Obstetrical and Pediatric Anesthesia

Hospital practice more than specialty influences the choice of regional or general anesthesia for Cesarean section

[La pratique hospitalière influence plus que la spécialité dans le choix de l'anesthésie régionale ou générale pour la césarienne]

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Purpose: Describe the influence of specialty certification and practice style upon the anesthetic technique used for Cesarean deliveries.

Methods: Alberta physician claims and hospital abstracts between April 1, 1998 to March 31, 2000 were used to determine the technique of anesthesia (regional or general). The influence of practice (volume of deliveries, geographic location, presence of regional analgesia providers) and specialty (anesthesiologist or family/general practice) is explored by logistic regression.

Results: Hospital abstracts of 13,884 Cesarean sections were analyzed. Anesthesiologists performed 76% of the anesthetics: epidural (33%), spinal (45%), and general anesthesia (22%). Comparing only regional and metropolitan hospitals, the percent of general anesthesia performed by anesthesiologists varied between 5% to 50%. After adjusting for other factors, we found, in order of importance, the following determined the use of general anesthesia for Cesarean sections: 1) hospitals with more epidural procedure providers during labour were 3% less likely to have providers choose general anesthesia; 2) larger, regional and metropolitan hospitals were less likely to have providers choose general anesthesia; 3) hospitals with a high volume epidural procedure provider during labour were 64% less likely to have providers choose general anesthesia; 4) anesthesiologists were 32% less likely to choose general anesthesia.

Conclusion: The overall use of regional anesthesia for Cesarean sections in Alberta is high. The chance of receiving a general anesthetic for a Cesarean delivery varies across the province and was more related to practice environment than specialty.

Objectif : Décrire l'influence de la spécialité et du style de pratique sur la technique anesthésique utilisée pour l'accouchement par césarienne.

Méthode : Les demandes de paiement des médecins et les résumés de dossiers hospitaliers de l'Alberta du 1 avril 1998 au 31 mars 2000 ont permis de connaître la technique d'anesthésie utilisée, régionale ou générale. L'influence de la pratique (nombre d'accouchements, localisation géographique, présence de personnel pouvant administrer l'analgésie régionale) et la spécialité (anesthésiologie ou médecine familiale/générale) est explorée par régression logistique.

Résultats : Les résumés de 13 884 césariennes réalisées en milieu hospitalier ont été analysés. Les anesthésiologistes ont fait 76 % des anesthésies : épidurale (33 %), rachidienne (45 %) et générale (22 %). Si on compare les hôpitaux régionaux à ceux des grandes villes, le pourcentage de l'anesthésie générale administrée par les anesthésiologistes varie de 5 % à 50 %. Après des modifications en fonction d'autres facteurs, nous avons, par ordre d'importance, ce qui détermine l'utilisation de l'anesthésie générale pour la césarienne : 1) dans les hôpitaux où un plus grand nombre de médecins peuvent administrer une anesthésie épidurale pendant le travail, il y a 3 % de moins d'anesthésie générale ; 2) dans les grands hôpitaux, les centres régionaux et municipaux, les médecins ont moins tendance à choisir l'anesthésie générale ; 3) dans les hôpitaux où les médecins offrant l'anesthésie épidurale sont nombreux, il y a 64 % moins d'anesthésie générale ; 4) les anesthésiologistes choisissent l'anesthésie générale dans 32 % moins de cas.

Conclusion : En Alberta, il y a un taux élevé d'anesthésie régionale pour la césarienne. La possibilité de recevoir une anesthésie générale pour la césarienne varie et est davantage reliée à l'environnement de la pratique qu'à la spécialité.

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THE literature suggests that more maternal deaths are associated with Cesarean delivery under general anesthesia.¹ If appropriate physician and nursing staff are available, regional anesthesia by epidural or spinal technique should be an option offered by every hospital providing delivery services.² Considerable variation exists comparing anesthetic practices for Cesarean sections.³⁻⁷ Using administrative databases, we assess the influence of physician specialty (anesthesiologist *vs* family/general practice) and type of practice upon the use of regional or general anesthesia for Cesarean sections.

Methods

Methods for data extraction have been detailed elsewhere.^{8,9} Type of anesthesia (none, local, epidural, spinal, general) was extracted for Cesarean sections using Canadian Institute for Health Information's Inpatient Discharge Abstract Database and Alberta Physician Claims Assessment System Database from April 1, 1998 to March 31, 2000. The number of unique physicians that claimed for epidural analgesia and the presence of at least one physician that provided a high volume of epidural procedures during

labour at each hospital was determined. High volume was defined as more than the 99th percentile (i.e., more than 150 per year) epidural procedures during the two study years.

Using stepwise logistic regression, the dependent variable was use of general anesthesia (yes, no) for Cesarean sections. The influencing factors in the regression were hospital size as described elsewhere,^{8,9} anesthetic performed by anesthesiologist, number of unique physicians that performed at least one anesthetic for Cesarean sections at each hospital site during the study period, number of unique physicians that perform an epidural procedure for labour at each site during the study period, and high volume epidural analgesia provider. Significance was defined as $P < 0.05$.

Results

Hospital abstracts of 13,884 Cesarean sections were analyzed. An anesthetic type was identified in all but ten cases; epidural (33%), spinal (45%), and general anesthesia (22%). Of the 3,011 general anesthetics, 358 (12%) had a previous epidural procedure for labour. Anesthesiologists performed 76% of the anesthetics for Cesarean sections. The median number of anesthetic

TABLE I Type of anesthetic for Cesarean section by hospital size

<i>All hospitals grouped by size or location</i>	<i>Epidural anesthetic</i>	<i>Spinal anesthetic</i>	<i>Regional anesthetic (total of epidural and spinal)</i>	<i>General anesthetic</i>	<i>Epidural analgesia used during labour and subsequent general anesthesia for Cesarean section</i>	<i>Procedure performed by anesthesiologist</i>
Less than 50 deliveries per year	10 (19%)	9 (17%)	19 (36%)	34 (64%)	0	1 (2%)
50-99 deliveries per year	26 (10%)	127 (50%)	153 (60%)	102 (40%)	11	2 (1%)
100-405 deliveries per year	255 (15%)	785 (46%)	1040 (61%)	669 (39%)	49	38 (2%)
Regional hospitals	394 (17%)	1058 (47%)	1452 (64%)	806 (36%)	79	1399 (64%)
Metropolitan Calgary <i>n</i>	2408 (50%)	1993 (42%)	4401 (92%)	396 (8%)	36	4603 (100%)
Metropolitan Edmonton <i>n</i>	1455 (31%)	2196 (47%)	3651 (78%)	1004 (22%)	183	3892 (86%)
All Alberta	4548 (33%)	6168 (45%)	10716 (78%)	3011 (22%)	358 (12%)	9935 (76%)

Where *n* is number of anesthetics and bracketed number is percentage. Some cases not classified as anesthetic type or hospital identification not recorded. All numbers represent the total number of Cesarean sections performed in the specific hospital grouping.

TABLE II Description of stepwise logistic regression explanatory factors for use of general anesthesia during Cesarean section

	<i>Odds ration</i>	<i>95% confidence interval</i>	
Number of epidural procedure providers per hospital	0.97	(0.96	0.99)
Hospitals with 100–405 deliveries per year compared to hospitals with less than 50 deliveries per year	0.48	(0.36	0.65)
Regional hospitals compared to hospitals with less than 50 deliveries per year	0.39	(0.28	0.53)
Metropolitan Edmonton hospitals compared to hospitals with less than 50 deliveries per year	0.23	(0.14	0.37)
Metropolitan Calgary hospitals compared to hospitals with less than 50 deliveries per year	0.11	(0.06	0.21)
High volume epidural procedure provider located at hospital	0.61	(0.51	0.71)
Anesthesiologist performed anesthetic	0.76	(0.65	0.88)
Number of physicians provider anesthetics per hospital	1.02	(1.01	1.03)

Note rank ordering of factors indicates relative strength of that factor's influence upon the use of general anesthesia for Cesarean section. General anesthetics which were preceded by epidural analgesia during labour were eliminated from this analysis.

providers for Cesarean sections at each facility was 6 (range 1 to 77). The median number of epidural providers for labour at each facility was 3 (range 1 to 73). High volume epidural providers were located at two hospitals (one in each of Calgary and Edmonton).

Only in regional hospitals did anesthesiologists and family practitioners both perform significant proportions of anesthetic procedures (Table I). In regional hospitals, 40% of 777 anesthetics performed by general/family practitioners were general anesthesia and 33% of 1,396 anesthetics performed by anesthesiologists were general anesthesia (chi square $P < 0.001$). Figure 1 plots the overall percentage of general anesthetics given during Cesarean sections for each hospital in Alberta. Figure 2 plots the percentage of general anesthetics given during Cesarean sections for only those Cesarean sections in which an anesthesiologist was involved. Table II describes the logistic regression modelling results for provision of general anesthesia rather than regional anesthesia for Cesarean sections.

Discussion

The overall use of general anesthesia for Cesarean sections in Alberta (22%) compared favourably to that described in other countries.^{3–7} For the individual patient, the chance of receiving a general anesthetic during a Cesarean section varied between hospitals. The practice environment played a significant role in the decision between regional and general anesthesia for Cesarean sections. The number of epidural procedure providers and a high volume epidural procedure provider decrease the use of general anesthesia for Cesarean sections. In contrast, a greater number of physicians providing anesthetics at any hospital actually increase the percentage of general anesthetics for Cesarean section.

Specialty training was a weak explanatory variable for type of anesthetic when compared to the number of deliveries at the hospital and presence of an epidural procedure provider. The presence of an anesthesiologist at any one hospital does not ensure a uniform use of regional anesthesia for Cesarean section. Anesthesiologists are more likely to practice in larger hospitals. However, the use of general anesthesia is only slightly different in larger rural hospitals (39%) compared to regional hospitals (36%) despite the virtual absence of anesthesiologists in the larger rural hospitals and the predominance (76%) of anesthetics performed by anesthesiologists in regional hospitals. The presence of peers that do regional anesthesia during labour has a strong association with the anesthetic choice for Cesarean section.

Limitations

Family/general practice or anesthesiologist identification relate to the Alberta College of Physician and Surgeons' classification. Some family/general practice physicians may have specialist training not recognized by the Alberta College of Physician and Surgeons. We were able to verify deliveries comparing two independent databases but not all variables could be verified. Population based administrative database research is highly generalizable although limited in clinical detail. For example, regional anesthesia may be contraindicated because of anatomical considerations, bacteremia, or fetal distress which are variables not found in the database. General anesthesia may be required in order to facilitate an emergency delivery. There are no uniform definitions for emergency, urgent, or elective Cesarean sections used consistently in all practices. Labelling a particular surgery as "an emergency" may be for multiple reasons. We have explored the use of defining surgery as "elective/urgent/emergent" in

FIGURE 1 Hospitals are grouped by the number of deliveries for each facility with increasing number of deliveries and more urban centres plotted from right to left (i.e., A are hospitals with less than 50 deliveries per year, B are hospitals with 50 to 99 deliveries per year, C are hospitals with 100 to 405 deliveries per year, D are regional hospitals, E are metropolitan hospitals, and F are referral metropolitan hospitals with level 3 neonatal intensive care unit). As some sites performed few Cesarean sections, the type of anesthetic percentage would change dramatically if only a few anesthetics were or were not a general anesthetic.

one previous study and found that such stratification afforded no additional explanatory power.¹⁰ The distribution of contraindications for regional anesthesia and emergency patients cannot be assumed to be similar between hospitals. The magnitude difference in the use of general anesthesia for Cesarean sections in similar type of hospitals is large: the differences in a small number of patients with absolute or relative contraindications for regional anesthesia and emergency requirement for Cesarean section would likely be insufficient to explain the results of this study.

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FIGURE 2 The percent of general anesthetic for Cesarean section performed by anesthesiologists varied between 5% to 50% between hospital sites. As some hospital sites perform few Cesarean sections and anesthesiologists provide few services to smaller hospitals, only data from regional and metropolitan hospitals are shown. A are metropolitan hospital with level 3 neonatal intensive care units (one each in Calgary and Edmonton), B are metropolitan Calgary hospitals, C are metropolitan Edmonton hospitals, and D are regional hospitals. Number quoted is the number of Cesarean sections performed at each hospital during the study period in which anesthesiologist submitted a billing claim. When compared to Figure 2, one regional hospital and two metropolitan area hospitals are not shown because of the low number of anesthetics performed by anesthesiologists.

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