



Perinatal Services BC

An agency of the Provincial Health Services Authority

Anesthetic Complications in British Columbia: 2003/2004 to 2009/2010

A Perinatal Services BC Surveillance Special Report

Volume 1, Issue 1, April 2011

Publication Information

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Suggested citation: Perinatal Services BC (April 2011). *Anesthetic Complications in British Columbia: 2003/2004 to 2009/2010*. Vancouver, BC.

Perinatal Services BC
West Tower, 3rd Floor
555 West 12th Avenue
Vancouver, BC V5Z 3X7
T: 604-877-2121
F: 604-872-1987
www.perinatalservicesbc.ca

ISBN: 978-0-9811237-4-5

Published: April 2011

Surveillance Special Report

Anesthetic Complications in British Columbia: 2003/2004 to 2009/2010 is Volume 1, Issue No. 1, 2011 of the Perinatal Services BC's Surveillance Special Reporting Series. The goal of this publication is to provide information to maternity health care providers, researchers and health information specialists about anesthetic complications in labour and delivery in BC. A small multidisciplinary team including members with expertise in anesthesia, maternal-fetal medicine, epidemiology, surveillance and data analysis provided tremendous knowledge, expert advice and guidance throughout the development of this Special Report.

Acknowledgement

We are grateful to the individuals who have assisted in the chart review and as reviewers of this manuscript:

Leanne Dahlgren, Maternal-Fetal Medicine Specialist, BC Women's Hospital

Kenny Der, Manager, Information System, PSBC

K.S. Joseph, Senior Epidemiologist, PSBC

Lily Lee, Leader, Surveillance, PSBC

Terri Pacheco, Health Data Analyst, PSBC

Roanne Preston, Head, Department of Anesthesia, BC Women's Hospital

John Ramsden, Regional Head, Department of Anesthesia, Fraser Health

About Perinatal Services British Columbia

The Ministry of Health and the British Columbia Medical Association (BCMA) initiated the British Columbia Reproductive Care Program (BCRCP) in June 1988. One of the mandates of the BCRCP was "the collection and analysis of data to evaluate perinatal outcomes, care processes and resources via a province-wide computerized database". This mandate was fundamental to the development of the British Columbia Perinatal Data Registry (BCPDR), which was initiated in 1993. Individuals instrumental in the creation of the BCPDR included Dr. Sidney Effer, Dr. William J. Ehman, Dr. Margaret Pendray, Mr. Peter Hayles and Dr. Alan Thomson with the support of the BC Ministry of Health.

The BCRCP became part of the Provincial Health Services Authority (PHSA) in 2001 when the government of British Columbia introduced five geographically based health authorities and one provincial health service authority.

In 2007, with the addition of the Provincial Specialized Perinatal Services (PSPS), the BCRCP was renamed the BC Perinatal Health Program (BCPHP). The BCPHP continued to work towards optimizing neonatal, maternal and fetal health in the province through educational support to care providers, outcome analysis and multidisciplinary perinatal guidelines. The BCPHP was overseen by a Provincial Perinatal Advisory Committee with representation from the Ministry of Health Services (MOHS), the Provincial Health Services Authority (PHSA), Children's and Women's Health Centre of BC, Health Authorities, health care providers and academic organizations.

In 2010, Perinatal Services BC (PSBC) was created to replace its predecessors, the BC Reproductive Care Program and the BC Perinatal Health Program. PSBC is overseen by a Provincial Perinatal Services Oversight Council and provides strategic leadership on the full continuum of perinatal care throughout the province focusing on perinatal care planning, service delivery and quality improvement. PSBC works collaboratively with local health authorities and stakeholders to improve perinatal health outcomes and enhance the quality of perinatal services in BC.

Abstract

The Perinatal Health Report 2008 published through Perinatal Services BC (PSBC) reported that the rate of anesthetic complications of labour and delivery increased 54% from 35 per 10,000 deliveries to 54 per 10,000 deliveries between 2004/2005 and 2005/2006. This remained elevated through 2007/2008. Coincidentally, a national study of severe maternal morbidity in Canada also identified BC as having significantly higher rates of pulmonary, cardiac and central nervous system (CNS) complications of anesthesia compared with other provinces and territories during the same period.

In response, Perinatal Services BC launched a detailed chart review for women with any of the four types of anesthetic complications coded in their medical charts; pulmonary, cardiac, CNS, or "other". This chart review was expanded to 2003/2004 to 2009/2010 for a more comprehensive evaluation of anesthetic complications of labour and delivery in BC. The unexpectedly high rates were found to be, in part, the result of coding of non-serious events as complications by institutions striving to track anesthesia-related events. The complication rate decreased by 80% when only serious complications were used to calculate the rate of anesthetic complications for a six-year period for the study sites. We conclude from our study that the incidence of anesthetic complications of labour and delivery in BC is likely more aligned with the Canadian average than first reported.

Introduction

As part of its comprehensive surveillance, Perinatal Services BC (PSBC) monitors temporal trends in severe maternal morbidity to provide an informed perspective on maternal health in the province. Severe maternal morbidity refers to a variety of severe, life-threatening conditions that may affect women as a consequence of labour and delivery. PSBC includes the following eight conditions in its definition of severe maternal morbidity: anesthetic complications, antepartum or postpartum hemorrhage with transfusion, postpartum hemorrhage with hysterectomy, eclampsia, pulmonary embolism, septic shock, and stroke. Cases are identified using the *International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision (ICD-9)* and the *International Classification of Diseases and Related Health Problems, 10th Revision, Canadian Enhancement (ICD-10-CA)* (CIHI, 2009).

The overall incidence of severe maternal morbidity is low for deliveries in British Columbia. For fiscal years 2004/2005 through 2007/2008, there were 167,988 deliveries and 1,725 cases of severe maternal morbidity, yielding an overall rate of 103 per 10,000 deliveries. The rate of severe maternal morbidity was 88 per 10,000 in 2004/2005 and 110 per 10,000 in 2007/2008 (BCPHP, 2010). For all conditions, except anesthetic complications, the rate has remained relatively stable over time (Table 1). The rate of anesthetic complications increased 54% between 2004/2005 and 2005/2006 (from 35 per 10,000 deliveries to 54 per 10,000 deliveries) and remained elevated through 2007/2008. In another study of severe maternal morbidity in Canada, BC was identified as having significantly higher rates of pulmonary, cardiac and central nervous system (CNS) complications of anesthesia (2.8 per 10,000 deliveries, C.I. 2.1 – 3.6) compared with other provinces and territories for the aggregate period of 2003/2004 through 2007/2008 and for each year from 2004/2005 to 2007/2008 (Liu et. al. 2010).

These findings of unexpectedly high and increasing rates of serious anesthetic complications led PSBC to launch an in-depth investigation. A small multidisciplinary team was formed (including members with expertise in anesthesia, maternal-fetal medicine, epidemiology, surveillance and data analysis) to study the issue.

Table 1. Severe maternal morbidity rates per 10,000 deliveries, British Columbia, 2004/2005 to 2007/2008

Morbidity	2004/2005		2005/2006		2006/2007		2007/2008	
	n	rate	n	rate	n	rate	n	rate
Anesthetic Complications	141	35	219	54	234	56	232	53
PPH with Transfusion	134	33	163	40	141	34	169	39
APH with Transfusion	41	10	45	11	42	10	47	11
PPH with Hysterectomy	30	7	28	7	17	4	27	6
Eclampsia	27	7	31	8	14	3	23	5
Pulmonary Embolism	8	2	10	2	11	3	12	3
Septic Shock	14	3	9	2	10	2	9	2
Stroke	<5	NR	<5	NR	<5	NR	<5	NR

Source: BC Perinatal Data Registry

NR: Data for conditions with fewer than five events per year are not reported.

Methods

We undertook a chart review of cases with anesthetic complications using data from the Discharge Abstract Database of the Canadian Institute for Health Information (CIHI) and BC Perinatal Data Registry (BCPDR). Although the PSBC Perinatal Health Report focused on fiscal years 2004/2005 to 2007/2008, this chart review was expanded to 2003/2004 to 2009/2010 for a more comprehensive evaluation of anesthetic complications of labour and delivery in BC. We selected medical records with any of the following anesthetic complications of labour and delivery: central nervous system complications (ICD-9 668.2 or ICD-10-CA O74.3 and O89.2); aspiration

pneumonitis (ICD-10-CA O74.0); other pulmonary complications (ICD-9 668.0 or ICD-10-CA O74.1); or cardiac complications (ICD-9 668.1 or ICD-10-CA O74.2 and O89.1). Aspiration pneumonitis and other pulmonary complications were grouped together in the analysis as pulmonary complications.

A convenience sample of patient charts at hospitals in two Health Authorities was reviewed by a small task group to assess the severity of the coded diagnoses. The severity of the adverse events related to anesthesia was assessed based on progress notes and chart documentation. Complications were deemed serious if they caused harm and/or morbidity to the patient. Complications were deemed “other” if they reflected pre-existing conditions, conditions that were not a direct result of the anesthesia given, or were transient effects with no sequelae.

Other complications of spinal and epidural anesthesia during labor and delivery

The definition of anesthetic complications in the PSBC Perinatal Health Report 2008 includes one additional code; that for other complications of spinal and epidural anesthesia during labor and delivery (O74.6). Preliminary investigation revealed that two hospitals accounted for the majority of the cases with this code.

In discussion with health records staff at Hospital 1, we learned that between 2003/2004 to 2007/2008, they routinely coded O74.6 for women with epidurals that were converted to spinal anesthesia, or cases of spinal anesthesia that were converted to general anesthesia. This practice disproportionately affected cases that were caesarean deliveries compared with women who delivered vaginally. The hospital discontinued this practice in April 2008, and the number of cases coded as O74.6 decreased from 108 in 2007/2008 to less than 5 in 2008/2009.

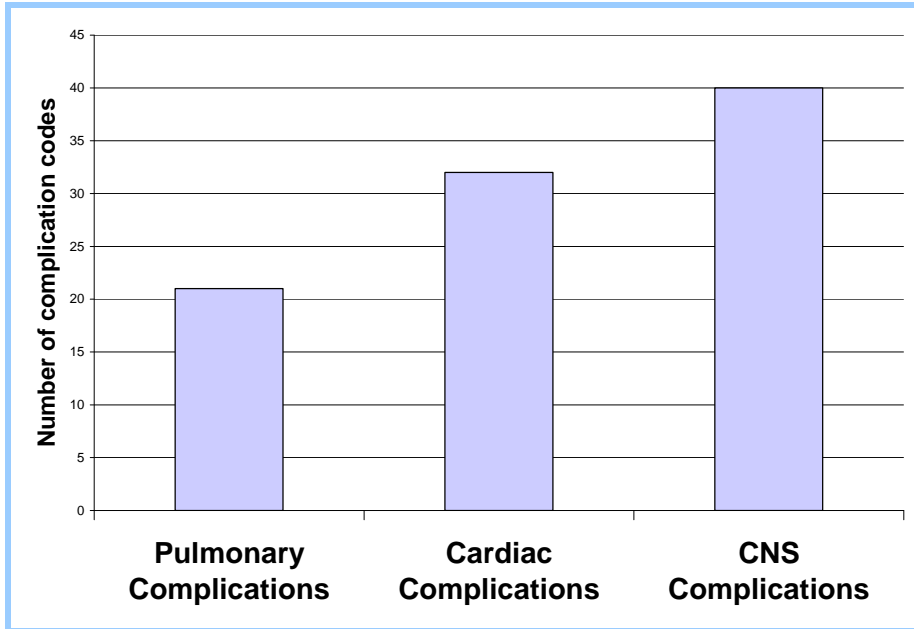
In 2005, the anesthesia department at Hospital 2 decided to capture and audit all adverse events related to anesthesia as part of a continuous quality improvement process. An internally developed guideline outlined when and where to locate information for coding of anesthetic complications or adverse events. Implementation of this anesthesia coding guideline resulted in a rise of O74.6 cases from 14 in 2004/2005 to 86; 89 and 66 cases in 2005/2006, 2006/2007 and 2007/2008, respectively. At this hospital, O76.4 was coded for both vaginal and caesarean deliveries.

Based on this information, we excluded O74.6 from our review to focus on serious anesthetic complications.

Results

Between 2003/2004 and 2009/2010, 84 women were identified as having experienced one or more cardiac, CNS or pulmonary anesthetic complications of labour and delivery in BC, an incidence rate of 2.9 per 10,000 deliveries for the period. The number and type of diagnoses are shown in Figure 1.0.

Figure 1.0 Number and Type of Anesthetic Complication Codes in BC, 2003/2004 to 2009/2010.



A convenience sample of 41 charts from three hospitals in two Health Authorities of women with ICD codes of cardiac, CNS or pulmonary anesthetic complications were reviewed. At a hospital in Health Authority A, the task group reviewed 35 charts with an anesthetic complication code from 2003/2004 through 2009/2010. At two hospitals in Health Authority B, six charts with an anesthetic complication code from 2004/2005 through 2009/2010 were reviewed by the head of anesthesiology and the Surveillance Lead from PSBC.

Table 2 shows the maternal and obstetric characteristics of reviewed cases. Maternal age ranged from 20 to 42 years of age, with a mean age of 32.7 years. The length of stay ranged from 11.3 to 1770 hours (73.8 days), with a mean of 183 hours (7.6 days, data not shown).

Of the 41 charts reviewed, four included a pulmonary complication code, 17 had a cardiac complication and 22 had CNS complications; two cases had multiple anesthetic complication codes resulting in a total of 43 anesthetic complication codes. These 41 charts and 43 codes accounted for 19% of pulmonary, 53% of cardiac, and 55% of CNS anesthetic complication codes in BC for 2003/2004 through 2009/2010.

Table 2. Maternal and Obstetric Characteristics of Women with Serious Anesthetic Complications

	Total Cases (based on ICD codes)	
	Number	Percent
Parity		
Nulliparous	24	58.5
Parous	17	41.5
Anesthesia type		
Other	1	2.4
Spinal	12	29.3
Epidural	17	41.5
General	8	19.5
Combined	3	7.3
Delivery mode		
Spontaneous vaginal birth	8	19.5
Caesarean birth	28	68.3
Assisted vaginal birth	5	12.2
Labour type		
No labour	12	29.3
Spontaneous labour	24	58.5
Induced labour	5	12.2
Any anesthetic complications (cardiac, pulmonary or CNS)		
Serious	12	29.3
Other	29	70.7

Detailed examination of chart documentation classified 13 codes as serious complications and 30 codes as other complications (Table 3). Some women may have had more than one code assigned. The proportion of codes assessed as serious and other varied by category of complication; 24% of cardiac complications were assessed as serious complications vs. 75% of pulmonary complications.

Table 3. Severity of Anesthetic Complications by Type of Complication

Anesthetic Complications	Serious	Other	Total Number of ICD Codes	Percent serious complications
Pulmonary	3	1	4	75.0%
Cardiac	4	13	17	23.5%
Central Nervous System	6	16	22	27.3%
Total	13	30	43	30.2%

Examples of serious anesthetic complications and other complications categorized by type are presented in Table 4 below.

Table 4. Examples of Serious Anesthetic and Other Complications by Type

	Serious anesthetic complications	Other Complications
Pulmonary	<ul style="list-style-type: none"> ▪ Failed epidural & spinal, atelectasis secondary to right main stem intubation, pulmonary edema ▪ Sudden respiratory distress requiring intubation and ventilation for 3 days ▪ Collapsed lung due to intubation 	<ul style="list-style-type: none"> ▪ Fainting ▪ Anxiety
Cardiac	<ul style="list-style-type: none"> ▪ Chest pain intra-operative period ▪ Asystole or cardiac arrest 	<ul style="list-style-type: none"> ▪ Transient bradycardia ▪ Mobitz type II arrhythmia
Central Nervous System	<ul style="list-style-type: none"> ▪ Gluteal numbness related to compartment syndrome ▪ Prolonged muscle weakness and difficulty breathing 	<ul style="list-style-type: none"> ▪ Paresthesia ▪ Obstetrical nerve palsy

Based on this review, we calculated the rate of serious anesthetic complications for these three hospitals for the period 2004/2005 through 2009/2010. Thirty-six women at these three sites had at least one anesthetic complication charted, for an incidence of 4.3 anesthetic complications per 10,000 deliveries. However, only seven of these women experienced a serious complication as assessed by the reviewers, yielding an estimated serious anesthetic complication rate of 0.84 per 10,000 deliveries.

Discussion

A rise in anesthetic complications of labour and delivery in BC was reported in Perinatal Service BC's Perinatal Health Report in 2008. A national comparison study noted that BC's rate of anesthetic complications was twice the national average. In response, a careful review of the high rate of anesthetic complications of labour and delivery was undertaken.

The increased rate of anesthetic complications in BC from 2005/2006 to 2007/2008 compared to the rate in 2004/2005 was found in part to be a result of local coding practices in two centres (BCPHP, 2010, also see the sidebar). Careful review of charts with cardiac, central nervous system, and pulmonary complications was undertaken at sites in two Health Authorities. This review found that 29% of these complications reflected significant harm caused to the patient as a result of anesthesia during labour and delivery. A larger proportion of coded pulmonary complications (75%) than cardiac (24%) or central nervous system (27%) complications were deemed serious and significant by the reviewers. The complication rate decreased by 80% when only serious complications were used to calculate the rate of anesthetic complications for a six-year period at these three sites. If the same pattern holds for the rest of the province, the incidence of anesthetic complications in BC may be lower than the rate of 2.8/10,000 reported by Liu et al, and more in line with the Canadian average of 1.4/10,000.

Conclusion

Perinatal Service BC's provincial perinatal surveillance system closely monitors temporal trends in perinatal health. When unexpected trends or increased rates elicit concerns, it is important to launch in-depth and rigorous

investigation to verify findings. Administrative data such as those contained in the Discharge Abstract Database (DAD) is essential for monitoring the utilization of health services, as well as patient experiences and outcomes. Health care leaders and stakeholders rely on accurate, credible, and comparable data to manage health services, inform decision-making, and develop or modify policy.

We applaud local quality improvement initiatives that are data-driven to continuously monitor clinical practice and improve patient outcomes. This case study reflects the challenges of balancing local need for detailed information on adverse events and outcomes with the need for nationally representative and consistent data. The DAD and ICD-10-CA provide discrete codes and typing for several anesthetic complications of labour and delivery, and are a convenient classification system for categorizing adverse events. The use of this pan-Canadian database to capture local quality improvement data using non-standard code definitions; however, may lead to inaccurate information at a provincial or national level. This risk is heightened for rare events such as severe complications of anesthesia. We acknowledge that local initiatives in quality improvement play a vital role in examining clinical practice; there are however other avenues for meeting this objective. To facilitate the capture of locally-relevant data for quality improvement, Health Authorities and hospitals may take advantage of the institution-specific fields in the DAD or in the PDR, which do not contribute to analyses at a national or provincial level. Clinicians and health care providers who seek to collect locally specific data may wish to discuss initiatives with Health Record experts and their regional CIHI representatives.

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