the risk of the operation or that the mother's perception is that it does." The main indications for C-sections in Canada and the US are 1) previous C-section, 2) dystocia, and 3) fetal distress.[62,63] At BCGH the main indications for C-section are dystocia, previous C-section, breech and fetal distress.

Limitations

The data presented in this paper provide detailed insights into the practice of rural obstetrics in one rural hospital over a 60-year period. As with most data sets, it is not perfect. First of all, the study population size of 2373 deliveries may not be large enough to capture significant differences involving rarely occurring events such as maternal mortality; that is, certain variables studied are at risk of suffering a Type II statistical error — false-negative finding. MMRs for Canadian women are presently in the order of 1/10 000 births. We do believe the population studied was large enough, however, for variables such as episiotomy and C-section rates.

It is difficult to comment on the accuracy of the data entered into the delivery case room books. One would suspect that events like C-section, twin delivery, maternal death or stillbirth would almost always be accurately reported. Perhaps things like the occasional vacuum extraction or forceps delivery would be missed, but we assume most were entered accurately. The case room book also contained notes referring to morbidities such as postpartum hemorrhage, dystocia, prolonged labour, but we chose not to report on this information because of the greater likelihood this kind of data was prone to greater inter-observer variability.

Data were missing for the time period Mar. 22, 1967, through to Jan. 7, 1969, inclusive, so it is possible that we missed maternal mortalities during this time period. It is also possible that there were deaths not reported in the case room books. However, we polled the collective residents of 14 long-term Bella Coola Valley residents who were young adults in the 1940s, as well as 4 nurses and 1 doctor who worked in the Valley in the '50s and '60s. None of these people were aware of any women who died while giving birth at BCGH during our study period. People recalled a woman who died giving birth in 1906; and several people mentioned the deaths prior to 1940 of 2 women, who each died several days after giving birth, from what sounded like toxemia. Although the scientific validity of polling collective memories of a community is obviously suspect, it was still reassuring to us that none of the long-term residents recalled a maternal death during the study period.

Another limitation of the data relates to the fact that since about the late 1970s an increasing number of women have been choosing to deliver their babies out of the Valley. Local residents and health professionals who worked in Bella Coola Valley during the '50s, '60s and '70s state that very few women went out to deliver their babies prior to the start of the 1980s. The Bella Coola airstrip was paved and extended in 1977, and this allowed for medical evacuations by provincial ambulance jet. We believe that the development of a rapid medical evacuation system is an important factor in more and more women being transferred elsewhere to deliver, and more and more women being told that they should deliver elsewhere because of the possibility there would be no C-section coverage during the time of their delivery. Lynch and colleagues[64] reviewed obstetric outcome data obtained from BC Vital Statistics for women who listed the Bella Coola Valley as their home residence. Obstetric outcomes for women who gave birth at the BCGH were compared to outcomes reported for women who delivered elsewhere over the time period Jan. 1, 1986, to Dec. 31, 2000.[64] In the early 1980s over 80% of women were delivering locally, but over time this number has fallen to less than 60%. More of the women who delivered elsewhere had a C-section (31% v. 12%).[64]

Statistical analyses revealed no significant differences in obstetrical outcomes between Aboriginal and non-Aboriginal women. Lastly, the data reported here were for only one rural, remote, hospital and it is not clear how applicable these results are to other rural, remote hospitals. Perhaps people working in other rural hospitals could take a look in their old safes to see if they too, have similar obstetric data sets, which could also be summarized and compared to our results.

Conclusion

The data presented here support the position that rural hospitals such as the BCGH have been offering, and continue to offer, relatively safe obstetric services to local residents.[65] The absence of immediate specialist backup and advanced technology support has not resulted in an obvious lowering of maternity or obstetrical care. Trends in maternal

mortality, as well as episiotomy, forceps, vacuum extraction, and C-section rates mirror those recorded for BC, Canada and the US. Episiotomy, forceps, and C-section rates were, however, lower than the rates reported for BC, Canada and the US — suggesting that Bella Coola Valley physicians had a low interventionist philosophy.

Competing interests: None declared.

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References

1. Hutten-Czapski P. Decline of obstetrical services in northern Ontario. *Can J Rural Med* 1999;4(2):72-6.
2. Levitt C, Kaczorowski J. Provision of intrapartum care by GP/FPs in Canada: an update. *CMAJ* 1999;160(6):815-6.
3. Johnson D. Low-volume obstetrics: characteristics of family physicians' practices in Alberta. *Can Fam Physician* 2002;48:1208-15.
4. Society of Obstetricians and Gynaecologists of Canada. Obstetrical crisis in Canada [position statement]. *J Soc Obstet Gynaecol Can* 1996;18:1161-8.
5. Klein M, Reynolds JL, Boucher F, Malus M, Rosenberg E. Obstetrical practice and training in Canadian family medicine: conserving an endangered species. *Can Fam Physician* 1984;30:2093-9.
6. Buckle D. Obstetrical practice after a family medicine residency. *Can Fam Physician* 1994;40:261-8.
7. Klein M, Chrstilaw J, Johnston S. Loss of maternity care: the cascade of unforeseen dangers. *Can J Rural Med* 2002;7(2):120-1.
8. Klein M, Johnston S, Chistilaw J, Carty E. Mothers, babies and communities: centralizing maternity care exposes mothers and babies to complications and endangers community sustainability. *Can Fam Physician* 2002;48:1177-9.
9. Obstetrics '87: A report of the Canadian Medical Association on obstetrical care in Canada. *CMAJ* 1987;Suppl:9-26.
10. Iglesias S, Grzybowski SCW, Klein MC, Gagné GP, Lalonde A. Rural obstetrics. Joint position paper on rural maternity care. *Can J Rural Med* 1998;3(2):75-80. Also available in *Can Fam Physician* 1998;44:831-6 and *J Soc Obstet Gynaecol Can* 1998;20(4):393-8.
11. Hutten-Czapski P, Iglesias S. Position paper on training for family practitioners in cesarean section and other advanced maternity care skills. Working draft, 1998 Oct 17. Available at: www.srpc.ca/library-docs/cxtrainingdraft.html (accessed 2004 Sep 14).
12. Shapiro J. Satisfaction with obstetric care:patient survey in a family practice shared-call group. *Can Fam Physician* 1999;45:651-7.
13. Rourke J. Trends in small hospital obstetric services in Ontario. *Can Fam Physician* 1998;44:2117-24.
14. Klein MC, Kelly A, Spence A, Kaczorowski J, Grzybowski S. In for the long haul: Why do family physicians plan to continue or discontinue intrapartum maternity care? *Can Fam Physician* 2002;48:1216-22.
15. Klein MC, Spence A, Kaczorowski J, Kelly A, Grzybowski S. Does delivery volume of family physicians predict maternal and newborn putcome? *CMAJ* 2002;166(10):1257-63.
16. SOGC Clinical Practice Guidelines for Obstetrics. Policy statement no. 24: Number of deliveries to maintain competence. Ottawa (ON): Society of Obstetricians and Gynaecologists of Canada; 1996 Nov.
17. Nesbitt TS, Connell FA, Hart LG, Rosenblatt RA. Access to obstetric care in rural areas: effect on birth outcomes. *Am J Public Health* 1990;80(7):814-8.
18. Nesbitt TS. Rural maternity care: New models to access. *Birth* 1996; 23(3):161-5.
19. Deutchman M. Cesarean delivery and hospitals: size matters. *J Fam Pract* 2001;50(3):224-5.
20. Black DP, Fyfe IM. The safety of obstetric services in small communities in Northern Ontario. *CMAJ* 1984;130:571-6.
21. Larimore WL, Davis A. Relation of infant mortality to the availability of maternity care in rural Florida. *J Am Board Fam Pract* 1995;8:392-9.
22. Smylie J; for the Aboriginal Health Issues Committee. A guide for health professionals working with Aboriginal peoples: health issues affecting aboriginal peoples [policy statement]. *J Soc Obstet Gynaecol Can* 2001;100:54-68.
23. Macaulay AC, Gibson N, Freeman W, Commanda L, McCabe M, Robbins C, et al. Participatory research maximizes community and lay involvement. *BMJ* 1999;319:774-8.
24. Cave AJ, Ramsden VR. Hypothesis: the research page. Participatory action research. *Can Fam Physician* 2002;48:1671-2.
25. Thommasen HV, Klein MC, Mackenzie T, Grzybowski S. Perinatal outcomes at Bella Coola General Hospital: 1941 to 2001. *Can J Rural Med* 2005;10(1):22-8.
26. Bella Coola: A closer look. Medical and dental. Available at: www.centralcoastbc.com/bellacoola/closerlook.asp (accessed 2004 Sept 21).
27. Thommasen HV, Newbery P, Watt WD. Medical history of Central Coast of British Columbia. *BC Med J* 1999;41(9):464-70.
28. BC Stats. P.E.O.P.L.E. 27. BC Ministry of Management Services. PO Box 9410, Stn Prov Govt Victoria BC V8W 9V1.
29. British Columbia Vital Statistics Agency. 2001 British Columbia census. Victoria (BC): Govt of British Columbia. 2003.
30. Kennedy DID, Bouchard RT. Bella Coola Indians. In:Suttles W, editor. *Handbook of North American Indians*. Washington: Smithsonian Institute; 1990. p. 323-39.
31. McIlwraith TF. The Bella Coola Indians. Toronto (ON): University of Toronto Press, 1992.
32. Thommasen HV. Prehistoric medicine on BC's Central Coast. *BC Med J* 1999;41(7):343-6.
33. Acheson S. Culture, contact, demography and health among the Aboriginal peoples of British Columbia. Stephenson PH, Elliott SJ, Foster LT, Harris J, editors. In: *A persistent spirit: towards understanding aboriginal health in British Columbia*. Canadian Western Geographical Series, Vol 31. University of Victoria, Victoria (BC): Western Geographical Press; 1995. p. 1-42.
34. British Columbia Provincial Health Officer. *A report on the health of British Columbians: provincial health officer's annual report 2001*. Feature report: The health and well-being of Aboriginal people in British Columbia. Victoria (BC): Ministry of Health and Ministry Responsible for Seniors; 2002.
35. Harvey G. *Excel for dummies*. 2nd ed. Foster City (CA): IDG Books; 1994. p. 366.
36. Snedecor GW, Cochran WG. *Statistical methods*. 7th ed. Ames (A): Iowa State University Press; 1980.
37. Strong-Boag V, McPherson K. The confinement of women: childbirth and hospitalization in Vancouver, 1919–1939. *BC Studies* 1986;69-70:142-74.
38. Caton D, Froiioh M, Euliano T. Anesthesia for childbirth: controversy and change. *Am J Obstet Gynecology* 2002;186(5 suppl Nature):S25-30.
39. Radomsky N. Family practice obstetrics in a community hospital. *Can Fam Physician* 1995;41:617-24.
40. Stamer U, Grond S, Schneck H, Wulf H. Surveys on the use of regional anaesthesia in obstetrics. *Curr Opinion Anaesthesiol* 1999;12 (5):565-71.

41. Lede R, Belizan J, Caroll G. Is routine use of episiotomy justified? *Am J Obstet Gynecol* 1996;174(5).

42. Reynolds L. Reducing the frequency of episiotomies through a continuous quality improvement program. *CMAJ* 1995;153(3):275-82.

43. Klein MC, Gauthier RJ, Jorgensen SH, Robbins JM, Kaczorowski J, Johnson B, et al. Does episiotomy prevent perineal trauma and pelvic floor relaxation? [erratum appears in *Online J Curr Clin Trials* 1992;Sept12:Doc No 20]. *Online J Curr Clin Trials* 1992;July 1:Doc No 10.

44. Klein M, Gauthier R, Robbins J, Kaczorowski J, Jorgensen S, Franco E, et al. Relation of episiotomy to perineal trauma and morbidity, sexual dysfunction and pelvic floor relaxation. *Am J Obstet Gynecol* 1994;171(3):591-8.

45. Klein MC, Kaczorowski J, Robbins JM, Gauthier RJ, Jorgensen SH, Joshi AK. Physician beliefs and behavior within a randomized controlled trial of episiotomy: consequences for women under their care. *CMAJ* 1995;153(6):769-79.

46. Klein MC. Reducing perineal trauma and pelvic floor relaxation: an evidence-based approach. In: *Clinics in family practice*. Saunders. 2001.

47. Signorello L, Harlow B, Chekos A, Repke J. Midline episiotomy and anal incontinence:retrospective cohort study. *BMJ* 2000;320:86-90.

48. Graham ID, Graham DF. Episiotomy counts: trends and prevalence in Canada, 1981/1982 to 1993/1994. *Birth* 1997;24(3):141-7.

49. *Canadian Perinatal Health Report, 2003*. Ottawa (ON): Health Canada; 2003.

50. *Care in normal birth: a practical guide*. Geneva: World Health Organization, Division on Family Health; 1996.

51. Hankins G, Rowe T. Operative vaginal delivery – year 2000. *Am J Obstet Gynecol* 1996;175(2).

52. Ramin S, Little B, Gilstrap L. Survey of forceps delivery in North America in 1990. *Obstet Gynecol* 1993;81(2):307-11.

53. Bofill J, Rust O, Perry K, Roberts W, Martin R, Morrison J. Operative vaginal delivery: a survey of fellows of ACOG. *Obstet Gynecol* 1996;88(6):1007-10.

54. MacNab YC. A review of delivery mode in British Columbia, 1987–1995. *BC Vital Stat Q* 1997;6(4). Available at: www.vs.gov.bc.ca/stats/quarter/q4_96/index.html (accessed 2004 Sept 16).

55. Menticoglou S. Differences among obstetricians in caesarean section rates. *Aust N Z J Obstet Gynaecol* 1997;37(4):387-92.

56. Klein M. Do family physicians 'prevent' cesarean sections? A Canadian exploration. *Fam Med* 1988;20(6):431-6.

57. Notzon F. International differences in the use of obstetric interventions. *JAMA* 1990;263(24):3286-91.

58. International Cesarean Awareness Network (ICAN). *Statistics, 2002*. Available at: www.ican-online.org/resources/statistics.htm (accessed 2004 Sept 16).

59. Mindell W, Vayda E, Cardillo B. Ten-year trends in Canada for selected operations. *CMAJ* 1982;127:23-7.

60. Wadhera S, Nair C. Trends in cesarean section deliveries, Canada, 1968–1977. *Can J Public Health* 1982;73:47-51.

61. Chamberlain G, Steer P. ABC of labour care: operative delivery. *BMJ* 1999;318:1260-4.

62. Holmes P, Oppenheimer L, Wu Wen S. The relationship between cervical dilatation at initial presentation in labour and subsequent intervention. *Br J Obstet Gynaecol* 2001;108:1120-4.

63. Anderson G, Lomas J. Determinants of the increasing cesarean birth rate. *N Engl J Med* 1984;311(14):887-92.

64. Lynch N, Thommasen HV, Grzybowsky S. Does caesarean section capability make a difference to a small rural maternity service? *Can Fam Physician*. In press.

65. Grzybowski S, Cadesky A, Hogg W. Rural obstetrics: a 5-year prospective study of the outcomes of all pregnancies in a remote northern community. *CMAJ* 1991;144(8):987-94.

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