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# Use of epidural analgesia for labour and delivery in Alberta

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Purpose: To describe the use of epidural analgesia during vaginal deliveries in urban and rural hospitals in Alberta between Apr. 1, 1997, and Mar. 31, 2000. The influence of hospital organizational factors (i.e., the training of the physician who administers the analgesia and the number of deliveries per year per hospital) on the use of epidural anlagesia is also explored.

Methods: Using physician claims, hospital abstracts, vital statistics, birth registrations and the Alberta Health Care Insurance Plan registry, the pattern of epidural analgesia use in Alberta is explored.

Results: Use of epidural analgesia during labour for vaginal deliveries was 30% during the study period. In small, rural hospitals (up to 99 deliveries per year) the use was 3% to 4%. Use increased to 45% in specialized tertiary care hospitals in Edmonton and Calgary. The chance of receiving epidural analgesia during labour for vaginal delivery was 25 times greater in the largest versus smallest facilities, after controlling for previous live births, birthweight, prematurity, breech or cephalic presentation, and reproductive system comorbidity. Most epidural procedures for vaginal delivery provided by general practitioners (GPs) were in larger, rural hospitals (100 to 405 deliveries per year). Anesthetists provided most epidural procedures for vaginal deliveries in regional and Edmonton or Calgary area hospitals. The use of epidural analgesia in the larger, rural hospitals (9% of vaginal deliveries) and regional centres (10%) was similar despite any difference in the training of the physician who administered the analgesia (i.e., anesthetist or GP).

Conclusion: There exists a stark rural/urban geographical division in the use of epidural analgesia in Alberta. The use of epidural analgesia in the larger, rural hospitals and regional centres was similar despite any difference in the training of the physician who administered the analgesia. We

conclude that the training of the physician who administers the analgesia and the number of yearly deliveries per hospital are influential in determining the use of epidural analgesia during labour for vaginal delivery.

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Objet : Décrire l'utilisation de l'analgésie péridurale pendant des accouchements par voie vaginale dans des hôpitaux urbains et ruraux de l'Alberta entre le 1er avril 1997 et le 31 mars 2000. On explore aussi l'effet des facteurs organisationnels de l'hôpital (c.-à-d. la formation du médecin qui administre l'analgésie et le nombre d'accouchements effectués par année dans l'hôpital) sur le recours à l'analgésie péridurale.

Méthodes : On étudie les tendances du recours à l'analgésie péridurale en Alberta en se fondant sur les demandes de paiement des médecins, des résumés d'hôpitaux, les statistiques démographiques, les naissances inscrites et le registre du régime d'assurance soins de santé de l'Alberta.

Résultats : Le recours à l'analgésie péridurale pendant le travail préparatoire à un accouchement par voie vaginale s'est établi à 30 % pendant la période d'étude. Dans les petits hôpitaux ruraux (jusqu'à 99 accouchements par année), l'utilisation a atteint 3 à 4 %. Elle a grimpé à 45 % dans les hôpitaux de soins tertiaires spécialisés d'Edmonton et de Calgary. Une patiente avait 25 fois plus de chances de recevoir une analgésie péridurale pendant le travail préparatoire à un accouchement par voie vaginale dans les gros établissements que dans les petits, compte tenu du contrôle des naissances vivantes antérieures, du poids à la naissance, de la prématurité, de la présentation par le siège ou le crâne et d'une comorbidité de l'appareil reproducteur. La plupart des injections péridurales administrées par des omnipraticiens (OP) en vue d'un accouchement par voie vaginale ont été administrées dans les grands hôpitaux ruraux (100 à 405 accouchements par année). Des anesthésistes ont administré la plupart des injections péridurales en vue d'un accouchement par voie vaginale dans les hôpitaux régionaux et ceux de la région d'Edmonton et de Calgary. Le recours à l'analgésie péridurale dans les grands hôpitaux ruraux (9 % des accouchements par voie vaginale) et les centres régionaux (10 %) était semblable en dépit de toute différence au niveau de la formation du médecin qui a administré l'analgésie (c.-à-d. anesthésiste ou OP).

Conclusion : Il existe un clivage géographique frappant entre les milieux ruraux et urbains en ce qui concerne le recours à l'analgésie péridurale en Alberta. Le recours à cette technique dans les grands hôpitaux ruraux et les centre régionaux se ressemblait en dépit de toute différence au niveau de la formation du médecin qui a administré l'analgésie. Nous concluons que la formation du médecin qui administre l'analgésie et le nombre d'accouchements annuels pratiqués dans l'hôpital ont un effet sur l'administration d'une analgésie péridurale pendant le travail préparatoire à un accouchement par voie vaginale.

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## Introduction

Pain relief for labour may be provided effectively using a variety of techniques.1-3 The published medical literature supports using a local anesthetic delivered by epidural in order to provide greater quality of pain relief compared to parenteral narcotics.1 If appropriate physician and nursing staff are available, epidural analgesia should be one of the analgesic options offered by every hospital providing delivery services.1

The selected pain relief technique depends in part on patient-centred factors including patient/physician preferences, the medical status of the patient, and the progress of labour. Hospital organizational factors may also play a significant role in obstetrical pain relief. Over the last decade, obstetrical services have become more concentrated, with fewer small, rural hospitals providing care.4 Some studies note that the use of epidural analgesia increased with the number of births occurring at the specific hospital site.5,6 The influence of physician training (anesthesia specialist versus general practice) upon the use of epidural analgesia is not well described.

In this study the use of epidural analgesia for obstetrical labour in Alberta during the years 1997 to 2000 is described using administrative databases. The influence of the specialty of the physician who is providing the service and the number of yearly deliveries per hospital upon the use of epidural analgesia is explored.

## Methods

Four administrative health service databases were used, and the analysis was done within the protected environment of Alberta Health and Wellness governed by provincial legislative guidelines on the confidentiality of health information:

- Canadian Institute for Health Information (CIHI) inpatient Discharge Abstract Database (DAD) for the province of Alberta for 1997/98 to 1999/00;
- Alberta Claims Assessment System Database for 1997/98 to 1999/00;
- Alberta Vital Statistics (VS) Birth Registry Database for 1997-1999; and
- Alberta Health Care Insurance Plan (AHCIP) Registry Database for 1997 to 2000.

Maternal deliveries were identified using the CIHI DAD. Ninety-nine point seven percent of births that occur in Alberta every year take place in acute care facilities. The obstetrics main patient service field for all hospital discharges from 1997/98, 1998/99 and 1999/00 were extracted and encompassed the last available 3 fiscal years. The decision to combine 3 years of data was made because the volume of deliveries in some facilities was small. No stillbirths were included. The use of forceps or vacuum for delivery (International Classification of Diseases [ICD-9-CM] 720, 721, 722x, 723x, 724, 725x, 726, 7271, 7279, 733) was extracted from any of the 10 CIHI DAD procedural codes fields. Medical or surgical induction (ICD-9-CM 734, 7301, 7309) was extracted from any of the 10 CIHI DAD procedural codes fields.

In order to obtain neonatal data (sex, birthweight, date and time of birth), the newborn main patient service field was extracted from CIHI DAD for 1997/98, 1998/99 and 1999/00. Using the AHCIP registry, we matched each neonate to each delivering mother. Average length of stay after delivery for the mothers was calculated using the neonatal admission time and date and the maternal discharge time and date.

Birth records for each delivery were obtained. Vital statistic birth records contain questions to be completed by the mother and family physician or pediatrician within 24 hours of delivery. Because the VS Birth Registry Database does not record a patient's unique AHCIP registry number, a linkage to maternal records for each of the 3 years was done by matching to neonatal birth date (365 unique values), birth weight (3007 unique values), delivery site (87 facilities), neonatal sex, and maternal age (39 unique values). Records from vital statistics are collated by calendar year, whereas all other administrative data are collated by fiscal year (April 1 to March 31). Vital statistics data from Jan. 1 to Mar. 31, 2000, were unavailable. Variables unique to vital statistics incorporated into this study were number of total maternal live births, breech or cephalic presentation, neonatal Apgar at 1, 5 and 10 min, and gestational weeks.

Physician claims were extracted from physician claims for identified maternal deliveries file using the Canadian Classification of Procedures (CCP) code.7 The anonymous maternal identifier for delivery hospital separations was used to identify specific billing records for these same mothers from physician claims. To account for time between the service date and a claim for reimbursement, all physician claims for at least 6 months after the delivery date were queried. These billing records included a range of anesthesia services, including epidural (CCP code 16.91C) for obstetrical procedures, the role of the provider (anesthesia), and the specialty of the provider (anesthesiology, general practice). The absence of an anesthetic claim for a vaginal delivery was verified using the in-hospital CIHI record in which the anesthetic type (none, epidural/spinal, general) was linked to the ICD-9-CM procedural code for vaginal delivery.

### Defining facility size and service region

Facilities providing maternal delivery services were categorized by the average number of deliveries each had, per year, over the 3-year study period: size 1 (1-49 deliveries); size 2 (50-99 deliveries); size 3 (100-405 deliveries); size 4 (631-1691 deliveries); size 5 (any hospital located in the metropolitan health regions of Edmonton or Calgary); size 6 (hospital with a Level 3 [highest intensity of care] neonatal intensive care unit) (there was one size 6 hospital in each of Edmonton and Calgary health regions.

### Statistics

Statistical modelling was done by forward stepwise logistic regression. The order of factor entry into the model was used to rank the magnitude of factor influence. The number of cases included in the models varied because data for each factor influencing outcomes were not available for all deliveries. Significance was defined as $p < 0.05$.

The model included the following factors influencing outcomes.

- Dependent variable: use of epidural (yes, no) for vaginal delivery
- Facility size, as defined above
- Preterm (less than 37 weeks)
- Low birthweight (less than 2500 grams)
- Breech or cephalic delivery
- Previous live births
- Any maternal comorbidity (any maternal reproductive system coexisting diagnosis associated with pregnancy, including multiple pregnancy, malposition or malpresentation, abnormalities of cervix or uterus, and cephalopelvic disproportion abstracted in any of the 15 CIHI DAD diagnosis codes [ICD-9-CM 651 to 654] or CIHI designation as previous cesarean sections 602, 603, 608, 610).

## Results

There were 90 991 vaginal deliveries in Alberta between Apr. 1, 1997, and Mar. 31, 2000. Data from vital statistics were unavailable for the period Jan. 1, 2000, to Mar. 31, 2000; therefore, 7197 deliveries were not available for matching. Of the remaining 83 794 deliveries 67 181 (80%) were matched to the VS Birth Registry Database and were available for modelling using variables obtained from this source.

Table 1 illustrates the relationship between facility size (i.e., number of deliveries performed at the hospital site) and the use of epidural analgesia during labour for vaginal delivery. As shown in Table 2 these epidurals were performed by a large number of anesthetists and general practioners (GPs). All physicians who submitted a claim for at least 1 epidural anesthetic during a vaginal delivery at any time during the 3-year period were included (Table 2) The median number of claims for epidurals is 10-fold greater for anesthetists compared to GPs. The median number of epidural procedures for vaginal delivery claimed by GPs is less than 4 per annum, and the corresponding number for anesthetists is 33.

Table 2 also illustrates the relationship between facility size and the type of physician submitting a claim for an epidural analgesia during vaginal delivery. Most epidural procedures for vaginal delivery are provided by GPs in facility sizes 1 to 3 (i.e., hospitals that performed up to 405 deliveries during the 3-year period). Anesthetists provide most epidural procedures for vaginal deliveries in regional and Edmonton or Calgary area hospitals (facility sizes 4 to 6). The epidural rate for vaginal deliveries is similar in facility sizes 3 and 4 (9% and 10% respectively) despite the fact that the majority of procedures are performed by GPs (93%) in facility size 3 and by anesthetists in facility size 4 (72%). The median number of epidural procedures claimed by individual GPs by facility size type is greater than that for individual anesthetists in facility sizes 1 to 4. Only in facility sizes 5 and 6 do individual anesthetists perform a higher number of

epidurals for vaginal delivery.

Table 3 illustrates the effect of facility size upon the use of epidural analgesia for vaginal delivery after controlling for other factors influencing outcomes. The odds of receiving an epidural during labour for vaginal delivery increases from 3 times to 25 times as the size of the facility increases. The order of entry into the model and the listing of variables indicate the relative strength of the factors influencing outcomes. Again, facility size has the greatest influence when compared to other maternal factors such as first live birth or reproductive system comorbidity. Category totals in Tables 1 to 3 vary due to a variation in database source and completeness.

## Discussion

We found that the overall provincial use of epidural analgesia during labour for vaginal delivery was 30% in this retrospective study for the time period Apr. 1, 1997, to Mar. 31, 2000. The epidural rate for Alberta was similar to that from other industrialized countries.5,8 However, within Alberta, there was a stark geographical division in the use of epidurals. The high rate of epidural use was predominately found in hospitals located in the 2 metropolitan health regions (Edmonton and Calgary), with decreasing frequencies in both designated regional hospitals and the lowest use in small, rural hospitals. The importance of hospital geographic location was greater than the patient factors influencing outcomes that were available from administrative databases. As well, the use of epidural analgesia in the larger rural hospitals and regional centres was similar despite the difference in the type of physician that predominantly performs the service (anesthetist or GP). We conclude that the organizational factors of physician specialty providing the service and the number of yearly deliveries per hospital are influential in determining the use of epidural analgesia for vaginal delivery.

The availability of choice concerning labour analgesia and an increased demand for epidural analgesia in urban centres has resulted in an inequitable distribution in the province. Since the introduction of epidural analgesia 30 years ago there is now a greater demand for this procedure. This could be due to improvements with the procedure and could also be due to the fact that physicians and health organizations are being lobbied by a population that now has higher expectations for pain relief and an increased familiarity with the procedure.9 In studies published in the early 90s, the rate of epidural analgesia was shown to be lower in rural hospitals.5,10 For example, the rate of epidurals during labour for vaginal deliveries in a rural Saskatchewan hospital with 1224 deliveries between 1984 to 1988 was 4.6%.10 We attempted to simultaneously assess the effect of patient factors that may alter the use of epidurals along with the facility size. We found that previous births, reproductive system comorbidity, prematurity and low birthweight were less influential than small facility size in influencing the use of epidurals.

A high epidural rate may be considered beneficial because it affords superior obstetrical pain relief.11 Opposing the desirability of a greater epidural rate is the generally unwanted

connotation that childbirth is being medicalized. As well, epidurals may have risks.12-18 If increasing the use of epidural analgesia is the desired goal, then a number of factors must be considered. Continuous infusion of low-dose epidural analgesia negates the need for physicians to stay and watch. Physician reimbursement for epidural procedures has been demonstrated to be one factor in determining use.11 In the US,19 insurance companies have tried to deny epidural analgesia on the basis of increased costs. The number of rural Ontario hospitals providing epidural analgesia decreased between 1988 and 1995;4 this is similar to the US trend of fewer small, rural hospitals performing deliveries.20 In the absence of an enabling organization, the resources required to facilitate epidural analgesia are unlikely to be provided. As a result, patients may choose to give birth in a hospital other than the one closest to their home. Metropolitan hospitals are within a few hours travelling time for the majority of Albertans. Twenty percent of mothers who are carrying only one child (which is known to weigh at least 2500 g) and who plan to have a vaginal delivery, bypass the nearest facility that performs deliveries.21 The reasons are unknown, but we can speculate that patients may desire services not locally available.

In smaller hospitals, the number of epidurals per facility performed by GPs was greater than for anesthetists. In the largest rural hospitals, GPs provided epidural analgesia as frequently as anesthetists working in regional hospitals. We provide no new data on the advantages or disadvantages of epidurals performed by specialists versus nonspecialists. Nor do we make any inferences from our data concerning outcomes by high- or low-volume epidural providers. However, any organization attempting to increase its use of epidurals does not need to be constrained in only considering anesthetists nor assume that a high rate for the procedure is ensured by the mere presence of anesthesia specialists.

Our analysis divided hospitals into categories according to the number of deliveries per year for each. However, within hospitals with similar delivery volumes, variation in the use of epidurals still existed. Most striking is that one of the highest uses of epidurals is in a medium-sized rural hospital22 staffed by 2 GP/anesthetists. This high rate was compared to other similar-sized hospitals and to the largest metropolitan hospitals with a dedicated epidural service. A survey of Alberta hospitals that provided delivery services in 1994 reported that maternity units with high epidural rates had developed a consensus among all clinicians that epidural analgesia was an important and helpful method of pain relief.22 In maternity units with lower epidural rates this consensus did not exist. These lower-rate maternity units also reported that their patients would not take advantage of the epidural service. However, both patients and physicians stated that pain issues were only discussed in relation to direct patient questions.22

## Limitations

Population-based administrative database research is highly generalizable although limited in clinical detail. We were able to verify both deliveries and performance of epidurals by comparing 2 independent databases. However, category totals (by provider type or facility size) vary due to this variation in data source and completeness (Tables 1 to 3). We are reliant on those completing

other data fields for non-verifiable data. Anesthetist or GP identification relate to the College of Physicians and Surgeons of Alberta (CPSA) classification. GPs may have specialist training not recognized by the CPSA. The link to the VS Birth Registry Database captured 80% of cases. We did not detect a systematic bias between matched and non-matched cases; however, this possibility exists.

## Conclusion

In Alberta between Apr. 1, 1997, and Mar. 31, 2000, the use of epidural analgesia was highest in the 2 metropolitan health regions (Edmonton and Calgary), with decreasing frequencies in regional hospitals and the lowest use being in small, rural hospitals. The use of epidural analgesia in the larger rural hospitals and regional centres was similar despite the difference in the specialist physician that predominantly performs the service.

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This article has been peer reviewed.

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