BC Perioperative Excellence

An Analysis of Surgical Volumes and Physical Operating Room Inventory in BC

March 14, 2014

Prepared for British Columbia Ministry of Health and the Provincial Surgical Advisory Council Perioperative Improvement Subcommittee (PSAC-PI)

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Acknowledgements

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Introduction

Perioperative services are a critical driver of overall health system performance in the province of British Columbia (BC). Each year, approximately 500,000 surgical cases are performed in hospitals across the province[1]. In 2011/2012, however, 50% of patients undergoing elective surgery waited more than 5.6 weeks and 10% waited more than 26.1 weeks. Moreover, whereas the number of patients on the BC surgical wait list has remained stable in recent years, the amount of time patients are waiting has increased significantly[2].

As such, shortening wait times for surgery remains an intense focus for the province as indicated in the BC Ministry of Health Revised 2011/12 – 2013/14 Service Plan. Performance Goal #4 in the Plan indicates targets for the average wait time for high demand non-emergency surgeries of 19, 17 and 15 weeks for 2011/12, 2012/13 and 2013/14 respectively. The actual average wait time for these surgeries was 22 weeks in 2011/12[3]. To meet the Ministry's targets, several initiatives aimed at improving wait list management, the number of long waiting patients and the rate of surgical cancellations are underway, including a patient prioritization methodology, best practice dissemination using National Surgical Quality Improvement Program (NSQIP) data and the province-wide perioperative process improvement program.

Project Context and Background

In June 2011, BC's physicians issued a policy paper, *Enhancing Surgical Care in BC*, which served as a catalyst for a provincial initiative focused on performance improvement in surgical care in BC. The paper, published by the BC Medical Association (BCMA), offered 12 recommendations. These recommendations included the development of a provincial framework for improving surgical quality, efficiency and access in BC hospitals that would be overseen by the Provincial Surgical Advisory Council (PSAC), and an examination by Health Authorities and hospitals on how seasonal OR closures can be shortened and unused or underutilized capacity can be used for increasing access and efficiency (see Appendix A).

Work commenced in November 2011 to develop a multi-year provincial framework for improving the patient experience and access to surgical services, as well as the quality of work life for those who deliver surgical care. The framework, known as the *Provincial Perioperative Performance Improvement Program* (PPPIP), was released in March 2012 and subsequently endorsed for implementation by the Perioperative Improvement Sub-Committee of PSAC (PSAC-PI). The three streams of work that comprise the program include: Management Structure and Function, Process Improvement and Resource Utilization. Figure 1 highlights the components of each stream of work, their staging and the expected outcomes. The development of an operating room (OR) inventory is highlighted as a key component of Stage 1 of the program.

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[1] "Surgical Wait Times", *BC Surgical Wait Times Website*. BC Ministry of Health.<www.health.gov.bc.ca/swt/>.
[2] "Adult Priority Areas", *BC Surgical Wait Times Website*. BC Ministry of Health. <www.health.gov.bc.ca/swt/faces/PriorityAreas.jsp>.
[3] BC Ministry of Health Revised 2011/12-2013/14 Service Plan. May 2011. <www.bcbudget.gov.bc.ca/2011/sp/pdf/ministry/hlth.pdf>.

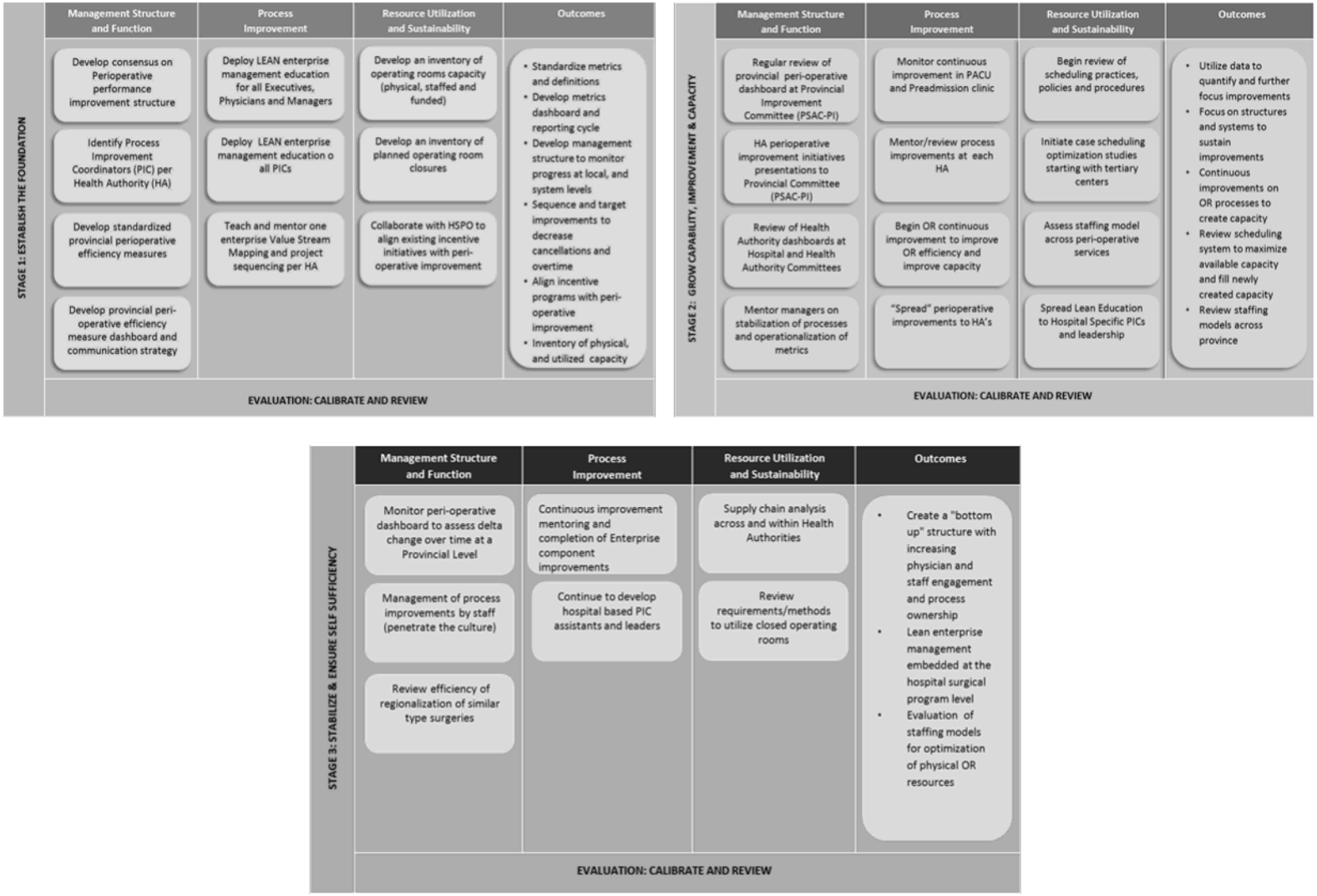

Figure 1: BC Provincial Perioperative Performance Improvement Program.

Why Develop an Inventory of Operating Rooms in the Province?
An initial step to a provincial approach to perioperative improvement requires a baseline understanding of physical, staffed and funded OR capacity provincially, regionally and organizationally. Moreover, establishing this baseline understanding of OR resources in the province and how they are used, provides the foundation necessary to:

- Understand how capacity is allocated across the province
- Identify unused and underutilized capacity in the system as a means to address the access to surgery challenge
- Inform a multi-faceted approach to provincial surgical capacity optimization
- Evaluate perioperative performance within the context of continuous improvement
- Inform capital planning and investment decisions

Project Goals and Objectives
The goal of the OR Inventory project, which this report summarizes, is to develop a comprehensive inventory of physical, funded and staffed operating room resources across the province of BC. Specific objectives of the project include:

- To develop an understanding of operating room capacity in the province in terms of the number and type of physical ORs and how they are distributed locally, regionally and provincially
- To develop an understanding of the use of current physical capacity and identify opportunities to increase access to surgery
- To establish a baseline from which to develop a supply-demand model of OR capacity in BC
- To develop an inaugural methodology as the basis for future provincial OR inventory efforts

Methodology

The methodology used to conduct this OR Inventory is outlined in the Figure 2 below:

Figure 2: BC Operating Room Inventory Methodology.

GE Healthcare developed a draft framework for the OR Inventory outlining the key evaluation questions to be addressed through the inventory and the data needed to address them. The OR Inventory framework was then presented to and approved by the OR Excellence Working Group, a sub-committee of PSAC. (The Working Group included stakeholders from the BC Ministry of Health, the Health Authorities and PSAC.) Following approval of the framework, GE Healthcare met with the Surgical Directors from each Health Authority to develop data definitions for the data to be collected as part of the OR Inventory. Based on the approved framework and data definitions, GE Health prepared an MS Excel-based data collection template in which to collect data for the OR Inventory (see Methodology Details below for details on the contents of the template). Subsequently, GE Healthcare again met with the Surgical Director (or their delegate) for each Health Authority to review the data to be collected and ensure any required clarifications around the template and data requirements were addressed. In some instances, GE Healthcare met directly with representatives from individual hospitals as needed. Following a review of the inventory data collected from each Health Authority, GE Healthcare identified any details requiring clarification and/or validation, communicated these details to the Surgical Director (or their delegate) at each Health Authority and set up validation meetings with them to review the necessary clarifications. Where required, the Surgical Directors sought additional clarification from representatives at individual hospitals and re-submitted the updated template to GE Healthcare. In some cases, multiple validation meetings were conducted to ensure all points of clarification were addressed. Completed and validated templates from each Health Authority were then used as the basis for the analysis contained in this report.

It should be noted that although the Excel-based data collection template was initially used to collect data on OR volumes (including level of care and unplanned surgical volumes data) as well as details on physical OR capacity from individual hospitals, data quality and consistency issues across hospitals and Health Authorities were identified with the volume data. Although useful volume data was extracted, it was ultimately decided that data from the Canadian Institute for Health Information's (CIHI's) Discharge Abstract Database would be used to support analysis of surgical volumes (including level of care and unplanned volumes) as this would ensure standardized and comparable data across all hospitals and Health Authorities.

Methodology Details

The following are details of the methodology that guided data collection and analysis of the BC OR Inventory project:

- As previously noted, to support analysis of OR volumes, levels of care and unplanned surgical volumes, DAD data was used to ensure standardized and comparable data across all Health Authorities. Data from three recently completed fiscal years was used (2009/10 - 2011/12). It should be noted, however, that categorization of surgical cases in the DAD are based on CIHI's intervention partition list (developed as part of the CMG+ grouper methodology) and include more invasive and significant interventions (e.g. cardiac catheterization). As such, the analysis of DAD data was divided into two groupings where appropriate: Main OR volumes, which represent surgical cases performed in a hospital's main operating rooms (as coded in the DAD), as well as Other Surgical volumes which represent surgical cases performed in other locations across a hospital (as coded in the DAD)[4]. In order to maintain focus on OR procedures, the analysis focused primarily on Main OR volumes.
- The physical inventory examined both Main ORs (ORs located within a traditional OR Department) as well as Minor ORs and Procedure Rooms located outside the Main ORs. The definition used for a Procedure Room for the purposes of this inventory was a room that provides for minor or major surgical procedures in conjunction with oral, parenteral, or IV sedation, or under analgesic or dissociative drugs, to exclude Cardiac, Interventional Radiology and Angiography procedure rooms. The definition used for a Minor OR for the purposes of this inventory was a room that provides for minor surgical procedures performed under topical, local or regional anaesthesia without preoperative sedation. The primary focus of the inventory, however, was on Main ORs.
- For Main ORs, data was collected on the number of physical, funded and staffed rooms, hours of operation for staffed rooms, multipurpose usage restrictions on Main ORs, PACU related delays (though many hospitals could not provide this data), high level staffing model details, and the frequency and duration of Main OR closures. Similar details were collected for Minor ORs and Procedure Rooms, though no data was collected on usage restrictions and closures. Note that where ORs are only funded and staffed to operate on certain days of the week, this is reflected accordingly in the data (for example, an OR that is only staffed one weekday per week is counted as 0.2 staffed rooms; an OR that is only staffed two weekdays per week is counted as 0.4 staffed rooms, etc.). Additionally, when examining the extent of after-hours and weekend operations, on call ORs were not counted.
- OR closures are reported as the percentage of day-time capacity closed in a given period (i.e. in December for Christmas holiday, in March for Spring Break, during the summer for summer holidays and overall throughout the whole year). The percent of OR capacity closed was calculated by dividing the total hours of closures for the period by the day-time OR capacity for the period. (To calculate each hospital's day-time OR

[4] Other locations include: Endoscopic Room (including GI Unit), Nursing Unit, Outpatient Department, Therapeutic Abortion Unit, Diagnostic Imaging Department, Emergency Department, Cardiac Catheterization Room, Ambulatory OR (or Treatment Room), Obstetrics Case Room or Obstetrical OR, or other intervention locations.

capacity for a period, the hospital's daily weekday hours were multiplied by the number of weekdays in the period, exclusive of any statutory holidays. Evening, night and weekend OR blocks were excluded as these are typically staffed to perform urgent and emergent cases only and are typically not affected by closures.) Percentage of capacity closed is reported exclusive of statutory holidays, on which ORs would normally be expected to be closed.

- The inventory data validation step focused not only on ensuring the accuracy of the data, but also on ensuring, to the extent possible, the consistency of the data across hospitals and Health Authorities (and understanding any differences). For example, some hospitals have Maternity ORs as part of their Main OR suites (and thus were captured as part of their Main ORs) and others have Maternity ORs located at other locations of the hospital (and thus were captured as part of their Minor ORs and Procedure Rooms). To account for this, any Main ORs that have multi-purpose usage restrictions (such as Maternity ORs) have been identified accordingly in this inventory report.

Key Findings

Interior Health Authority

Surgical volumes have increased by 10.8% in Interior Health Authority over the period 2009/10 - 2011/12, from 93,937 cases to 104,146 cases. Main OR volumes and Other Surgical volumes have both contributed to this increase, with increases of 5.8% and 17.3% respectively. While many hospitals have shown modest volume increases over the period examined, Kelowna General Hospital demonstrated a substantial 37% increase in Other Surgical volumes. Over the same period, the population of Interior Health Authority has increased by 0.4%, from 734,236 to 737,468.

Interior Health Authority has the third highest percentage of day surgery cases of all Health Authorities for Main OR volumes at ~62%, as well as the third highest percentage for all surgical volumes at ~79%. Additionally, in 2011/12, Interior Health Authority had the second lowest percentage of unplanned cases (for Main OR volumes) of all Health Authorities, with the percentage having steadily decreased from 18.1% in 2009/10 to 16.9% in 2011/12, mirroring the trend for most other Health Authorities. Interior Health Authority has performed a relatively stable number of C-sections for the period 2009/10 - 2011/12 (ranging between from 1843 to 1914 per year), with almost all performed in Main ORs. Additionally, over the period examined, Interior Health Authority has the second least resource intensive surgical case mix of all Health Authorities for its Main OR volumes in terms of both average OR case duration as well as average case Resource Intensity Weight[5] (though this might be expected given the relatively high day surgery percentage at Interior Health Authority).

In terms of Main OR capacity, Interior Health Authority has 52 physical ORs, the third lowest among all Health Authorities, with 96% (50) of the ORs regularly staffed (please refer to Table 2). Funding was cited as the reason for unstaffed ORs. Interior Health Authority was not able to provide data on Main OR closures nor was it able to provide information on Procedure Rooms and Minor ORs in the Health Authority.

Fraser Health Authority

Surgical volumes have increased by 6.4% in Fraser Health Authority over the period 2009/10 - 2011/12, from 143,332 cases to 152,445 cases. Other Surgical volumes have accounted for most of this increase with a very small increase in Main OR volumes. While many hospitals have shown modest volume increases over the period examined, Surrey Memorial Hospital demonstrated a substantial decrease in both Main OR and Other Surgical volumes from 2010/11 to 2011/12 (20.8% and 33.3% respectively), though this was due to the 2011 opening

[5] Resource Intensity Weight (RIW) is a relative case weight used to measure the intensity of resource use associated with a case and is assigned for a hospital stay and not a specific surgical case.

of the Jim Pattison Outpatient Care & Surgery Centre. Over the same period, the population of Fraser Health Authority has increased by 3.5%, from 1,574,548 to 1,629,695.

Fraser Health Authority has the second lowest percentage of day surgery cases of all Health Authorities for Main OR volumes at ~60%, and the second highest percentage for all surgical volumes at ~79%. Additionally, in 2011/12, Fraser Health Authority had the third highest percentage of unplanned cases (for Main OR volumes) of all Health Authorities, though the percentage has decreased slightly from 18.8% in 2009/10 to 18.3% in 2011/12, mirroring the trend for most other Health Authorities. Fraser Health Authority has seen a small 4.1% increase in C-section volumes for the period 2009/10 - 2011/12 (from 4861 to 5058), with ~67% of C-sections performed in Main ORs. Additionally, over the period examined, Fraser Health Authority has the third least resource intensive surgical case mix of all Health Authorities for its Main OR volumes in terms of average OR case duration, and the second most in terms of average case RIW.

In terms of Main OR capacity, Fraser Health Authority has 72 physical ORs, the highest among all Health Authorities, with 77% (55.4) of the ORs regularly staffed (please refer to Table 3). Funding was cited as the reason for unstaffed ORs. In terms of Main OR closures, Fraser Health Authority closes an estimated 7% of its day-time capacity annually due to Christmas, Spring Break and summer holidays, with the highest period of closure occurring in the summer when an estimated 21% of day-time OR capacity is closed (please refer to Table 9). In addition to its Main ORs, Fraser Health Authority has three Procedure Rooms, only one of which is regularly staffed, and 47 Minor ORs, of which 77% (36.2) are regularly staffed, throughout the Health Authority. The Minor ORs are predominantly ambulatory procedure rooms (please refer to Table 15).

Vancouver Coastal Health Authority

Surgical volumes have increased by 4.6% in Vancouver Coastal Health Authority over the period 2009/10 - 2011/12, from 129,088 cases to 135,002 cases. Main OR volumes and Other Surgical volumes have both contributed to this increase, with increases of 3.8% and 5.5% respectively. Most hospitals have shown modest volume increases over the period examined, with UBC Health Sciences Centre showing a modest decrease in both Main OR and Other Surgical volumes. Over the same period, the population of Vancouver Coastal Health Authority has increased by 3.5%, from 1,115,015 to 1,153,753.

Vancouver Coastal Health Authority has the lowest percentage of day surgery cases of all Health Authorities for Main OR volumes at ~56%, and the second lowest percentage for all surgical volumes at ~75%. Additionally, in 2011/12, Vancouver Coastal Health Authority had the second highest percentage of unplanned cases (for Main OR volumes) of all Health Authorities, though the percentage has steadily decreased from 24.9% in 2009/10 to 19.1% in 2011/12, mirroring the trend for most other Health Authorities. Vancouver Coastal Health Authority has seen a small 2.6% increase in C-section volumes for the period 2009/10 - 2011/12 (from 1736 to 1782), with ~60% of C-sections performed in Main ORs. Additionally, over the period

examined, Vancouver Coastal Health Authority has the most resource intensive surgical case mix of all Health Authorities for its Main OR volumes in terms of both average OR case duration as well as average case RIW (though this might be expected given the relatively low day surgery percentage at Vancouver Coastal Health Authority).

In terms of Main OR capacity, Vancouver Costal Health Authority has 67 physical ORs, the second highest among all Health Authorities, with 94% (63.2) of the ORs regularly staffed (please refer to Table 4). The Health Authority did not provide a reason for unstaffed ORs. In terms of Main OR closures, Vancouver Coastal Health Authority closes an estimated 6% of its day-time capacity annually due to Christmas, Spring Break and summer holidays, with the highest period of closure occurring in the summer when an estimated 18% of day-time OR capacity is closed (please refer to Table 10). In addition to its Main ORs, Vancouver Coastal Health Authority has five Procedure Rooms, of which 4.6 are regularly staffed, and five Minor ORs, all of which are regularly staffed, throughout the Health Authority (please refer to Table 16).

Vancouver Island Health Authority

Surgical volumes have increased by 9% in Vancouver Island Health Authority over the period 2009/10 - 2011/12, from 86,779 cases to 94,611 cases. Main OR volumes and Other Surgical volumes have both contributed to this increase, with increases of 5.2% and 14.2% respectively. While many hospitals have shown modest volume increases over the period examined, Royal Jubilee Hospital and Nanaimo Regional General Hospital demonstrated substantial increases in Other Surgical volumes, at 18.7% and 28.9% respectively. Over the same period, the population of Vancouver Island Health Authority has increased by 1.6%, from 750,282 to 761,990.

Vancouver Island Health Authority has the third lowest percentage of day surgery cases of all Health Authorities for Main OR volumes at ~60%, and the lowest percentage for all surgical volumes at ~74%. Additionally, in 2011/12, Vancouver Island Health Authority had the highest percentage of unplanned cases (for Main OR volumes) of all Health Authorities, though the percentage has steadily decreased from 21.1% in 2009/10 to 19.5% in 2011/12, mirroring the trend for most other Health Authorities. Vancouver Island Health Authority has performed a relatively stable number of C-sections for the period 2009/10 - 2011/12 (ranging between 1793 and 1827 per year), with only ~20% of C-sections performed in Main ORs. Additionally, over the period examined, Vancouver Island Health Authority has the third most resource intensive surgical case mix of all Health Authorities for its Main OR volumes in terms of average OR case duration and tied for the third most in terms of average case RIW.

In terms of Main OR capacity, Vancouver Island Health Authority has 58 physical ORs, the third highest among all Health Authorities, with 72% (42) of the ORs regularly staffed (please refer to Table 5). Funding together with staffing challenges (specifically with anesthesiology availability at Saanich Peninsula Hospital) were cited as the reasons for unstaffed ORs. In terms of Main OR closures, Vancouver Island Health Authority closes an estimated 10% of its day-time capacity annually due to Christmas, Spring Break and summer holidays, with the highest period

of closure occurring in the summer when an estimated 30% of day-time OR capacity is closed (please refer to Table 11). In addition to its Main ORs, Vancouver Island Health Authority has three Procedure Rooms, all of which are regularly staffed, and 12 Minor ORs, 11 of which are regularly staffed, throughout the Health Authority (please refer to Table 17).

Northern Health Authority

Surgical volumes have increased by 6.8% in Northern Health Authority over the period 2009/10 - 2011/12, from 30,483 cases to 32,555 cases. Other Surgical volumes have accounted for most of this increase, with a very small increase in Main OR volumes. Moreover, the University Hospital of Northern BC has accounted for most of this volume increase. Over the same period, the population of Northern Health Authority has increased by 1.6%, from 285,866 to 290,415.

Northern Health Authority has the second highest percentage of day surgery cases of all Health Authorities for Main OR volumes at ~70%, and the highest for all surgical volumes at ~80%. Additionally, in 2011/12, Northern Health Authority had the third lowest percentage of unplanned cases (for Main OR volumes) of all Health Authorities, though the percentage has steadily increased from 15.5% in 2009/10 to 17.6% in 2011/12, while this trend has decreased for all other Health Authorities. Northern Health Authority has performed a relatively stable number of C-sections for the period 2009/10 - 2011/12 (ranging between 906 and 981 per year), with almost all performed in Main ORs. Additionally, over the period examined, Northern Health Authority has the least resource intensive surgical case mix of all Health Authorities for its Main OR volumes in terms of both average OR case duration as well as average case RIW (though this might be expected given Northern Health Authority has the highest day surgery percentage).

In terms of Main OR capacity, Northern Health Authority has 33 physical ORs, the second lowest among all Health Authorities, with 59% (19.6) of the ORs regularly staffed (please refer to Table 6). Funding as well as staffing challenges (specifically with anesthesiology availability at Dawson Creek District Hospital and Kitimat General Hospital) and insufficient patient demand (specifically at G.R. Baker Memorial Hospital, Fort Nelson General Hospital and Prince Rupert Regional Hospital) were cited as the reasons for unstaffed ORs. In terms of Main OR closures, Northern Health Authority closes an estimated 11% of its day-time capacity annually due to Christmas, Spring Break and summer holidays, with the highest period of closure occurring in the summer when an estimated 40% of day-time OR capacity is closed (please refer to Table 12). Northern Health Authority does not have any Procedure Rooms or Minor ORs outside of its Main ORs (save for some endoscopy rooms that do not have anesthesia coverage).

Provincial Health Services Authority

Surgical volumes have increased by 3.3 % in Provincial Health Services Authority over the period 2009/10 - 2011/12, from 17,981 cases to 18,579 cases. Main OR volumes and Other Surgical volumes have both contributed to this increase, with increases of 2.3% and 4.2%

respectively. BC Children's Hospital has accounted for virtually all of this increase, demonstrating a substantial increase in Main OR and Other Surgical volumes from 2009/10 to 2011/12 (10.6% and 13.6% respectively).

Provincial Health Services Authority has the highest percentage of day surgery cases of all Health Authorities for Main OR volumes at ~75%, and the third lowest percentage for all surgical volumes also at ~75%. Additionally, in 2011/12, Provincial Health Services Authority had the lowest percentage of unplanned cases (for Main OR volumes) of all Health Authorities, with the percentage having decreased slightly from 10.3% in 2009/10 to 8.9% in 2011/12, mirroring the trend for most other Health Authorities. Provincial Health Services Authority has seen a 5.9% decrease in C-section volumes for the period 2009/10 - 2011/12 (from 2195 to 2066), with all C-sections performed in dedicated obstetrical ORs at BC Women's Hospital. Additionally, over the period examined, Provincial Health Services Authority has the second most resource intensive surgical case mix of all Health Authorities for its Main OR volumes in terms of average OR case duration, and tied for the third most in terms of average case RIW.

In terms of Main OR capacity, Provincial Health Services Authority has 13 physical ORs, the lowest among all Health Authorities, with 92% (12) of the ORs regularly staffed (please refer to Table 7). In terms of Main OR closures, Provincial Health Services Authority closes an estimated 3% of its day-time capacity annually due to Christmas, Spring Break and summer holidays, with the highest period of closure occurring during Christmas time when an estimated 22% of day-time OR capacity is closed (please refer to Table 13). In addition to its Main ORs, Provincial Health Services Authority has eight Procedure Rooms, all of which are regularly staffed, and no Minor ORs throughout the Health Authority (please refer to Table 18).

BC

Surgical volumes have increased by 7.1% province-wide over the period 2009/10 - 2011/12, from 501,600 cases to 537,338 cases. Main OR volumes and Other Surgical volumes have both contributed to this increase, with increases of 3.8% and 11.1% respectively. Over the same period, the population of BC has increased by 2.5%, from 4,459,947 to 4,573,321, though clearly surgical volumes increased at a more rapid rate.

Province-wide, about 60% of Main OR volumes are performed on a day surgery basis and about 77% of all surgical volumes are performed on a day surgery basis, with both percentages having increased by ~2% over the period 2009/10 - 2011/12. Additionally, in 2011/12, province-wide 18.1% of Main OR cases were unplanned, down from 20.1% in 2009/10. The province has seen a small 0.5% increase in C-section volumes for the period 2009/10 - 2011/12 (from 13,477 to 13,542), with ~55% of C-sections performed in Main ORs.

In terms of Main OR capacity, across the province there are 295 physical ORs, with 82% (242.2) of them regularly staffed (please refer to Table 8). As noted above, funding was most commonly cited as the reason for unstaffed ORs, though in a few cases staffing challenges and insufficient patient demand also contributed. Province-wide, relatively few of the ORs operate on

evenings and weekends (beyond being on-call) and those that do are typically staffed to handle urgent and/or emergent cases only. In terms of Main OR closures, an estimated 7% of day-time OR capacity is closed annually across the province[6] due to Christmas, Spring Break and summer holidays, with the highest period of closure occurring in the summer when an estimated 23% of day-time OR capacity is closed (please refer to Table 14). In addition to the Main ORs across the province, there are also 19 Procedure Rooms, 87% (16.6) of which are regularly staffed, and 64 Minor ORs, 82% (52.2) of which are regularly staffed, throughout the province[7] (please refer to Table 19).

Summary of Findings

A summary of key findings from the OR Inventory project is outlined in Table 1 below.

[6] Excluding Interior Health Authority, which was not able to provide this information.
[7] Excluding Interior Health Authority, which was not able to provide this information.

	Interior Health Authority	Fraser Health Authority	Vancouver Coastal Health Authority	Vancouver Island Health Authority	Northern Health Authority	Provincial Health Services Authority	BC Total
2011/12 surgical volumes	104,146	152,445	135,002	94,611	32,555	18,579	537,338
Surgical volumes growth from 2009/10 - 2011/12	10.9%	6.4%	4.6%	9.0%	6.8%	3.3%	7.1%
Population growth from 2009/10 - 2011/12	0.4%	3.5%	3.5%	1.6%	1.6%	N/A	2.5%
2011/12 percent of day surgery cases (Main OR only)	62.8%	59.8%	56.5%	60.2%	69.1%	75.4%	60.8%
2011/12 percent of day surgery cases (all surgical volumes)	79.2%	79.3%	75.0%	74.4%	81.4%	75.5%	77.4%
2011/12 percent of unplanned cases (Main OR only)	16.9%	18.3%	19.1%	19.5%	17.6%	8.9%	18.1%
2011/12 C-section volumes	1,880	5,058	1,782	1,793	963	2,066	13,542
C-section volumes growth from 2009/10 - 2011/12	-1.8%	4.1%	2.6%	0.2%	-1.8%	-5.9%	0.5%
Average Resource Intensity Weight[8] (Main OR cases only, 2009/10 - 2011/12)	0.78	0.96	1.14	0.92	0.61	0.92	0.94
Number of Main ORs	52 (96% regularly staffed)	72 (77% regularly staffed)	67 (94% regularly staffed)	58 (72% regularly staffed)	33 (59% regularly staffed)	13 (92% regularly staffed)	295 (82% regularly staffed)
Percent of day-time Main OR capacity closed annually	Not available	7%	6%	10%	11%	3%	7%[9]
Number of Procedure Rooms and Minor ORs	Not available	50 (74% regularly staffed)	10 (96% regularly staffed)	15 (93% regularly staffed)	No Procedure Rooms or Minor ORs	8 (100% regularly staffed)	83[10] (83% regularly staffed)

Table 1: OR Inventory project summary of key findings.

[8] RIW is a relative case weight used to measure the intensity of resource use associated with a case and is assigned for a hospital stay and not a specific surgical case.
[9] Excluding Interior Health Authority, which was not able to provide this information.
[10] Excluding Interior Health Authority, which was not able to provide this information.

Analysis

OR Demand and Case Mix

As previously noted in the methodology section, data on OR demand and case mix was extracted from CIHI's Discharge Abstract Database (DAD).

Volumes

Figure 3 below displays the surgical volumes for each Heath Authority as well as for the province of BC overall for the period 2009/10 - 2011/12. Volumes have been divided into two groupings: Main OR volumes, which represent surgical cases performed in a hospital's main operating rooms (as coded in the DAD) as well as Other Surgical volumes which represent surgical cases performed in other locations across a hospital (as coded in the DAD)[11]. As previously mentioned, it should be noted that categorization of surgical cases in the DAD are based on CIHI's intervention partition list (developed as part of the CMG+ grouper methodology) and include more invasive and significant interventions (e.g. cardiac catheterization). As such, in order to maintain focus on OR procedures, the analysis below will focus primarily on Main OR volumes.

[11] Other locations include: Endoscopic Room (including GI Unit), Nursing Unit, Outpatient Department, Therapeutic Abortion Unit, Diagnostic Imaging Department, Emergency Department, Cardiac Catheterization Room, Ambulatory OR (or Treatment Room), Obstetrics Case Room or Obstetrical OR, or other intervention locations.

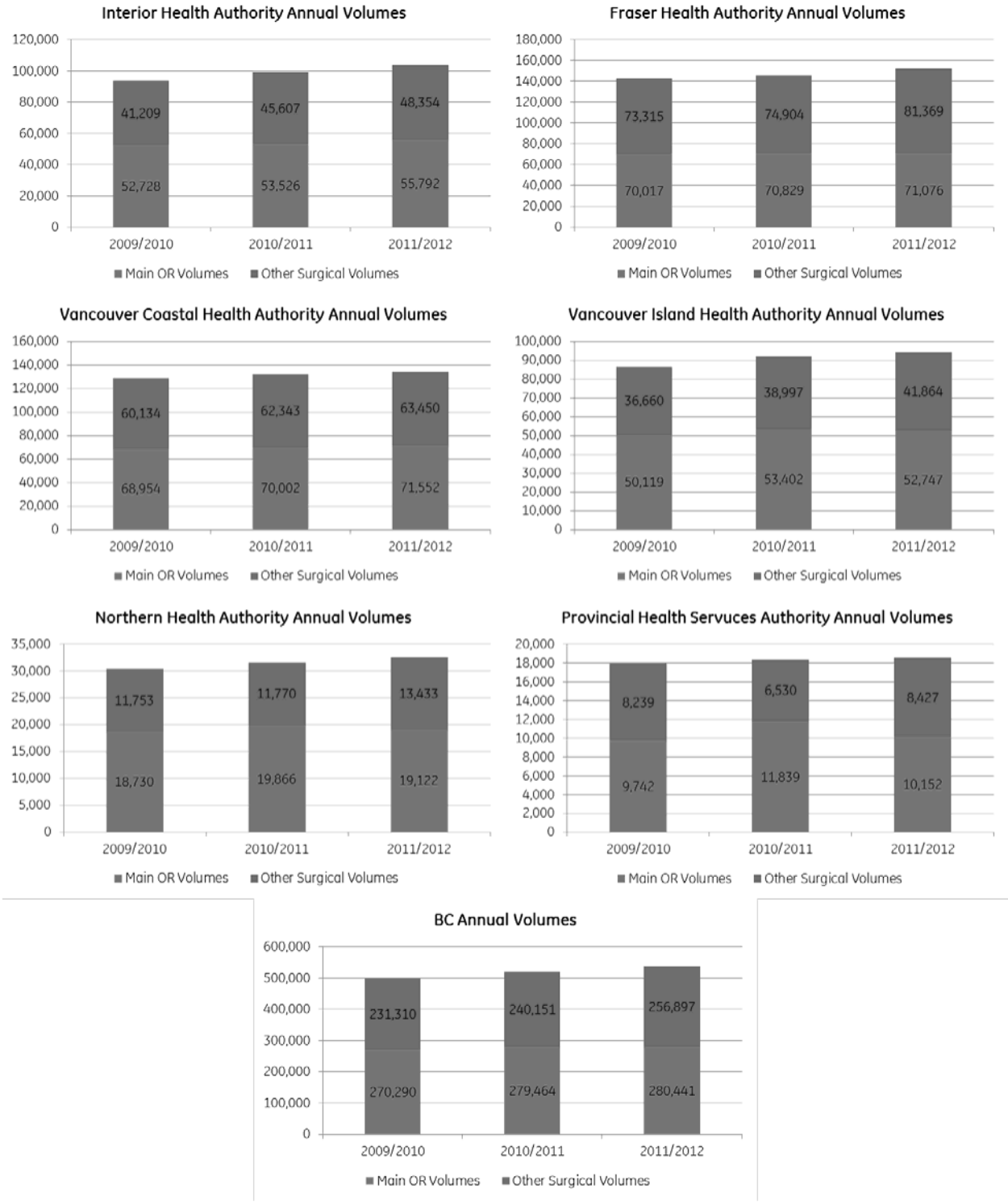

Figure 3: Annual surgical volumes for each Health Authority and BC for the period 2009/10 - 2011/12.

Figure 3 above illustrates that total surgical volumes are increasing across all Health Authorities, both in terms of Main OR volumes and Other Surgical volumes. It should be noted that over the period examined, the population of BC increased by 2.5%, from 4,459,947 to 4,573,321. Moreover, all regional Health Authorities experienced population increases over this period, ranging from 0.4% (Northern Health Authority) to 3.5% increase (Fraser Health Authority and Vancouver Coastal Health Authority).

Figure 4 below, however, shows that at most Health Authorities, as well as for BC overall, Main OR volumes as a percentage of total surgical volumes are decreasing. Whereas some of this trend may be due to coding changes (i.e. how intervention locations are coded in DAD data), it may also suggest a general trend of moving less complex and invasive surgical interventions out of main ORs and into other locations across a hospital (i.e. procedure rooms, ambulatory ORs, etc.). It should be noted that the spike in Main OR volumes as a percentage of total surgical volumes for Provincial Health Services Authority in 2010/11 is the result of a temporary DAD intervention location coding change at BC Women's Hospital, wherein approximately 2000 inpatient C-section procedures were coded as being performed in Main ORs instead of Obstetrical ORs[12].

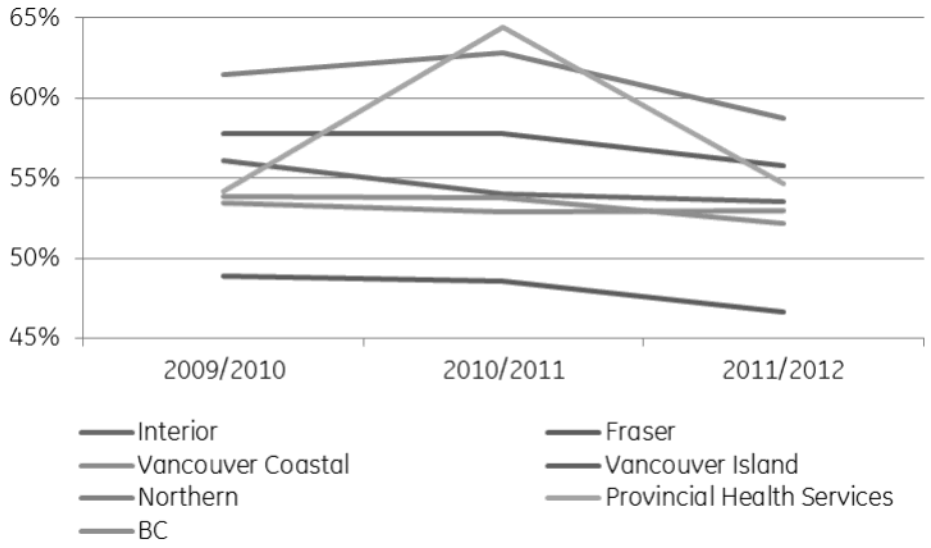

Figure 4: Main OR volumes as a percentage of total surgical volumes.

Volume trends for both Main OR volumes as well as Other Surgical volumes have been provided at the hospital level in Appendix B. While most hospitals demonstrate increasing Main OR and Other Surgical volumes, some demonstrate decreasing volumes (e.g. Surrey Memorial Hospital in Fraser Health Authority which saw a 20.8% decrease in Main OR volumes and a 33.3% in Other Surgical volumes from 2010/11 to 2011/12, though this decrease was due to the

[12] The location coding change was initially made to accommodate new data collection requirements, and was subsequently reversed in 2011/12 to align with updated CIHI guidelines.

2011 opening of the Jim Pattison Outpatient Care & Surgery Centre). It is also important to note that in some cases, observed trends can be due to DAD location coding changes, and as such Main OR volumes and Other Surgical volumes should be examined together when looking at hospital-level trends. (For example, at Shuswap Lake General Hospital in Interior Health Authority and at Prince Rupert Regional Hospital in Northern Health Authority, a significant increase in Main OR volumes is observed from 2009/10 to 2010/11, however the corresponding decrease in Other Surgical volumes at both hospitals suggests this increase is due to DAD location coding changes.)

Care Level

As day surgery cases are less resource intensive than inpatient surgical cases and better for patients, conducting surgery on a day surgery basis wherever appropriate is recommended as a perioperative best practice[13]. Moreover, some institutions have reorganized OR schedules to perform day surgery cases early in the day so as to provide an opportunity for inpatient beds to clear, thereby decreasing congestion and delays in the Post-Anesthesia Care Unit (PACU). Figure 5 below depicts the trend in day surgery cases as a percentage of total cases for Main OR volumes across Health Authorities and BC as a whole for the period 2009/10 - 2011/12.

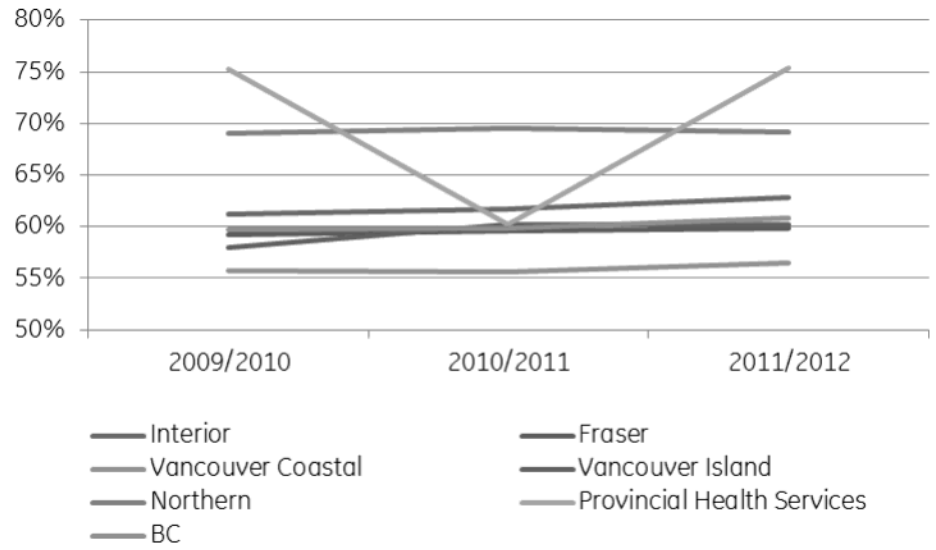

Figure 5: Day surgery cases as a percentage of total cases for Main OR volumes.

Similarly, Figure 6 below depicts the trend in day surgery cases as a percentage of total *planned* (i.e. elective) cases for Main OR volumes across Health Authorities and BC as a whole

[13] *Report of the Surgical Process Analysis and Improvement Expert Panel* (Zellermeyer V, Expert Panel Chair), June 2005.

for the period 2009/10 - 2011/12. Note that the sharp one-year decrease in day surgery cases as a percentage of total cases for Main OR volumes in Figure 5 (as well as the smaller decrease in Figure 6) for the Provincial Health Services Authority in 2010/11 is simply the result of a temporary location coding change (and not a change in clinical practice) at BC Women's Hospital, as previously described, wherein approximately 2000 inpatient C-section procedures were coded as being performed in Main ORs instead of Obstetrical ORs, thereby decreasing the overall proportion of Main OR day surgery cases.

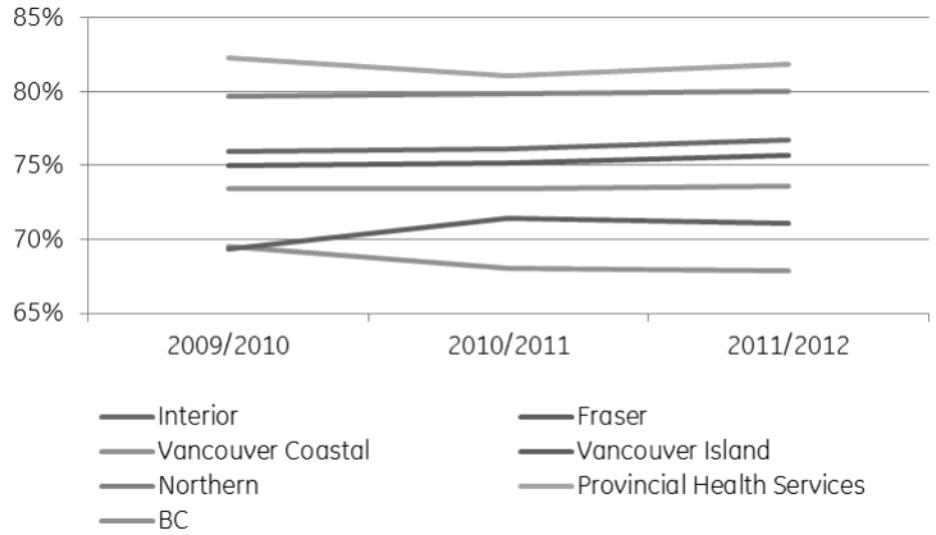

Figure 6: Day surgery cases as a percentage of total *planned* cases for Main OR volumes.

As would be expected, the percentage of day surgery cases is higher when only looking at planned volumes, as unplanned (i.e. urgent or emergent) cases tend to be performed on an inpatient basis. Both Figure 5 and Figure 6 demonstrate a relatively stable trend in the percentage of day surgery cases, with marked variability across Health Authorities. This variability across Health Authorities (as well as the variability across individual hospitals) is likely influenced by several factors, including hospital-specific practice patterns, patient acuity (e.g. a hospital treating higher acuity patients may treat fewer as day surgery cases) and demographic factors (e.g. average patient distance from the hospital).

Additionally, it should be noted that because both Figure 5 and Figure 6 above look only at Main OR volumes, they may represent artificially low day surgery percentages in situations where hospitals have the practice of performing most or all day surgery cases outside of their Main ORs (i.e. in Ambulatory ORs). By way of comparison, Figure 7 and Figure 8 below demonstrate the trend in day surgery cases as a percentage of total cases and total *planned* cases respectively across Health Authorities, for *all* surgical volumes (Main OR and Other volumes). As previously noted, however, due to the categorization of surgical cases based on CIHI's intervention partition list, the figures below also include more invasive and significant interventions (e.g. cardiac catheterization) in their data samples.

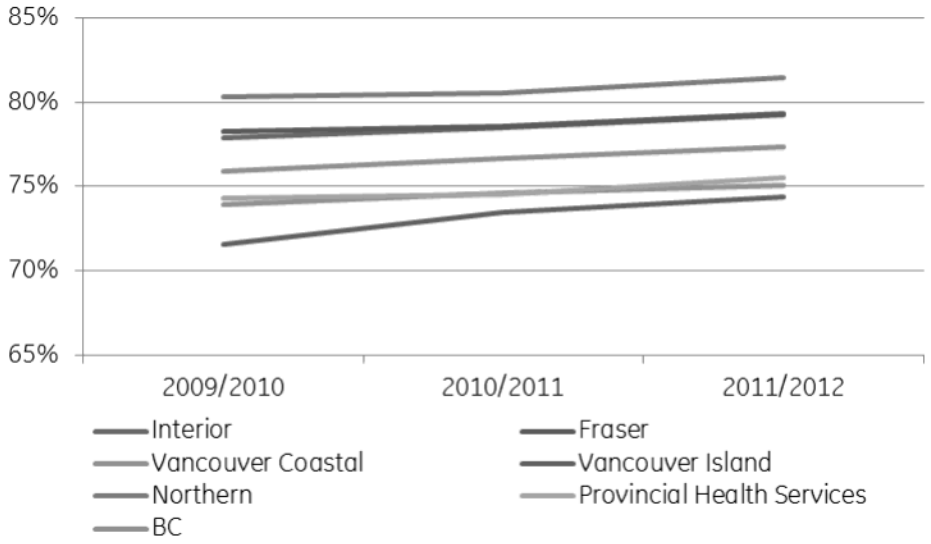

Figure 7: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes).

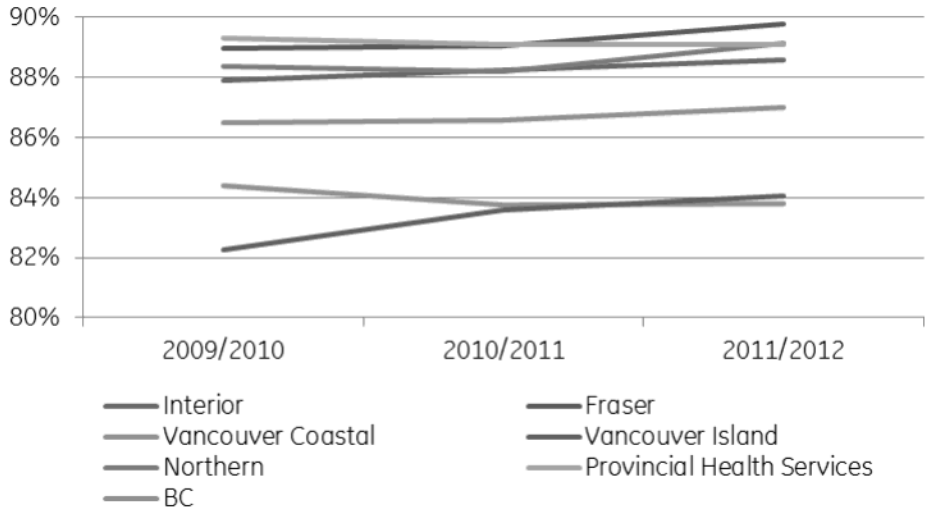

Figure 8: Day surgery cases as a percentage of total cases for all *planned* surgical volumes (Main OR and Other volumes).

Day surgery cases as a percentage of total surgical volumes have been provided at the hospital level in Appendix B.

Unplanned Cases

Unplanned cases consist of urgent and emergent cases (the DAD does not distinguish between them) though the majority of unplanned cases are likely urgent cases. In practice, it would be ideal to distinguish between urgent and emergent cases as the former category may have significantly greater predictability and scheduling flexibility. Figure 9 below depicts the trend in unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes across Health Authorities and BC as a whole for the period 2009/10 - 2011/12.

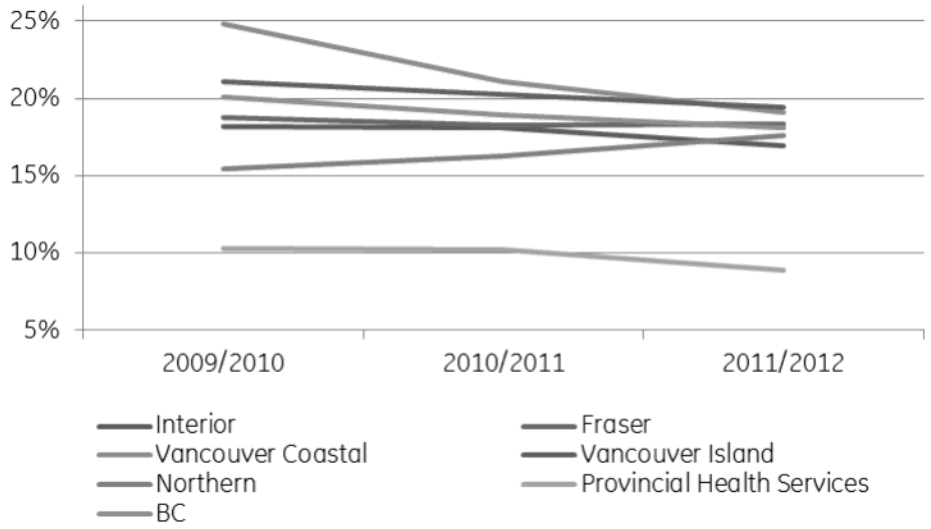

Figure 9: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes.

As can be seen from Figure 9, unplanned cases as a percentage of total cases have decreased across all Health Authorities, with the exception of Northern Health Authority, and BC as a whole, which experienced a decline from 20.1% in 2009/10 to 18.1% in 2011/12. A similar trend is seen when looking at the percentage of unplanned surgical cases across all hospital locations which suggests this decrease is not due to a shift in performing unplanned cases outside of Main ORs. This trend towards decreasing unplanned cases should make it easier for hospitals to schedule and manage their planned (i.e. elective) surgical volumes.

Understanding the volume of unplanned cases is critical as they can impact the scheduling of planned cases and result in scheduled cases getting bumped if there is inadequate time or resources to perform both planned and unplanned cases. Typically, to manage unplanned cases, hospitals can allocate a dedicated urgent/emergent room or block, they can leave gaps within the elective (planned) schedule into which urgent/emergent cases can be slotted, or they can perform urgent/emergent cases as add-ons at the end of the day. However, it is a recommended best practice to manage unplanned cases as part of regular operating room time rather than leaving them to the end of the surgical day (as this can increase overtime costs and

reduce staff satisfaction)[14]. If the daily elective schedule is fully utilized and add-ons are commonplace, a dedicated urgent/emergent room during elective hours may be warranted[15]. Moreover, since the total hours of urgent/emergent cases over a period will be statistically independent of the total hours of elective cases, it is generally appropriate to allocate OR time separately for urgent/emergent cases (e.g. via a dedicated urgent/emergent room)[16]. It has been recommended that all surgical suites containing around 10 or more ORs have a dedicated urgent/emergent room[17]. Additionally, an urgent/emergent room may also reduce the length of stay (and therefore the cost of care) for such cases, as some patients may be treated early in the day and discharged the day of surgery. This cannot be done if urgent/emergent cases are handled as add-ons at the end of the day. Trends in the percentage of unplanned cases for Main OR volumes at the hospital level have been provided in Appendix B.

C-sections

Figure 10 displays the C-section volumes for each Heath Authority as well as for the province of BC overall for the period 2009/10 - 2011/12. C-section volumes have been divided into two groupings: Main OR volumes, which represent C-sections performed in a hospital's main operating rooms (as coded in the DAD), as well as Other Location volumes, which represent C-sections performed at other locations across a hospital (as coded in the DAD, and most commonly representing obstetrics case rooms or obstetrical ORs located away from a hospital's main OR suites).

[14] *Report of the Surgical Process Analysis and Improvement Expert Panel* (Zellermeyer V, Expert Panel Chair), June 2005.
[15] Institute for Healthcare Improvement. *Dedicate Operating Room(s) for Unscheduled Surgeries*. <http://www.ihi.org/IHI/Topics/Flow/PatientFlow/Changes/IndividualChanges/DedicateOperatingRoom(s)forUnscheduledSurgeries.htm>.
[16] Dexter F, *et al*. (1999). An Operating Room Scheduling Strategy to Maximize the Use of Operating Room Block Time: Computer Simulation of Patient Scheduling and Survey of Patients' Preferences for Surgical Waiting Time. *Anesthesia & Analgesia*, 89, pp. 7 – 20.
[17] Paterson P (2005). What's the Best Way to Manage Urgent and Emergent OR Cases? *OR Manager*, 21(3).

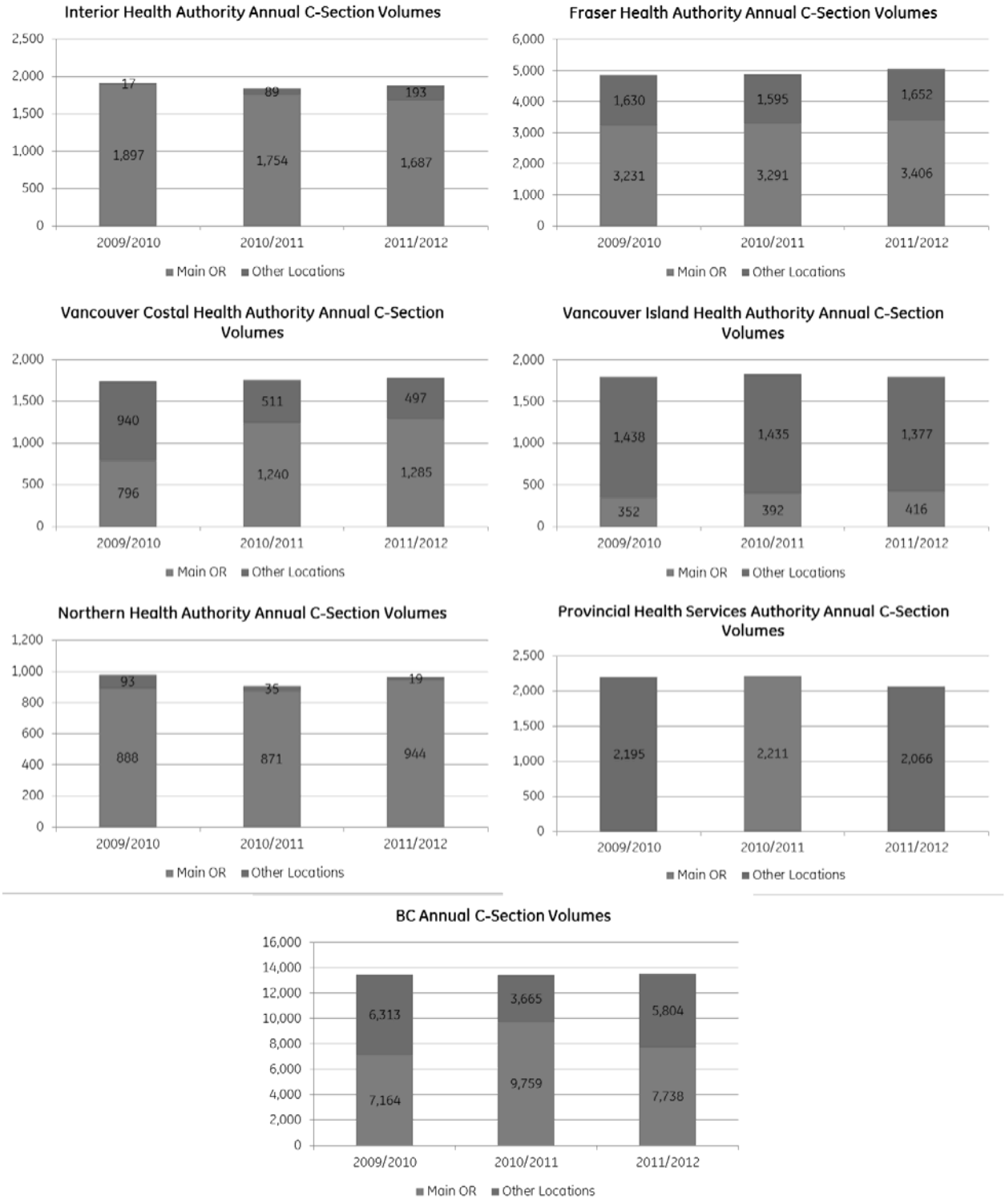

Figure 10: Annual C-section volumes for each Health Authority and BC for the period 2009/10 - 2011/12.

The trend in C-sections performed across BC is relatively stable between 2009/10 and 2011/12 (though Fraser Health Authority and Vancouver Health Authority show slight increases). Significant differences are seen across Health Authorities, however, with respect to where C-sections are performed. In some Health Authorities (such as Interior Health Authority and Northern Health Authority), C-sections are performed predominantly in Main ORs, whereas in other Health Authorities (such as Vancouver Island Health Authority), C-sections are performed predominantly outside of Main ORs. This observation varies across hospitals and depends on the physical facilities available at each hospital. For example, it might be expected that most C-sections are performed in Main ORs within Interior Health Authority and Northern Health Authority considering they are populated with smaller, rural hospitals that do not have the facilities to perform C-sections outside of their Main ORs.

It should be noted that the increase in C-sections performed in Main ORs in Vancouver Coastal Health Region is the result of a shift at St. Paul's Hospital from performing most C-sections in "other" locations in 2009/10 to performing almost all C-sections in Main ORs in 2010/11 and 2011/12. This shift may be due to the closing of obstetrical ORs or case rooms or simply due to changes in DAD intervention location coding at the site. Additionally, the seemingly temporary shift to performing C-sections in Main ORs at the Provincial Health Services Authority for 2010/11 (all of which were performed at BC Women's Hospital), is simply the result of a temporary DAD intervention location coding change at BC Women's Hospital, and not the result of any change in clinical practice, as previously described.

Overall (Main OR and Other Location) C-section volume trends at the hospital level have been provided in Appendix B. As with the Health Authority trends, C-section volume trends have been relatively stable at most hospitals over the period 2009/10 - 2011/12.

Case Mix

Figure 11 below shows the average duration of OR cases (for Main OR volumes only) for each Health Authority as well as for the province of BC overall, for the period 2009/10 - 2011/12.

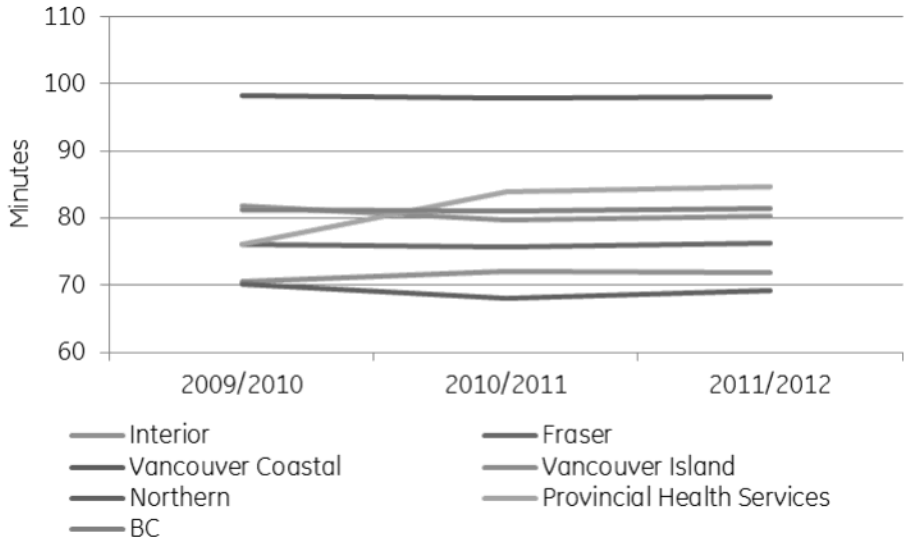

Figure 11: Average duration (in minutes) of OR cases for Main OR volumes.

While Figure 11 shows significant variation across Health Authorities (which is to be expected, owing to variations in case mix and practice patterns), the trend for each Health Authority, with the exception of Provincial Health Services Authority, is essentially flat, suggesting average case durations have not changed significantly over this three year period. The increase in average case duration for Main OR cases in Provincial Health Services Authority for 2010/11 and 2011/12 is at least partially the result of a substantial increase in average case duration at BC Cancer Agency (from approximately 27 minutes to 43 minutes). (One might expect changes in average case duration in response to widespread changes in case mix or practice patterns.) However, because data quality for case duration times collected in the DAD have not been tested, site specific values are not reported and care should be taken in making any cross-site or cross-Health Authority comparisons.

Figure 12 below shows the average Resource Intensity Weight for Main OR volumes as well as all surgical volumes for each Health Authority as well as for the province of BC overall, for the period 2009/10 - 2011/12.

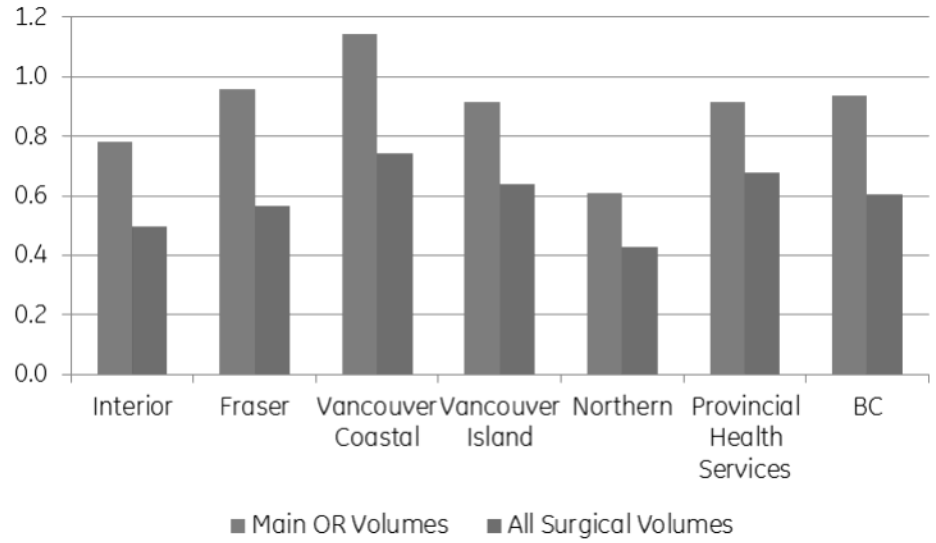

Figure 12: Average Resource Intensity Weight (RIW) for Main OR volumes only and all surgical volumes, by Health Authority, for the period 2009/10 - 2011/12.

RIW is a relative case weight used to measure the intensity of resource use associated with a case and is assigned according to the case mix group (CMG) to which an individual is assigned as well as their age, health status and discharge status. It should be noted that RIW is assigned for a hospital stay and not a specific surgical case. However, Figure 12 above, together with the varying average case durations shown in Figure 11, highlight the substantial case mix differences that exist between Health Authorities with respect to their surgical volumes, with Vancouver Coastal Health Authority having the most resource intensive surgical volumes and Northern Health Authority having the least resource intensive surgical volumes. Case mix differences are important to consider when comparing volumes and other data across Health Authorities and individual hospitals. It is also worth noting that a Health Authority's (or Hospital's) average RIW for its surgical cases is strongly correlated with its day surgery percentage (i.e. day surgery cases as a percentage of total surgical cases) as day surgery cases naturally consume fewer resources and therefore have a lower RIW.

The year-over-year trend in average RIW for the period 2009/10 - 2011/12 is flat for all Health Authorities, with the exception of Provincial Health Services Authority which sees a decrease in average RIW for Main OR volumes as well as all surgical volumes from 2010/11 to 2011/12 (from 0.98 to 0.82 and from 0.71 to 0.63, respectively), owing to decreases at both BC Women's Hospital and BC Children's Hospital.

Main OR Inventory

The tables in this section below provide an inventory of physical operating rooms in each Health Authority in BC, together with details about the extent of their usage. Also outlined are the number of ORs with multipurpose usage restrictions (these tend to be specialized rooms used only for specific procedures, such as maternity or urology rooms, or rooms that have other usage restrictions due to size or fixed equipment).

This section refers to a hospital's Main ORs only (i.e. ORs located within a traditional OR Department). Inventory details on Procedure Rooms and Minor ORs situated in other locations throughout a hospital are provided in a subsequent section of this report. The complete raw data set collected from this inventory project, which contains more specific details about OR hours of operation at each hospital as well as details around average staffing levels, can be found in Appendix C.

Note that at some hospitals, some ORs are only funded and staffed to operate on certain days of the week. This is reflected accordingly in the tables below (for example, an OR that is only staffed one weekday per week is counted as 0.2 staffed rooms; an OR that is only staffed two weekdays per week is counted as 0.4 staffed rooms, etc.). Additionally, when examining after hours and weekend operations in the tables below, on call ORs were not counted (as they typically do not have pre-scheduled cases and are only used in the event that there are emergent cases that need to be completed). Moreover, there were some inconsistencies in how Health Authorities reported details on after hours and weekend operations (particularly with respect to whether ORs staffed after hours and on weekends for urgent and emergent cases only were reported), however, these inconsistencies have been noted below. Accordingly, evening and weekend hours of operation should be not be directly compared across Health Authorities. Across all Health Authorities, however, there are very few (if any) elective cases being performed after hours and on weekends.

Interior Health Authority							
Hospital	**Number of Physical ORs**	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend[18]**
IHCMH - Cariboo Memorial Hospital & Health Centre	2	2	100%	0	0	0	0
IHEKH - East Kootenay Regional Hospital	4	4	100%	0	0	0	0
IHKBH - Kootenay Boundary Regional Hospital	4	4	100%	0	0	0	0
IHKGH - Kelowna General Hospital	9	9	100%	1 - maternity OR	0	0	0
IHKLH - Kootenay Lake Hospital	2	2	100%	0	0	0	0
IHPRH - Penticton Regional Hospital	4	4	100%	0	0	0	0
IHPVC - Pleasant Valley Health Centre	2	2	100%	0	0	0	0
IHQVH - Queen Victoria Hospital	1	1	100%	0	0	0	0
IHRIH - Royal Inland Hospital	11	9	82%	1 - maternity OR	0	0	0
IHSGH - Summerland Memorial Health Centre	2	2	100%	0	0	0	0
IHSLH - Shuswap Lake Hospital	2	2	100%	0	0	0	0
IHVJH - Vernon Jubilee Hospital	4	4	100%	0	0	0	0
Golden and District Hospital	1	1 (Irregular schedule)	100%	0	0	0	0
Lillooet Hospital and Health Centre	1	1 (Irregular schedule)	100%	0	0	0	0
Creston Valley Hospital	1	1 (Irregular schedule)	100%	0	0	0	0
One Hundred Mile District General Hospital	1	1 (Irregular schedule)	100%	0	0	0	0
Elk Valley Hospital	1	1 (Irregular schedule)	100%	0	0	0	0
Interior Health Authority Total	**52**	**50**	**96%**	**2**	**0**	**0**	**0**

Table 2: Inventory of physical and staffed Main ORs in Interior Health Authority.

[18] During evenings, nights and weekends, ORs are typically not staffed and are on call only for emergencies.

Fraser Health Authority							
Hospital	**Number of Physical ORs**	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend[19]**
Royal Columbian Hospital	9	6.3	70%	1 - fixed urology table	2	2	2
Open Heart RCH	2	2	100%	2 - cardiac ORs	2	2	0
Langley Memorial Hospital	5	4.5	90%	1 - fixed urology table	2	1	0
Surrey Memorial Hospital	10	8	80%	1 - fixed urology table	3	3	1
Burnaby Hospital	10	6	60%	3 - one OR with fixed urology table; two ORs set up for ophthalmology procedures (ceiling scopes)	1	1	1
Peace Arch District Hospital	3	3	100%	0	2	1	0
Delta Hospital	3	3	100%	0	0	0	0
Queen's Park Hospital	Not applicable - do not perform surgery						
Eagle Ridge Hospital	6	6	100%	3 - limited by size and layout	1	1	0
Jim Pattison Outpatient Care & Surgery Centre	6	4.6	77%	0	0	0	0
Chilliwack General Hospital	5	3	60%	1 - fixed urology table	1	1	0
Mission Memorial Hospital	Not applicable - do not perform surgery as of 2010/11						
Matsqui-Sumas-Abbotsford General Hospital	Not applicable - do not perform surgery						
Ridge Meadows Hospital and Health Care Centre	4	3	75%	0	1	1	0
Fraser Canyon Hospital	Not applicable - do not perform surgery						
Abbotsford Regional Hospital and Cancer Centre	9	6	67%	1 - fixed urology table	3	1	1
Fraser Health Authority Total	**72**	**55.4**	**77%**	**13**	**18**	**14**	**5**

Table 3: Inventory of physical and staffed Main ORs in Fraser Health Authority.

[19] Evening, night and weekend hours of operation are typically staffed to perform urgent (and emergent) cases but not elective cases.

Vancouver Coastal Health Authority							
Hospital	**Number of Physical ORs**	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions[20]**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend[21]**
Vancouver General Hospital Jim Pattison OR	20	18.8	94%	Not available	16.8 (most operate until 16:30)	2	0
UBC Health Sciences Centre	8	8	100%	Not available	8	0	0
Eye Care Centre	2	2	100%	Not available	0	0	0
St. Paul's Hospital	12	12	100%	Not available	5	5	0
Mount Saint Joseph Hospital	4	4	100%	Not available	0	0	0
Richmond Hospital	8	7	88%	1 - urology equipment	1	0	0
Lions Gate Hospital	8	8	100%	0	5	0	0
Squamish General Hospital	1	1	100%	Not available	0	0	0
St. Mary's Hospital	2	1.2	60%	Not available	0	0	0
Powell River General Hospital	2	1.2	60%	Not available	0	0	0
Holy Family Hospital	Not applicable - do not perform surgery						
G.F. Strong Rehab Centre	Not applicable - do not perform surgery						
R.W. Large Memorial Hospital	Not applicable - do not perform surgery						
Bella Coola General Hospital	Not applicable - do not perform surgery						
Vancouver Coastal Health Authority Total	**67**	**63.2**	**94%**	**Not available**	**35.8**	**7**	**0**

Table 4: Inventory of physical and staffed Main ORs in Vancouver Coastal Health Authority.

[20] Most hospitals in Vancouver Coastal Health Authority were not able to report information on ORs with multi-purpose usage restrictions. However, the general comment was made that there are few rooms within the Health Authority with multi-purpose usage restrictions and for the most part ORs are interchangeable.

[21] There are additional rooms staffed overnight and on weekends in Vancouver Coastal Health Authority beyond those listed in this table, however they are staffed for emergent cases only.

Vancouver Island Health Authority							
Hospital	**Number of Physical ORs**	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend[22]**
Royal Jubilee Hospital	16	11.2	70%	2 - size and/or fixed equipment constraints	2.4	1	2
Victoria General Hospital	16	11	69%	8 - four surgical day care rooms[23]; two labour & delivery rooms; two urology rooms; two rooms with CO2 laser	2	1	1
Cowichan District Hospital	4	3	75%	3 - size and/or fixed equipment constraints	1	1	0
Saanich Peninsula Hospital	3	1.8	60%	0	1.8 (until 16:30)	0	0
Nanaimo Regional General Hospital	10	7	70%	2 - one room limited by size; one cysto room	2	0	0
St. Joseph's General Hospital	4	3.8	95%	1 - limited due to size and logistics	1	1	0
Campbell River and District General Hospital	3	3	100%	1 - limited due to size	0	0	0
West Coast General Hospital	2	1.2	60%	0	0	0	0
Vancouver Island Health Authority Total	**58**	**42**	**72%**	**17**	**10.2**	**4**	**3**

Table 5: Inventory of physical and staffed Main ORs in Vancouver Island Health Authority.

[22] Night and weekends hours of operation are staffed to perform urgent cases but not elective cases.
[23] Use restricted due to distance from ICU.

Northern Health Authority							
Hospital	**Number of Physical ORs**	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend[24]**
Fort St. John Hospital	3	1.2	40%	0 (though one general purpose room is currently only used for C-sections)	0	0	0
St. John Hospital	1	1	100%	0	0	0	0
The University Hospital of Northern British Columbia	10	7	70%	1 - urology OR	1	1	1
Dawson Creek and District Hospital	2	1	50%	0	1	0	0
G.R. Baker Memorial Hospital	3	1.6	53%	0	0	0	0
Fort Nelson General Hospital	1	0	0%	0	0	0	0
Wrinch Memorial Hospital	1	1	100%	0	0	0	0
Prince Rupert Regional Hospital	3	2	67%	0	0	0	0
Bulkley Valley District Hospital	2	1.6	80%	0	0	0	0
Kitimat General Hospital	2	1	50%	1 - orthopedic OR	1	0	0
Mills Memorial Hospital	5	2.2	44%	3 - size constraints (one room currently used for ophthalmology and another for endoscopy	0	0	0
Northern Health Authority Total	**33**	**19.6**	**59%**	**5**	**3**	**1**	**1**

Table 6: Inventory of physical and staffed Main ORs in Northern Health Authority.

[24] Evening, night and weekend hours of operation are staffed to perform urgent (and emergent) cases but not elective cases.

Provincial Health Services Authority							
Hospital	**Number of Physical ORs**	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend[25]**
BC Cancer Agency (Vancouver Centre)	1	1	100%	0	0	0	0
BC Children's Hospital	8	8	100%	1 - dental OR	2	0	0
BC Women's Hospital	4	3	75%	4 - three maternity ORs; one general gynecology OR	1	1	1
Provincial Health Services Authority Total	**13**	**12**	**92%**	**5**	**3**	**1**	**1**

Table 7: Inventory of physical and staffed Main ORs in Provincial Health Services Authority.

BC							
	Number of Physical ORs	**Number of Staffed ORs**	**Percentage of Physical ORs Staffed**	**Number of ORs with Multi-Purpose Restrictions**	**Number of ORs Operating Past 16:00**	**Number of ORs Operating Past 18:00**	**Number of ORs Operating on the Weekend**
BC Total	**295**	**242.2**	**82%**	**42[26]**	**70**	**27**	**10**

Table 8: Inventory of physical and staffed Main ORs in BC.

As shown in the tables above, there are 295 main ORs in BC, with 82% of them regularly staffed. The most common reason cited for any variance between physical and staffed ORs is funding, however other reasons such as staffing challenges were outlined as well. Within Interior Health Authority, 96% of physical ORs are currently staffed, with funding cited as the reason for any unstaffed ORs (i.e. at Royal Inland Hospital). Within Fraser Health Authority, where 77% of physical ORs are currently staffed, funding was again cited as the reason for any unstaffed rooms.

[25] Night and weekend hours are staffed to perform emergent cases only.
[26] Excluding Vancouver Coastal Health Authority which was unable to provide this information.

Within Northern Health Authority, where 59% of physical ORs are currently staffed, funding was also cited as a reason for unstaffed rooms (i.e. at the University Hospital of Northern BC and Mills Memorial Hospital), however staffing challenges and insufficient patient demand also contributed. For example, both Dawson Creek District Hospital and Kitimat General Hospital have two ORs, with only one being staffed at a time due to the presence of only one anesthesiologist (however both sites use their two rooms as swing rooms with cases alternating rooms to minimize turnover time and increase efficiency, though only one room can be used at a time). Additionally, G.R. Baker Memorial Hospital, Fort Nelson General Hospital and Prince Rupert Regional Hospital cited insufficient patient demand as (at least partially) the reason for unstaffed ORs. (At G.R. Baker Memorial Hospital, the third room is being used as an endoscopy/gastroscopy suite instead.)

Within Vancouver Island Health Authority, where 72% of physical ORs are currently staffed, funding was also cited as a reason for unstaffed rooms (i.e. at Nanaimo Regional Hospital, where two rooms are unfinished, as well at Royal Jubilee Hospital and Victoria General Hospital, both of whom use some unstaffed rooms as swing rooms for added efficiency), however staffing challenges were also cited. For example, at Saanich Peninsula Hospital, only two of three ORs are staffed as there are only two anesthesiologists. Moreover, the third OR is not equipped with anesthesia machines.

Within Vancouver Coastal Health Authority, 94% of physical ORs are currently staffed, though they did not provide reasons for unstaffed ORs. Finally, within Provincial Health Services Authority, 92% of physical ORs are currently staffed, with the single unstaffed room at BC Women's Hospital available for use for emergencies.

Tables 2-8 above demonstrate that across all Health Authorities there are very few ORs operating into the evenings and on weekends. This suggests the opportunity to expand capacity (should it be required) through expanded hours of operation, though this would require staff to work additional non-standard hours. Moreover, with any potential increase in OR throughput, consideration must be given to the impact on other areas of the hospital. For example, increasing OR throughput would create additional demand for pre-admission clinics, PACU beds, ICU beds, inpatient beds and other hospital resources that must be met.

It should also be noted that Tables 2-8 above examine physical OR capacity and the extent to which it is funded and staffed. They do not examine OR utilization (i.e. the extent to which available OR hours are used for patient care). Prior to giving consideration to expanded hours of operation, OR utilization together with other indicators of perioperative efficiency should be examined to identify potential opportunities for improving capacity utilization through enhanced efficiency.

Main OR Closures

This section outlines the extent to which Main ORs are closed throughout the year. The most common periods of closure are in December for Christmas holiday, in March for Spring Break and during the summer for summer holidays.

The tables in this section show the estimated percent of day-time OR capacity closed during the months of December and March, throughout the summer months, as well as throughout the entire year by hospital and Health Authority. The percent of OR capacity closed was calculated by dividing the total hours of closures for the period by the day-time OR capacity for the period. (To calculate each hospital's day-time OR capacity for a period, the hospital's daily weekday hours were multiplied by the number of weekdays in the period exclusive of any statutory holidays (e.g. 19 for December). Evening, over-night and weekend OR blocks were excluded as these are typically staffed to perform urgent and emergent cases only and are typically not affected by closures. Summer capacity was calculated from the last week of June (i.e. June 25) through the end of the first week of September (i.e. September 7) as at some hospitals, summer closures extend throughout this entire period.) The percent of day-time OR capacity closed in each period in the tables below is exclusive of statutory holidays, on which ORs would normally be expected to be closed. (Note that while Fraser Health Authority and Vancouver Coastal Health Authority reported their closures inclusive of statutory holidays, their numbers were adjusted to remove statutory holiday closures and ensure consistency across all Health Authorities.)

Fraser Health Authority				
Hospital	**% Day-time OR Capacity Closed in December**	**% Day-time OR Capacity Closed in March**	**% Day-time OR Capacity Closed in Summer**	**% Day-time OR Capacity Closed per Year**
Royal Columbian Hospital	11%	7%	13%	4%
Open Heart RCH	0%	0%	0%	0%
Langley Memorial Hospital	26%	16%	34%	10%
Surrey Memorial Hospital	10%	12%	25%	7%
Burnaby Hospital	32%	15%	32%	11%
Peace Arch District Hospital	16%	7%	27%	7%
Delta Hospital	21%	0%	13%	4%
Queen's Park Hospital	Not applicable - do not perform surgery			
Eagle Ridge Hospital	26%	14%	13%	6%
Jim Pattison Outpatient Care & Surgery Centre	5%	16%	37%	9%
Chilliwack General Hospital	25%	15%	13%	6%
Mission Memorial Hospital	Not applicable - do not perform surgery as of 2010/11			
Matsqui-Sumas-Abbotsford General Hospital	Not applicable - do not perform surgery			
Ridge Meadows Hospital and Health Care Centre	18%	15%	13%	5%
Fraser Canyon Hospital	Not applicable - do not perform surgery			
Abbotsford Regional Hospital and Cancer Centre	26%	7%	20%	7%
Fraser Health Authority Total	**18%**	**11%**	**21%**	**7%**

Table 9: Seasonal Main OR closures in Fraser Health Authority.

Vancouver Coastal Health Authority				
Hospital	**% Day-time OR Capacity Closed in December**	**% Day-time OR Capacity Closed in March**	**% Day-time OR Capacity Closed in Summer**	**% Day-time OR Capacity Closed per Year**
Vancouver General Hospital Jim Pattison OR	11%	9%	14%	4%
UBC Health Sciences Centre	35%	11%	23%	8%
Eye Care Centre	35%	43%	18%	10%
St. Paul's Hospital	6%	4%	20%	5%
Mount Saint Joseph Hospital	9%	5%	9%	3%
Richmond Hospital	25%	20%	31%	10%
Lions Gate Hospital	23%	11%	14%	6%
Squamish General Hospital	21%	0%	17%	5%
St. Mary's Hospital	26%	0%	19%	6%
Powell River General Hospital	26%	0%	19%	6%
Holy Family Hospital	Not applicable - do not perform surgery			
G.F. Strong Rehab Centre	Not applicable - do not perform surgery			
R.W. Large Memorial Hospital	Not applicable - do not perform surgery			
Bella Coola General Hospital	Not applicable - do not perform surgery			
Vancouver Coastal Health Authority Total	**17%**	**10%**	**18%**	**6%**

Table 10: Seasonal Main OR closures in Vancouver Coastal Health Authority.

Vancouver Island Health Authority				
Hospital	**% Day-time OR Capacity Closed in December**	**% Day-time OR Capacity Closed in March**	**% Day-time OR Capacity Closed in Summer**	**% Day-time OR Capacity Closed per Year**
Royal Jubilee Hospital	18%	8%	28%	10%
Victoria General Hospital	21%	9%	32%	11%
Cowichan District Hospital	28%	8%	32%	9%
Saanich Peninsula Hospital	21%	10%	41%	11%
Nanaimo Regional General Hospital	15%	18%	24%	9%
St. Joseph's General Hospital	25%	24%	25%	9%
Campbell River and District General Hospital	25%	8%	26%	8%
West Coast General Hospital	44%	19%	72%	20%
Vancouver Island Health Authority Total	**21%**	**11%**	**30%**	**10%**

Table 11: Seasonal Main OR closures in Vancouver Island Health Authority.

Northern Health Authority				
Hospital	**% Day-time OR Capacity Closed in December**	**% Day-time OR Capacity Closed in March**	**% Day-time OR Capacity Closed in Summer**	**% Day-time OR Capacity Closed per Year**
Fort St. John Hospital	53%	0%	0%	4%
St. John Hospital	51%	22%	19%	10%
The University Hospital of Northern British Columbia	30%	0%	73%	18%
Dawson Creek and District Hospital	21%	0%	0%	2%
G.R. Baker Memorial Hospital	25%	0%	19%	6%
Fort Nelson General Hospital	N/A	N/A	N/A	N/A
Wrinch Memorial Hospital	29%	0%	42%	11%
Prince Rupert Regional Hospital	27%	0%	45%	11%
Bulkley Valley District Hospital	20%	0%	10%	4%
Kitimat General Hospital	26%	0%	0%	2%
Mills Memorial Hospital	37%	10%	35%	11%
Northern Health Authority Total	**31%**	**2%**	**40%**	**11%**

Table 12: Seasonal Main OR closures in Northern Health Authority.

Provincial Health Services Authority				
Hospital	**% Day-time OR Capacity Closed in December**	**% Day-time OR Capacity Closed in March**	**% Day-time OR Capacity Closed in Summer**	**% Day-time OR Capacity Closed per Year**
BC Cancer Agency (Vancouver Centre)	37%	0%	17%	6%
BC Children's Hospital	24%	0%	6%	3%
BC Women's Hospital	12%	0%	6%	2%
Provincial Health Services Authority Total	**22%**	**0%**	**7%**	**3%**

Table 13: Seasonal Main OR closures in Provincial Health Services Authority.

BC				
	% Day-time OR Capacity Closed in December	**% Day-time OR Capacity Closed in March**	**% Day-time OR Capacity Closed in Summer**	**% Day-time OR Capacity Closed per Year**
BC Total[27]	**20%**	**9%**	**23%**	**7%**

Table 14: Seasonal Main OR closures in BC.

Fraser Health Authority, Vancouver Coastal Health Authority, Northern Health Authority and Provincial Health Services Authority did not report any substantial OR closures beyond Christmas, Spring Break and during the summer. Vancouver Island Health Authority, specifically Royal Jubilee Hospital and Victoria General Hospital, reported additional closures (adding up to ~2% and 1%, respectively, of their annual capacity) due primarily to staff attendance at various conferences.

The most substantial period of Main OR closures is during the summer, when approximately 23% of provincial capacity is closed (representing the equivalent of approximately 55 staffed rooms) over a period of approximately 10 weeks. The primary reason provided for OR closures during Christmas, Spring Break and summer was to accommodate staff and physician vacation.

Interior Health Authority was not able to provide data on OR closures.

Other OR Inventory

In addition to the inventory of Main ORs in BC outlined above, data was also collected on Procedure Rooms and Minor ORs located outside of hospitals' Main ORs. The definition used for a Procedure Room for the purposes of this inventory was a room that provides for minor or major surgical procedures in conjunction with oral, parenteral, or IV sedation, or under analgesic or dissociative drugs, to exclude Cardiac, Interventional Radiology and Angiography procedure

[27] Excluding Interior Health Authority, which was unable to provide information on OR closures.

rooms. The definition used for a Minor OR for the purposes of this inventory was a room that provides for minor surgical procedures performed under topical, local or regional anaesthesia without preoperative sedation. The complete raw data collected from this inventory project can be found in Appendix C, which contains more specific details, where available, around Procedure Room and Minor OR hours of operation at each hospital, as well as details around average staffing levels.

Fraser Health Authority						
Hospital	**Number of Physical Procedure Rooms**	**Number of Staffed Procedure Rooms**	**Percentage of Physical Procedure Rooms Staffed**	**Number of Physical Minor ORs**	**Number of Staffed Minor ORs**	**Percentage of Physical Minor ORs Staffed**
Royal Columbian Hospital	0	0	N/A	3 (Ambulatory procedure rooms)	2.8	93%
Langley Memorial Hospital	1 (Maternity OR)	0	0%	3 (Ambulatory procedure rooms)	2.2	73%
Surrey Memorial Hospital	1 (Maternity OR)	1	100%	8 (4 satellite eye centre rooms and 4 ambulatory procedure rooms)	6	75%
Burnaby Hospital	0	0	N/A	4 (Ambulatory procedure rooms)	4	100%
Peace Arch District Hospital	0	0	N/A	3 (Ambulatory procedure rooms)	2	67%
Delta Hospital	0	0	N/A	1 (Ambulatory procedure rooms)	1	100%
Queen's Park Hospital	Not applicable - do not perform surgery					
Eagle Ridge Hospital	0	0	N/A	5 (Ambulatory procedure rooms)	4.5	90%
Jim Pattison Outpatient Care & Surgery Centre	0	0	N/A	3 (Ambulatory procedure rooms)	2	67%
Chilliwack General Hospital	1 (Maternity OR)	0	0%	8 (2 eye centre rooms and 6 ambulatory procedure rooms	5	63%
Mission Memorial Hospital	Not applicable - do not perform surgery as of 2010/11					
Matsqui-Sumas-Abbotsford General Hospital	Not applicable - do not perform surgery					
Ridge Meadows Hospital and Health Care Centre	0	0	N/A	5 (Ambulatory procedure rooms)	2.7	54%
Fraser Canyon Hospital	Not applicable - do not perform surgery					
Abbotsford Regional Hospital and Cancer Centre	0	0	N/A	4 (Ambulatory procedure rooms)	4	100%
Fraser Health Authority Total	**3**	**1**	**33%**	**47**	**36.2**	**77%**

Table 15: Inventory of physical and staffed Procedure Rooms and Minor ORs in Fraser Health Authority.

Vancouver Coastal Health Authority						
Hospital	**Number of Physical Procedure Rooms**	**Number of Staffed Procedure Rooms**	**Percentage of Physical Procedure Rooms Staffed**	**Number of Physical Minor ORs**	**Number of Staffed Minor ORs**	**Percentage of Physical Minor ORs Staffed**
Vancouver General Hospital Jim Pattison OR	0	0	N/A	0	0	N/A
UBC Health Sciences Centre	0	0	N/A	0	0	N/A
Eye Care Centre	0	0	N/A	0	0	N/A
St. Paul's Hospital	0	0	N/A	0	0	N/A
Mount Saint Joseph Hospital	3	2.6	87%	0	0	N/A
Richmond Hospital	0	0	N/A	0	0	N/A
Lions Gate Hospital	2	2	100%	5	5	100%
Squamish General Hospital	0	0	N/A	0	0	N/A
St. Mary's Hospital	0	0	N/A	0	0	N/A
Powell River General Hospital	0	0	N/A	0	0	N/A
Holy Family Hospital	0	0	N/A	0	0	N/A
G.F. Strong Rehab Centre	0	0	N/A	0	0	N/A
R.W. Large Memorial Hospital	0	0	N/A	0	0	N/A
Bella Coola General Hospital	0	0	N/A	0	0	N/A
Vancouver Coastal Health Authority Total	**5**	**4.6**	**92%**	**5**	**5**	**100%**

Table 16: Inventory of physical and staffed Procedure Rooms and Minor ORs in Vancouver Coastal Health Authority.

Vancouver Island Health Authority						
Hospital	**Number of Physical Procedure Rooms**	**Number of Staffed Procedure Rooms**	**Percentage of Physical Procedure Rooms Staffed**	**Number of Physical Minor ORs**	**Number of Staffed Minor ORs**	**Percentage of Physical Minor ORs Staffed**
Royal Jubilee Hospital	0	0	N/A	7	7	100%
Victoria General Hospital	0	0	N/A	1	1	100%
Cowichan District Hospital	2	2	100%	0	0	N/A
Saanich Peninsula Hospital	0	0	N/A	2	2	100%
Nanaimo Regional General Hospital	1	1	100%	1	1	100%
St Joseph's General Hospital	0	0	N/A	0	0	N/A
Campbell River and District General Hospital	0	0	N/A	0	0	N/A
West Coast General Hospital	0	0	N/A	1	0	0%
Vancouver Island Health Authority Total	**3**	**3**	**100%**	**12**	**11**	**92%**

Table 17: Inventory of physical and staffed Procedure Rooms and Minor ORs in Vancouver Island Health Authority.

Provincial Health Services Authority						
Hospital	**Number of Physical Procedure Rooms**	**Number of Staffed Procedure Rooms**	**Percentage of Physical Procedure Rooms Staffed**	**Number of Physical Minor ORs**	**Number of Staffed Minor ORs**	**Percentage of Physical Minor ORs Staffed**
BC Cancer Agency	5	5	100%	0	0	N/A
BC Children's Hospital	0	0	N/A	0	0	N/A
BC Women's Hospital	3	3	100%	0	0	N/A
Provincial Health Services Authority Total	**8**	**8**	**100%**	**0**	**0**	**N/A**

Table 18: Inventory of physical and staffed Procedure Rooms and Minor ORs in Provincial Health Services Authority.

BC						
	Number of Physical Procedure Rooms	Number of Staffed Procedure Rooms	Percentage of Physical Procedure Rooms Staffed	Number of Physical Minor ORs	Number of Staffed Minor ORs	Percentage of Physical Minor ORs Staffed
BC Total[28]	**19**	**16.6**	**87%**	**64**	**52.2**	**82%**

Table 19: Inventory of physical and staffed Procedure Rooms and Minor ORs in BC.

Northern Health Authority does not have Procedure Rooms or Minor ORs outside of hospitals' Main ORs other than some endoscopy rooms (that do not have anesthesia coverage). Interior Health Authority was not able to provide information on Procedure Rooms and Minor ORs in the Health Authority.

It should be noted again that Tables 15-19 above examine physical Procedure Room and Minor OR capacity and the extent to which it is funded and staffed. They do not examine the utilization of these rooms (i.e. the extent to which available hours are used for patient care).

[28] Excluding Interior Health Authority, which was unable to provide information on Procedure Rooms and Minor ORs.

OR Staffing

In addition to the inventory of physical ORs in BC, data was also collected (for those hospitals able to provide it) on average staffing levels in ORs for key resources such as RNs and LPNs (Licensed Practical Nurses). Interior Health Authority and Vancouver Coastal Health Authority were not able to provide staffing details. Typically, hospitals staff Main ORs with 2-3 RNs, with variable practices around the use of LPNs. Many hospitals do not staff LPNs in their Main ORs though some do, with typically no more than one LPN per OR and often with one LPN moving between multiple ORs as needed. The complete raw data collected from this inventory project can be found in Appendix C, which contains details submitted by hospitals around their OR staffing practices.

It is important to note, however, that staffing models should not be directly compared across hospitals as they are (at least partially) driven by case mix and procedure type. Staffing models might be more appropriately compared across hospitals for specific surgical subspecialties or procedures. Understanding staffing models is nonetheless critical because it provides an understanding of the resources that would be required to run unstaffed ORs. That is, if ORs that are currently unstaffed due to funding were funded, adequate staff must be available to run these additional rooms. Moreover, as noted in this report, some hospitals in Northern Health Authority and Vancouver Island Health Authority did cite staffing challenges as reasons for unstaffed ORs (though typically anesthesiologist shortages were cited).

Recommendations

This section outlines recommendations on how to expand upon the foundation established by this OR Inventory project to continue to better measure and understand OR inventory and perioperative capacity in BC as well as recommendations on how to use the findings from this OR Inventory project within a broader framework to support the optimization of OR capacity in BC.

Measuring OR Inventory Going Forward

Regularly update the OR Inventory to understand changes in physical capacity
Physical OR capacity across the province changes over time as old ORs are permanently closed and new ORs are built. Regularly updating the OR inventory using the approach established with the current effort will not only provide an up-to-date snapshot of physical capacity in the province, but will facilitate an understanding of capacity trending in the province and how this aligns with changes in demand for surgery (i.e. how is physical, funded and staffed capacity changing over time relative to demand for surgery).

Drill down to better understand capacity allocation
This OR Inventory project provides an understanding of overall physical, funded and staffed OR capacity in the province of BC. A next logical step, however, might be to analyze this capacity as it pertains to specific priority areas, subspecialties and procedures. This can be accomplished by drilling deeper into the current inventory of physical ORs and their hours of operation to understand how this capacity is allocated (e.g. the number of dedicated rooms or the number of weekly blocks allocated to certain areas). Understanding the allocation of physical capacity is critical in ensuring that it is well aligned to demand. Examining the relative wait times for different priority areas, subspecialties and/or procedures, and comparing this with information on how existing capacity is allocated can facilitate recommendations on the equitable allocation of capacity across hospitals, Health Authorities or province-wide. (For example, such analyses might support recommendations around the reallocation of resources from areas with significant wait time pressures to areas with low wait time pressures, understanding of course limitations on where certain procedures can be performed.)

Expand the inventory scope to include other critical perioperative resources
Understanding physical OR capacity is critical, however the overall perioperative process requires considerable planning and coordination across many resources and processes. For example, increasing OR throughput would create additional demand for pre-admission clinics, PACU beds, ICU beds, inpatient beds and other hospital resources. As such, to facilitate a more complete understanding of perioperative capacity, this inventory framework could be expanded in the future to include other critical perioperative resources:

- *Human resources:* Data collected from this inventory project can be used as a starting point for further understanding human resources inventory and demand. For example, some data has been collected on average staffing per OR for key resources such as RNs and LPNs. This data can be used to understand the number of full-time equivalent (FTE) resources required to run a target number of OR blocks and compare it against available FTE. Examining human resources is particularly important because, as noted in this report, some hospitals in Northern Health Authority and Vancouver Island Health Authority cited staffing challenge as reasons for unstaffed ORs (though typically anesthesiologist shortages were cited).
- *Equipment:* Certain surgical procedures require specialized equipment that limit where they can be performed. Conducting an inventory of key equipment, particularly equipment required for the performance of priority area surgeries, is therefore critical in understanding the provincial capacity for such priority area surgeries and where this capacity exists.
- *Beds:* The availability of beds (e.g. PACU beds, ICU beds, inpatient beds) can be a key driver of perioperative capacity as surgery cannot be performed without the availability of a bed for the patient post-operatively. However, while physical beds can readily be inventoried, bed capacity can be difficult to measure as beds are often shared between medical and surgical units and their capacity is subject to how quickly they are turned over. However, indicators measuring bed availability related delays (i.e. number of cases delayed in the OR awaiting a PACU or ICU bed, number of cases delayed in the PACU awaiting an inpatient bed, etc.) can provide a good indication regarding the extent to which bed availability affects perioperative capacity. While this OR inventory did ask hospitals to provide details on PACU-related delays, many were not able to do so, suggesting that such indicators are not widely collected at present.

Within the context of an expanded perioperative inventory, simulation technologies can also be useful tools to help understand where perioperative capacity bottlenecks exist and how additional resources might impact overall perioperative capacity.

Ensure standard definitions for data collection

Any OR inventory exercise needs to ensure clear definitions are outlined for all data elements collected. Wherever possible, however, definitions need to be flexible enough to accommodate differences among Health Authorities and individual hospitals. (In the context of this inventory, for example, definitions were provided to hospitals for what constituted a Main OR versus a Minor OR versus a Procedure Room. However, some hospitals had Maternity ORs as part of their Main ORs whereas others had them as part of their Minor ORs or Procedure rooms. As such, these differences had to be noted in the inventory.) In addition to standard definitions, key data inclusions and exclusions need to be outlined as well. (In the context of this inventory, for example, some Health Authorities collected OR closure data exclusive of statutory holidays whereas others collected it inclusive of statutory holidays. Adjustments were therefore made to the latter group's data to ensure consistency.) Clearly outlined definitions and data inclusion and exclusion criteria are critical to the success of any subsequent inventory exercises.

Strategies to Optimize Capacity

Understand the capacity-demand balance using wait list trending

The consistent trend of increasing surgical volumes across all health authorities suggests growing demand for surgical services in BC. However, further analysis is required to understand the balance between capacity (supply) and demand and to understand whether additional capacity is required to meet this demand. A review of wait list trending should be conducted as a preliminary analysis to begin to understand this balance. (A consistently growing wait list is indicative of a persistent imbalance between capacity and demand, with the magnitude of growth indicative of the magnitude of the imbalance. Conversely, a stable wait list is indicative of relative alignment between capacity and demand, with temporary surge capacity an appropriate method for clearing any pre-existing backlog). Moreover, wait list trending at the Health Authority and hospital level, as well as by priority area, surgical subspecialty and/or procedure can help to identify how equitably capacity is distributed relative to demand (i.e. do certain areas or procedures have growing wait lists and wait times while others having shrinking wait lists and wait times). Wait list trending is a useful pre-cursor for more sophisticated analyses of the surgical capacity-demand balance leveraging principles of capacity planning[29].

Take a multi-faceted approach to capacity optimization

Conducting an inventory of physical OR capacity in BC is a critical exercise. However, effectively maximizing the use of this capacity requires a multi-faceted and properly sequenced approach to build off this inventory, as summarized in Figure 13 below:

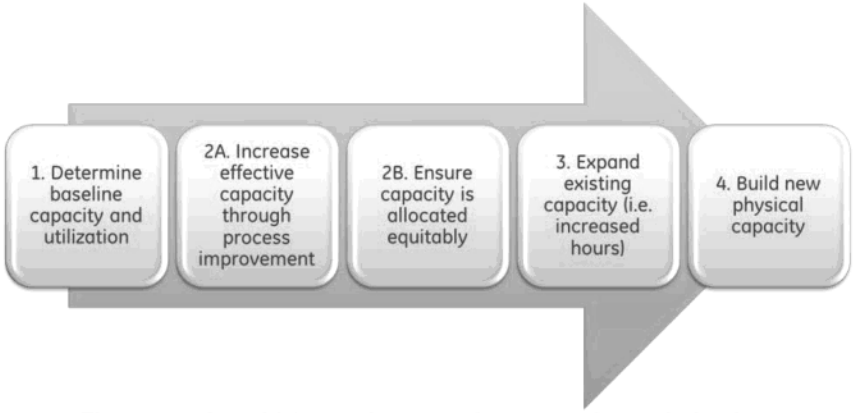

Figure 13: A multi-faceted approach to capacity optimization.

1. Determine Baseline Capacity and Utilization: This inventory project is a critical first step in understanding the physical OR capacity that exists across the province of BC and the extent to which it is funded and staffed. The next step is to establish a baseline understanding of how

[29] Fixler T, *et al*. (2011). Pediatric Surgical Capacity and Demand: Analysis Reveals a Modest Gap in Capacity and Additional Efficiency Opportunities. *Healthcare Quarterly*, Vol. 14, Special Issue October 2011, pp. 28 – 34.

effectively this capacity is utilized (i.e. the extent to which available OR hours are used efficiently for patient care). This requires the identification, definition and measurement of a set of key performance indicators (e.g. OR utilization, first case start time accuracy, average turnaround time, etc.) in order to benchmark performance both internally over time as well as externally against established best practices[30]. This will facilitate the identification of potential opportunities for improving capacity utilization through enhanced efficiency prior to giving consideration to expanding existing capacity. Note that in benchmarking performance across hospitals and Health Authorities, consideration must be given to case mix and other differences between facilities. As such, peer group benchmarking (based on hospital/surgical program type, patient acuity and case mix measures, etc.) with appropriate peer group (or individual hospital) targets should be employed.

2A. Increase Effective Capacity by Improving Processes: Once a baseline of capacity utilization and performance has been established through the measurement of key performance indicators, performance targets (e.g. based on literature, 75th percentile performance, etc.) need to be established with process improvement plans developed to help hospital's achieve target performance. Simulation technologies can be useful tools to support process improvement efforts as they can test the impact of workflow redesign, the reallocation of responsibilities for various tasks and other process improvement strategies in a risk-free environment (without impacting real world operations). Similarly, schedule optimization technologies can be used to optimize OR block schedules to ensure that all assigned blocks (whether to an individual surgeon or a service) are properly utilized, helping to maximize overall OR utilization.

2B. Ensure Capacity is Allocated Equitably: In parallel with process improvement efforts aimed at maximizing the use of existing capacity, efforts should be made to ensure that capacity is allocated appropriately. As noted above, this can be achieved by understanding the allocation of physical capacity to certain areas and/or procedures and comparing against relative wait times to ensure equitable allocation (see recommendation "Drill down to better understand capacity allocation" above).

3. Expand Existing Capacity: Once it has been established that existing capacity is being utilized efficiently and there remains unmet demand, consideration can be given to expanding the use of existing physical capacity through extended hours of operation, shortening of seasonal closures and additional funding to staff currently unstaffed rooms. As the inventory has demonstrated, there is considerable opportunity to expand the use of existing capacity, with 18% of physical Main ORs currently unstaffed, few ORs operating evenings and weekends province-wide, and an estimated 7% of provincial day-time capacity closed due to seasonal closures. However, given that expanded use of existing capacity may be disruptive to staff (through increased demand to work non-standard hours or reduced vacation flexibility) and may incur added expense (through the potential for premium pay for increased off hours shifts), as previously noted, this strategy should ideally only be considered once efficiency opportunities have been identified and reasonably exhausted.

[30] Comprehensive Performance Management in the Operating Room. *Healthcare Financial Management* 2002;56(12 Suppl):1-7.

4. Build New Physical Capacity: Due to the capital intensive nature of ORs, the construction of new physical capacity should only be considered once efficiency opportunities and the expansion of existing capacity have been reasonably exhausted as alternatives (or there is specific need to replace older capacity with more modern, state of the art surgical suites and equipment).

Conclusion

Shortening growing wait times for surgery is an intense focus for the province of BC. To help support this focus, the *Provincial Perioperative Performance Improvement Program,* a multi-year provincial framework for improving the patient experience and access to surgical services, was released in March 2012. A key component of this program includes the development of an inventory of physical, funded and staffed operating rooms across BC as well as an analysis of surgical volumes, which are the subject of this report.

Surgical volumes have increased by 7.1% province-wide over the period 2009/10 - 2011/12, from 501,600 cases to 537,338 cases. Main OR volumes and Other Surgical volumes have both contributed to this increase, with increases of 3.8% and 11.1% respectively. Over this same period, the percentage of Main OR cases that were unplanned have decreased from 20.1% down to 18.1% province-wide, with all Health Authorities except Northern Health Authority showing a decrease. The province has seen a small increase of 0.5% in C-section volumes over the same period.

Across the province there are 295 physical Main ORs with 82% (242.2) of them regularly staffed. Funding was cited as the most common reason by hospitals for unstaffed ORs, though some hospitals in Vancouver Island Health Authority and Northern Health Authority cited staffing challenges as well. Additionally, an estimated 7% of OR capacity is closed annually across the province for seasonal closures. In addition to the Main ORs, there are also 19 Procedure Rooms, 87% (16.6) of which are regularly staffed, and 64 Minor ORs, 82% (52.2) of which are regularly staffed, throughout the province.

This report has also outlined a number of recommendations on how to expand upon the foundation established by this OR Inventory project to continue to better measure and understand OR inventory and perioperative capacity in BC. These recommendations include:

- Regularly updating the OR inventory to understand changes and trends in physical capacity
- Drilling down to better understand capacity allocation and ensuring that it is well aligned to demand
- Expanding the inventory scope to include other critical perioperative resources that help to drive overall system capacity
- Ensuring standard definitions and clearly outlined data inclusions and exclusions in any future inventory exercise

Finally, a multi-faceted approach for the optimization of OR capacity in BC, building off this inventory exercise, has been briefly outlined.

Appendix A: Summary of Recommendations from *Enhancing Surgical Care in BC*[31]

General

To improve communication, safety, and efficiency in the operating room, all surgical programs and OR team members across British Columbia hospitals should implement the surgical safety checklist and surgical briefings as standard practice. **(Recommendation 1)**

Health authorities and their hospitals should implement process improvement initiatives. Standardized performance indicators must be in place and used to measure performance before and after. **(Recommendation 2)**

Process Improvement Panel

The Ministry of Health, through the Provincial Surgical Advisory Council (PSAC), should establish a multi-stakeholder Perioperative Improvement Panel (PIP) that will, within six months of its initial meeting, develop a report with a provincial framework for improving surgical quality, efficiency, and access in hospitals across BC. **(Recommendation 3)**

The PSAC should oversee the implementation of the provincial framework and ensure that process improvement projects undertaken by health authorities and hospitals are coordinated and integrated within the framework. **(Recommendation 4)**

Clinical Champions

Health authorities and hospitals must identify and support clinical champions to lead multidisciplinary perioperative improvement teams at each hospital. Support should enable the perioperative improvement teams to make relevant changes based on local needs and priorities. **(Recommendation 5)**

Provincial Implementation Support

To aid the implementation of the provincial framework, the PSAC should establish an implementation support unit to assist hospitals and the perioperative improvement teams. The implementation unit can work with hospitals and community surgical facilities to assess their surgical programs and develop action plans to improve their perioperative processes based on best practices identified by the PIP. **(Recommendation 8)**

Health authorities should work with the Ministry of Health and the BCMA at the Specialist Services Committee (SSC) to identify how SSC funding can be used to help support physicians

[31] British Columbia Medical Association. *Enhancing Surgical Care in BC: Improving Perioperative Quality, Efficiency and Access,* June 2011.

who wish to learn about process improvement methodologies and who want to participate in perioperative process improvement initiatives. **(Recommendation 6)**

Patient Involvement

Patient representatives should be engaged as partners in initiatives to improve surgical care by participating on the provincial PIP as well as on committees at the local hospital level and the regional health authority level. **(Recommendation 7)**

Performance Measurement

The PIP should develop or adopt existing standardized indicators and benchmarks that can track and measure both perioperative efficiency and quality performance in all surgical programs across the province. Using provincial benchmarks, individual hospitals should establish performance targets, track their progress through the collection of performance indicators, and make continued improvements against those targets. **(Recommendation 9)**

The Ministry of Health should work with health authorities to incorporate the reporting of standard perioperative quality and efficiency performance indicators in the annual performance accountability agreements between the Ministry and individual health authorities. Where appropriate, public reporting on overall performance is encouraged. **(Recommendation 10)**

The provincial perioperative improvement framework must include an evaluation component to measure whether the provincial initiative is successful at improving the quality and efficiency of perioperative services at the level of individual hospitals as well as at a provincial level. **(Recommendation 11)**

Maximize Utilization of Resources

Health authorities and hospitals should consistently re-examine how seasonal OR closures can be shortened. Currently unused or underutilized operating rooms should also be examined as options for increasing access and efficiency. **(Recommendation 12)**

Appendix B: OR Demand and Case Mix - Hospital-Level Data

Main OR Volumes by Hospital

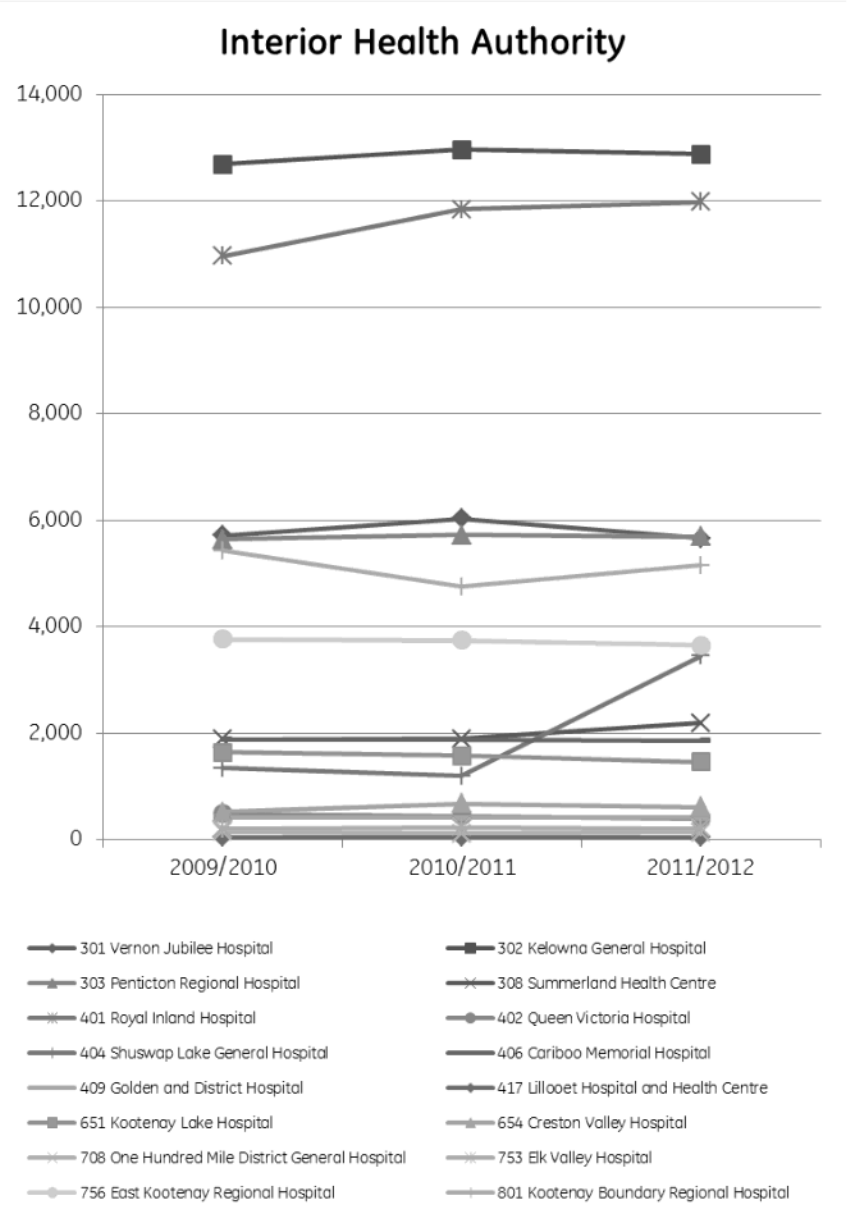

Figure 14: Annual Main OR volumes for Interior Health Authority.
Note the significant increase in Main OR volumes at Shuswap Lake General Hospital (from 2010/11 to 2011/12) is likely due to DAD intervention location coding changes as there is a corresponding decrease in Other Surgical volumes over the same period.

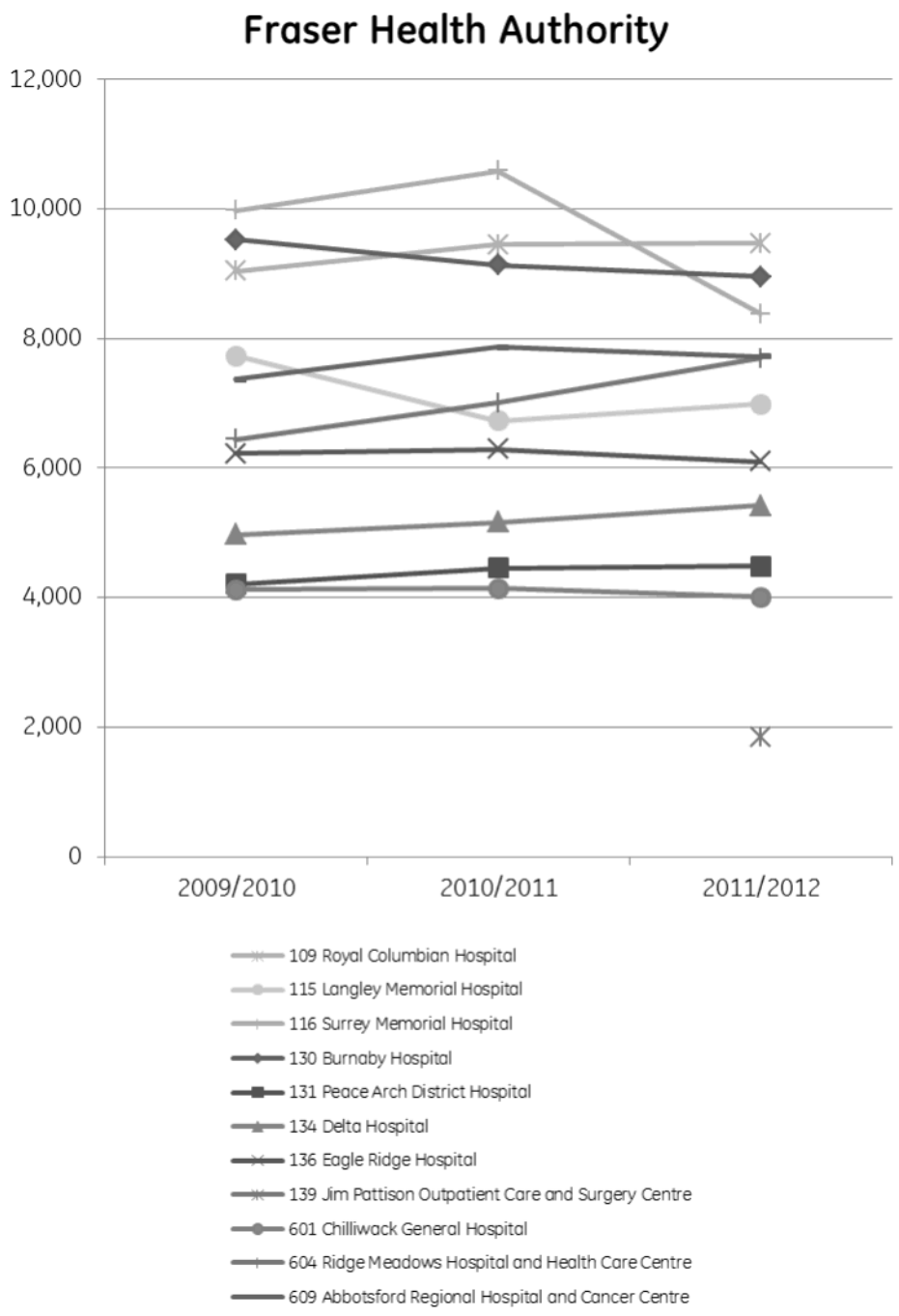

Figure 15: Annual Main OR volumes for Fraser Health Authority.

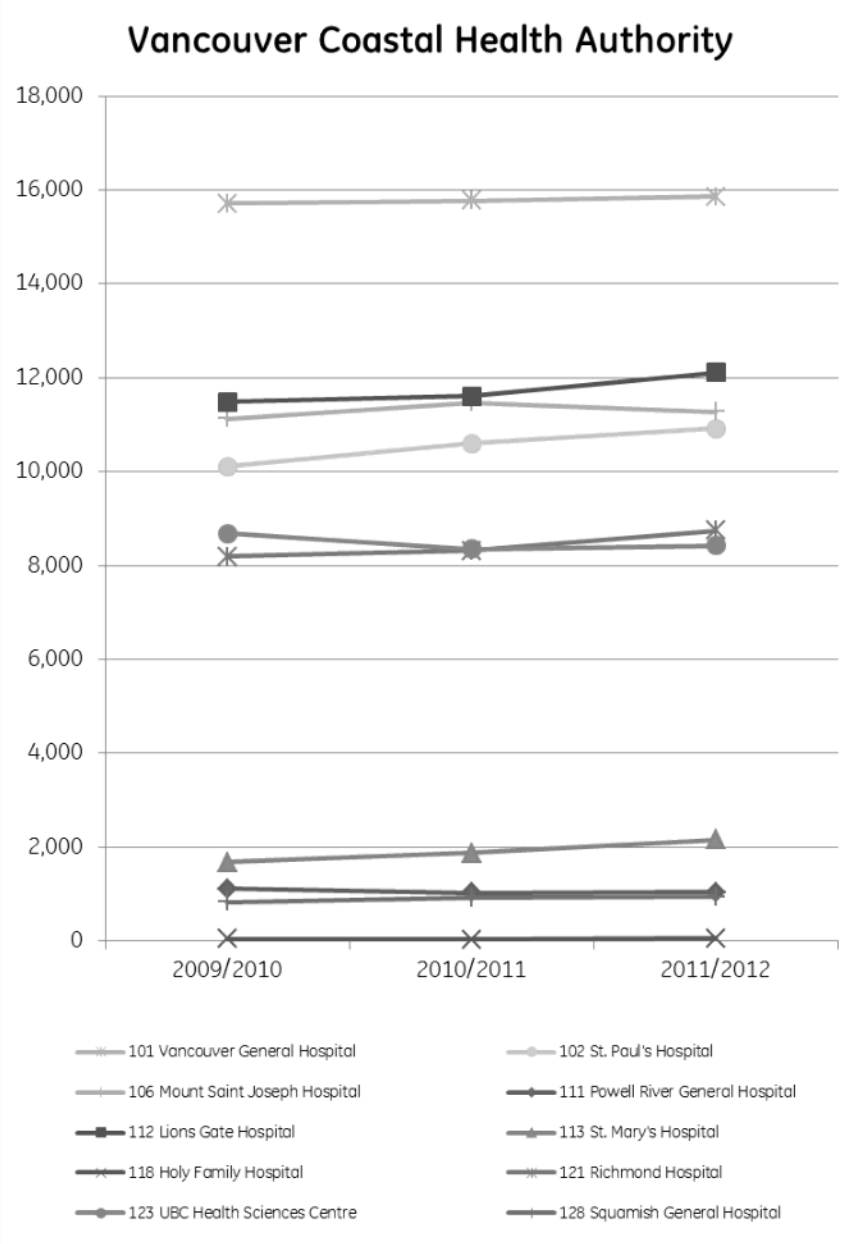

Figure 16: Annual Main OR volumes for Vancouver Coastal Health Authority.

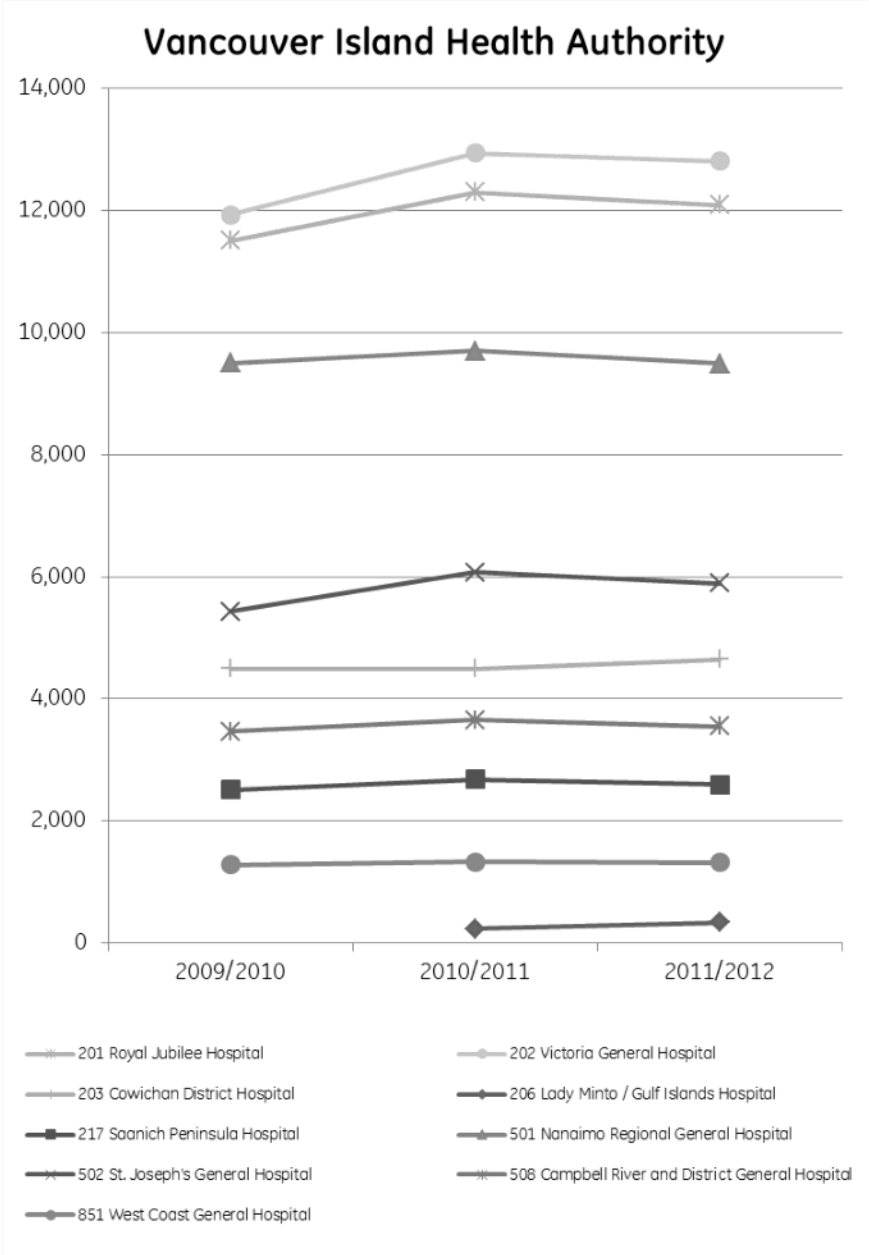

Figure 17: Annual Main OR volumes for Vancouver Island Health Authority.

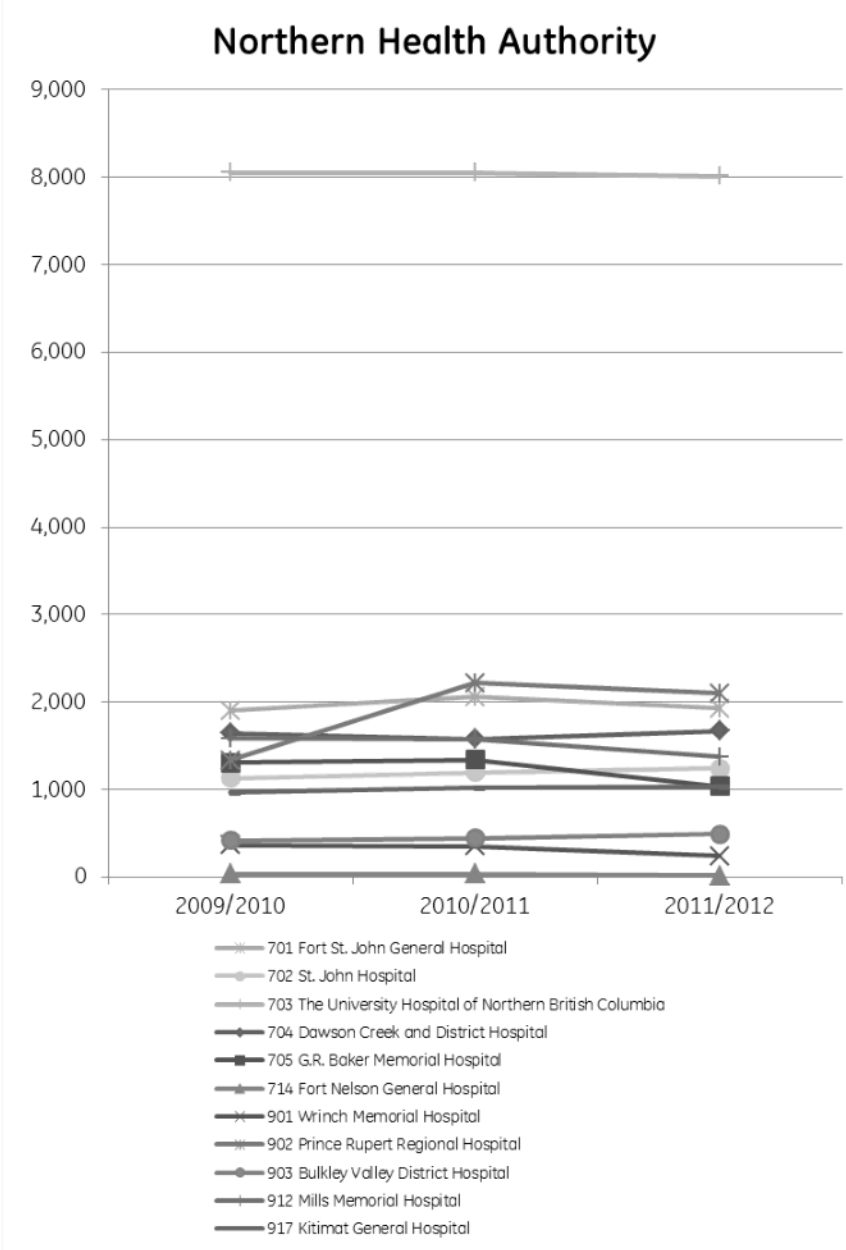

Figure 18: Annual Main OR volumes for Northern Health Authority.
Note the significant increase in Main OR volumes at Prince Rupert Regional Hospital (from 2009/10 to 2010/11) is likely due to DAD intervention location coding changes as there is a corresponding decrease in Other Surgical volumes over the same period.

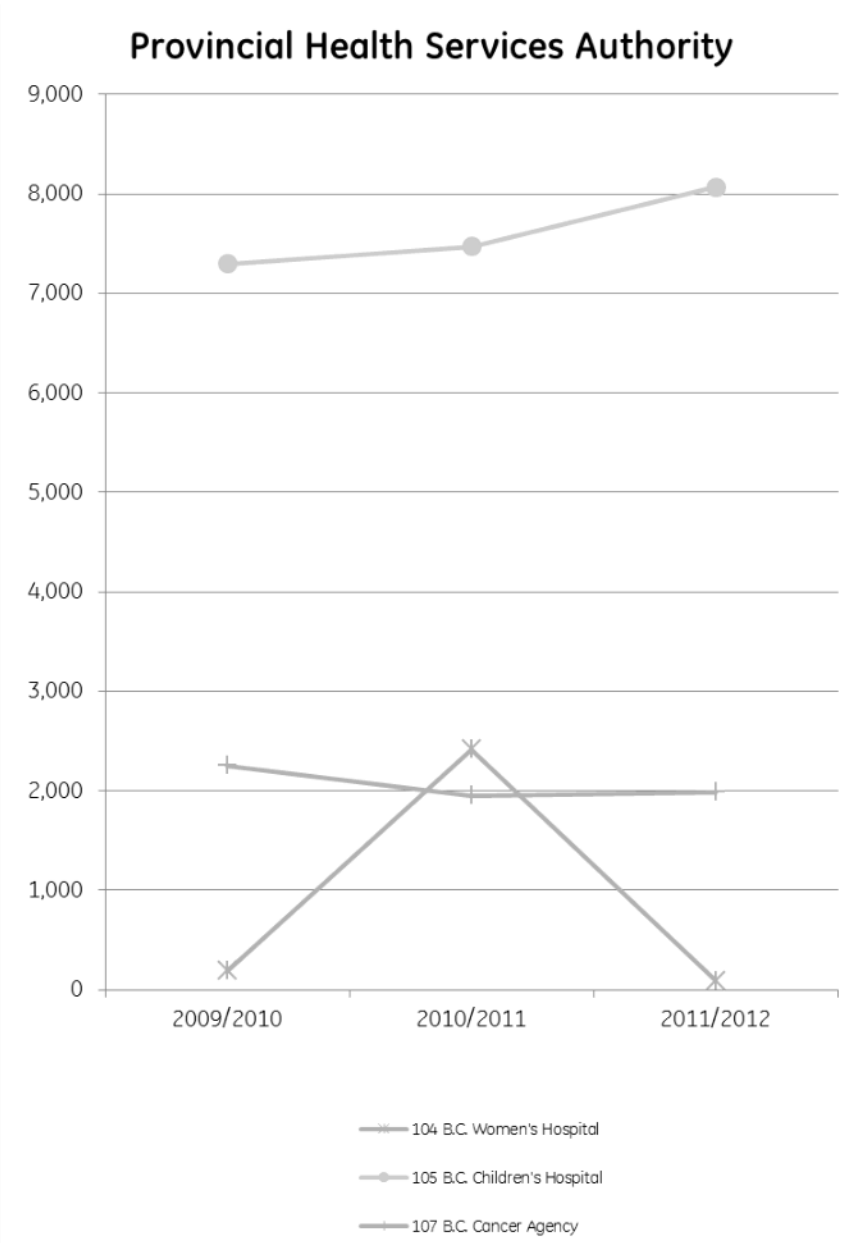

Figure 19: Annual Main OR volumes for Provincial Health Services Authority.
Note the significant increase in Main OR volumes at BC Women's Hospital in 2010/11 is due to a temporary DAD intervention location coding change, wherein approximately 2000 inpatient C-section procedures were coded as being performed in Main ORs instead of Obstetrical ORs. A corresponding decrease in Other Surgical volumes is seen in 2010/11 at BC Women's Hospital.

Other Surgical Volumes (Outside of Main OR) by Hospital

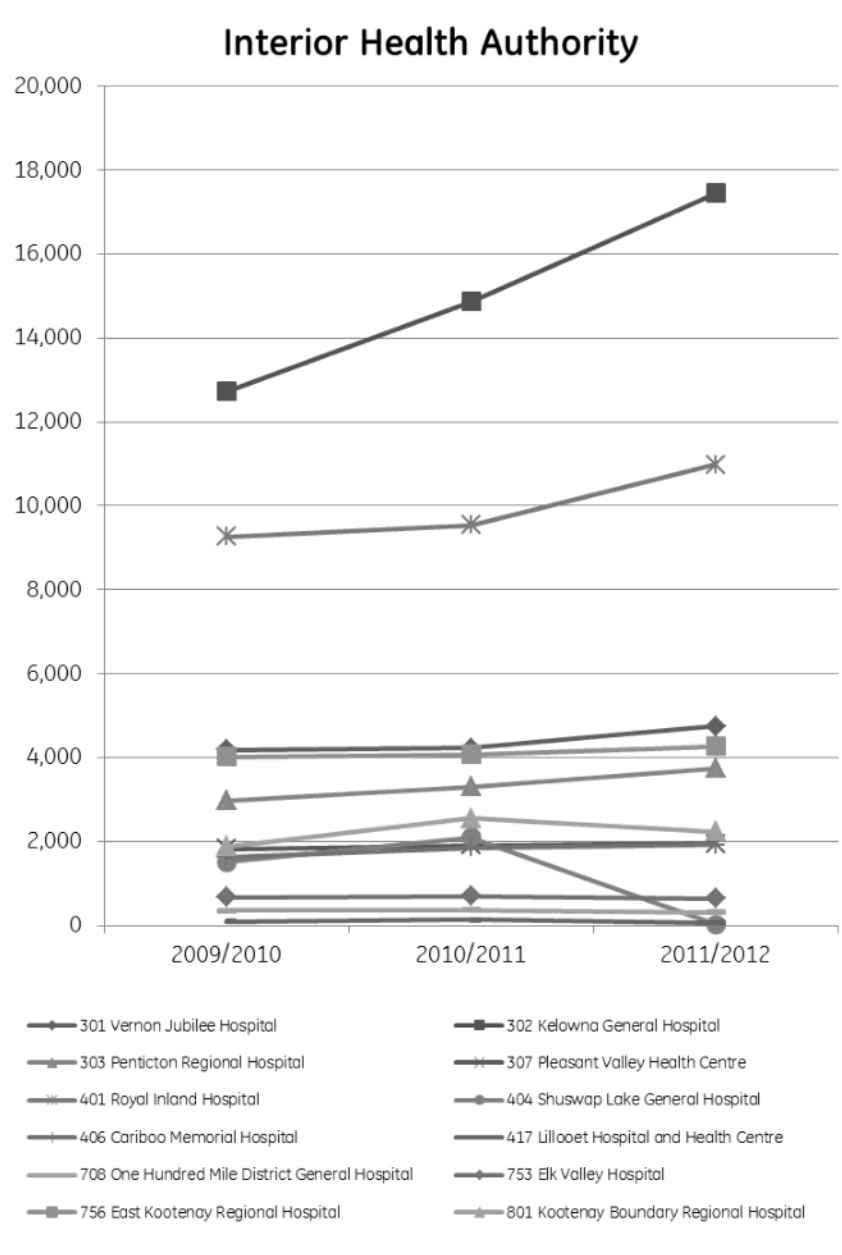

Figure 20: Annual Other Surgical volumes for Interior Health Authority.
Note the significant decrease in Other Surgical volumes at Shuswap Lake General Hospital (from 2010/11 to 2011/12) is likely due to DAD intervention location coding changes as there is a corresponding increase in Main OR volumes over the same period.

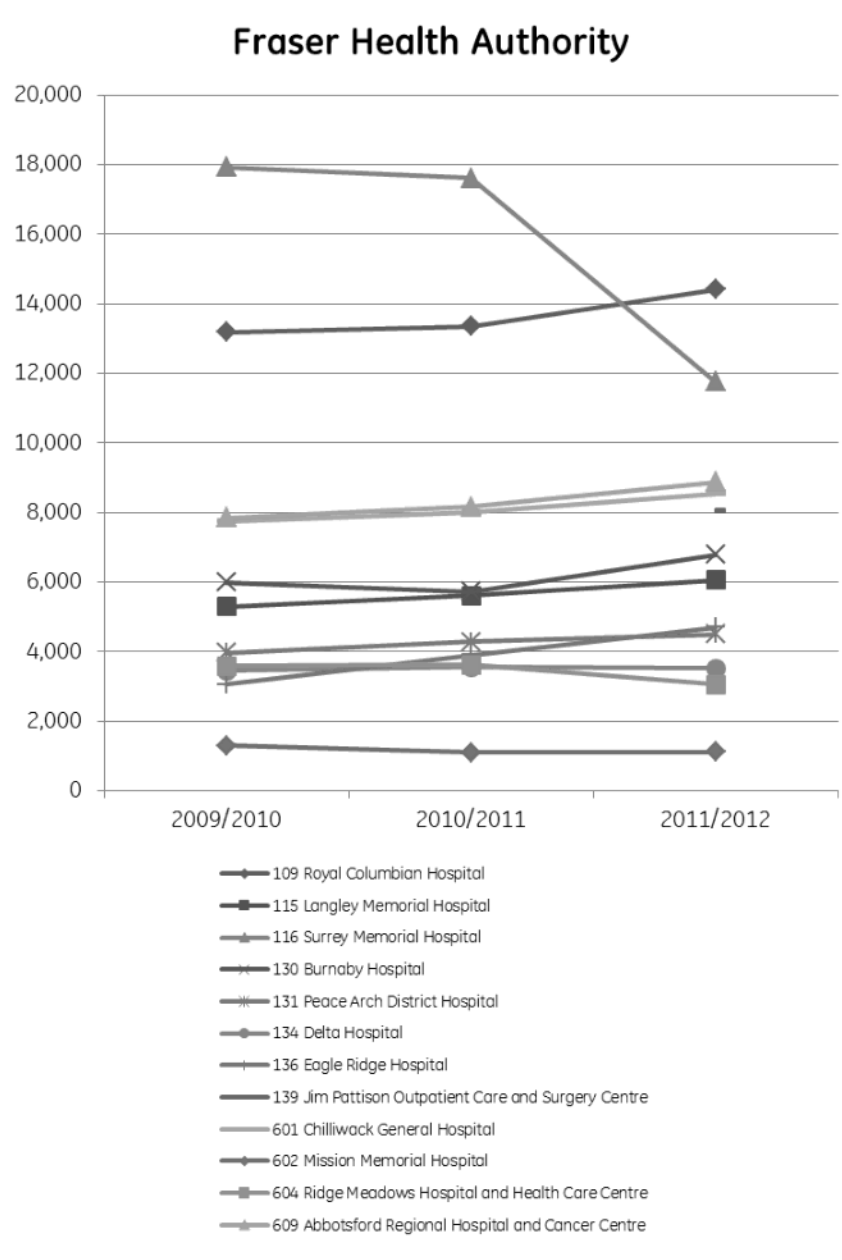

Figure 21: Annual Other Surgical volumes for Fraser Health Authority.

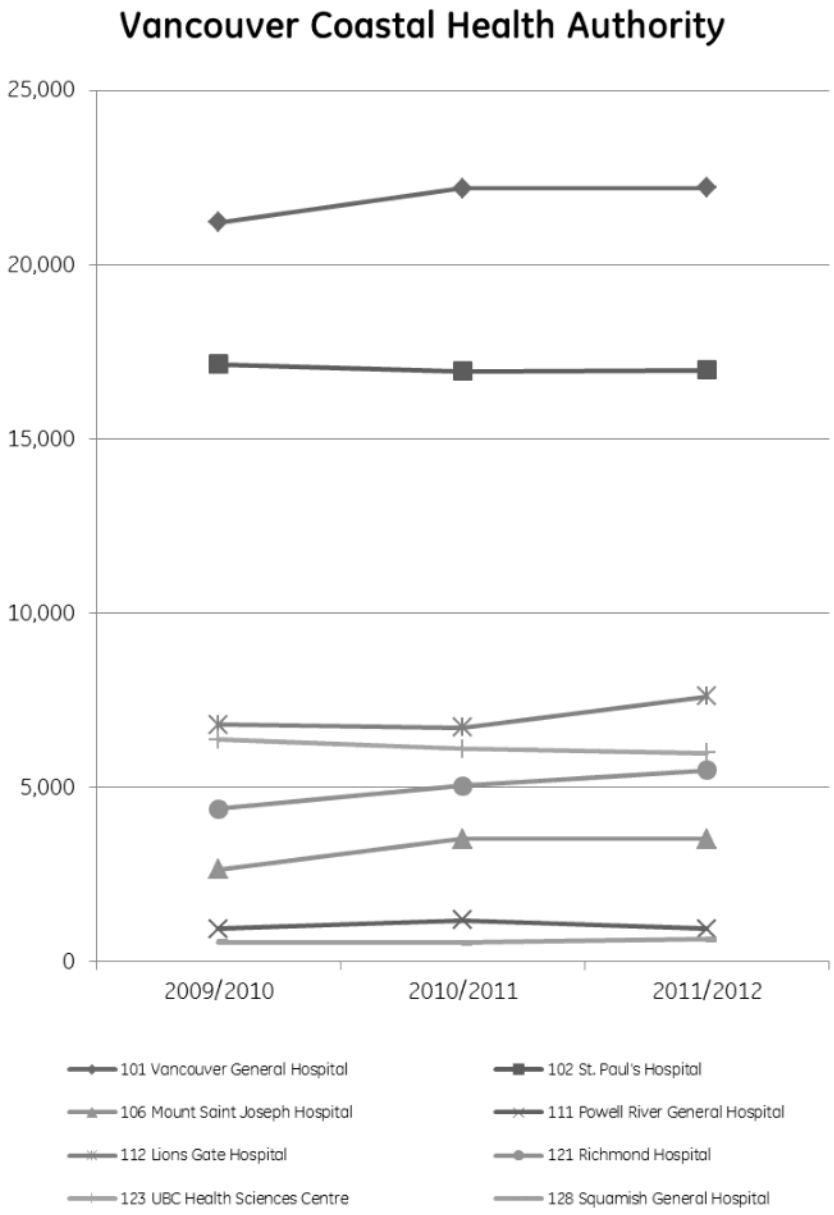

Figure 22: Annual Other Surgical volumes for Vancouver Coastal Health Authority.

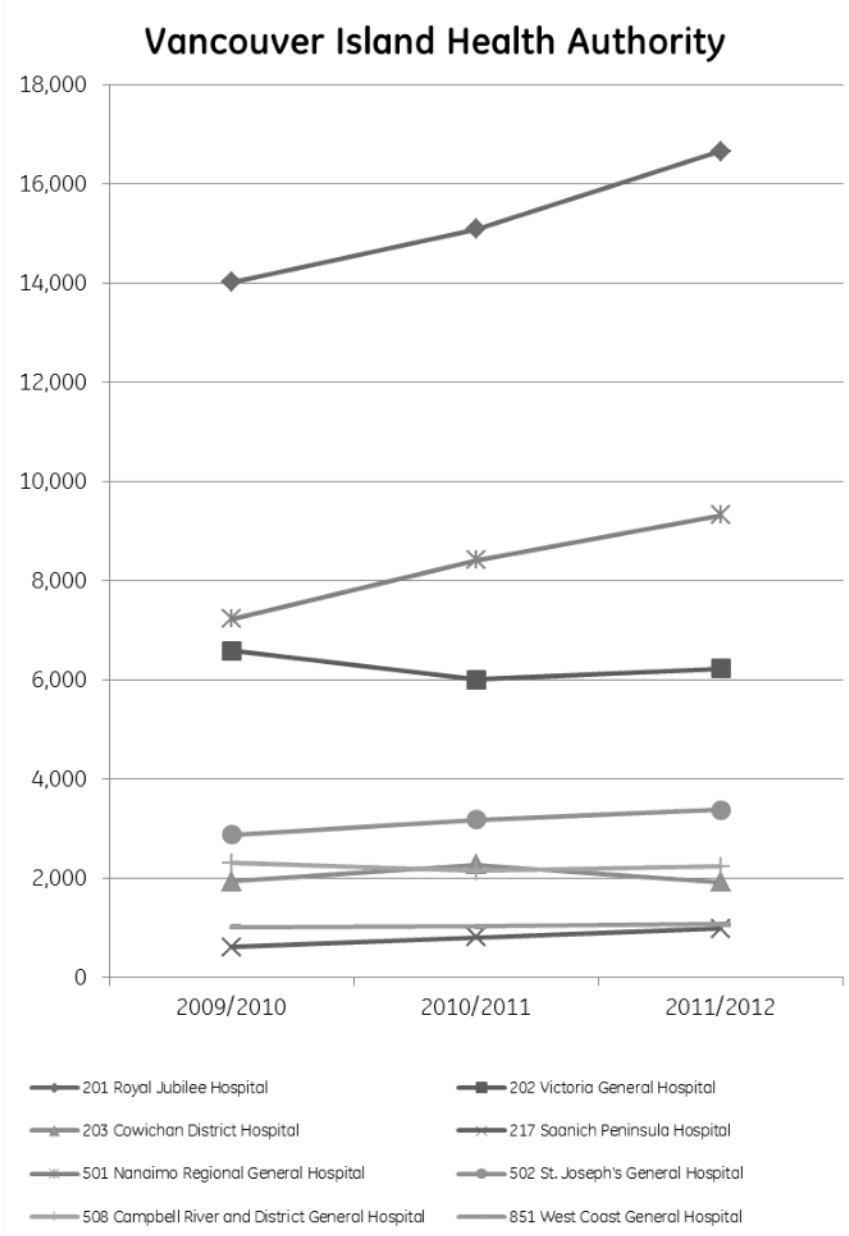

Figure 23: Annual Other Surgical volumes for Vancouver Island Health Authority.

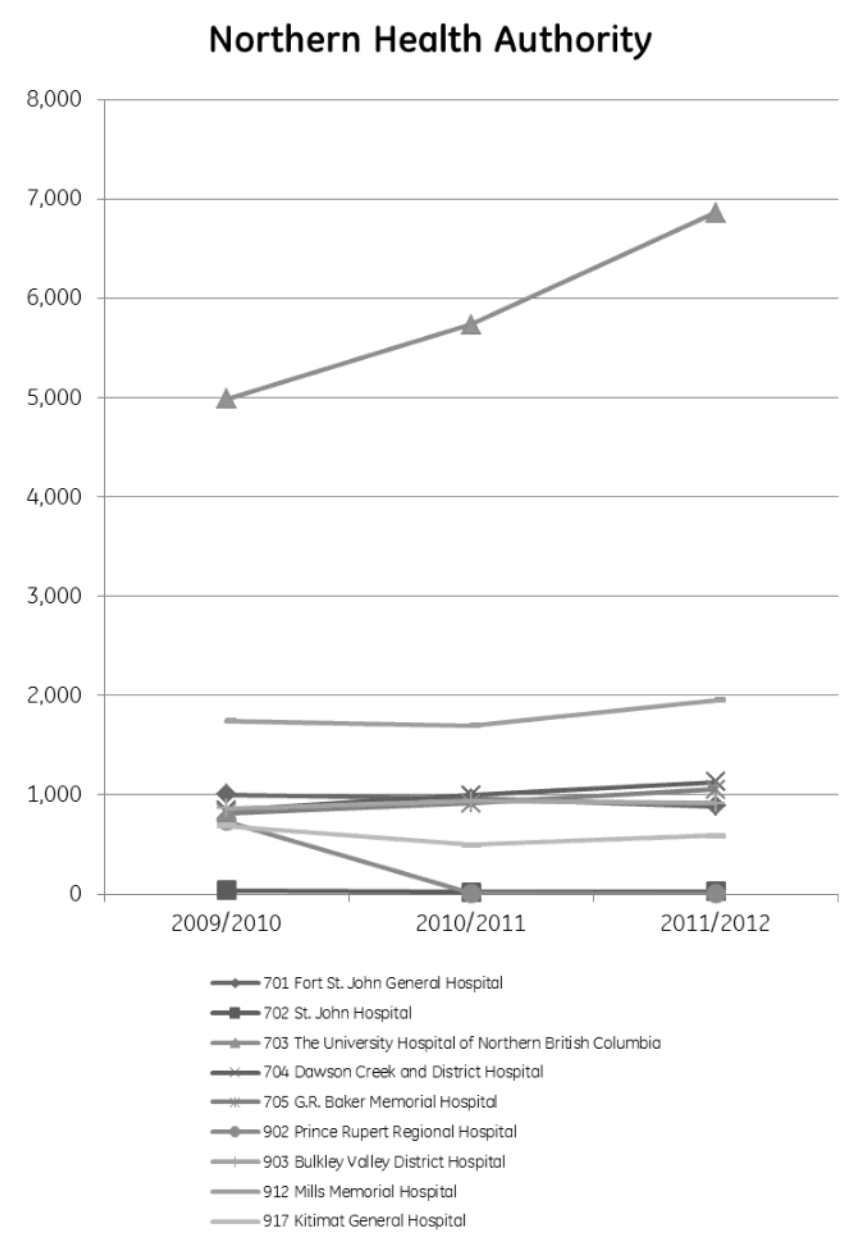

Figure 24: Annual Other Surgical volumes for Northern Health Authority.
Note the significant decrease in Other Surgical volumes at Prince Rupert Regional Hospital (from 2009/10 to 2010/11) is likely due to DAD intervention location coding changes as there is a corresponding increase in Main OR volumes over the same period.

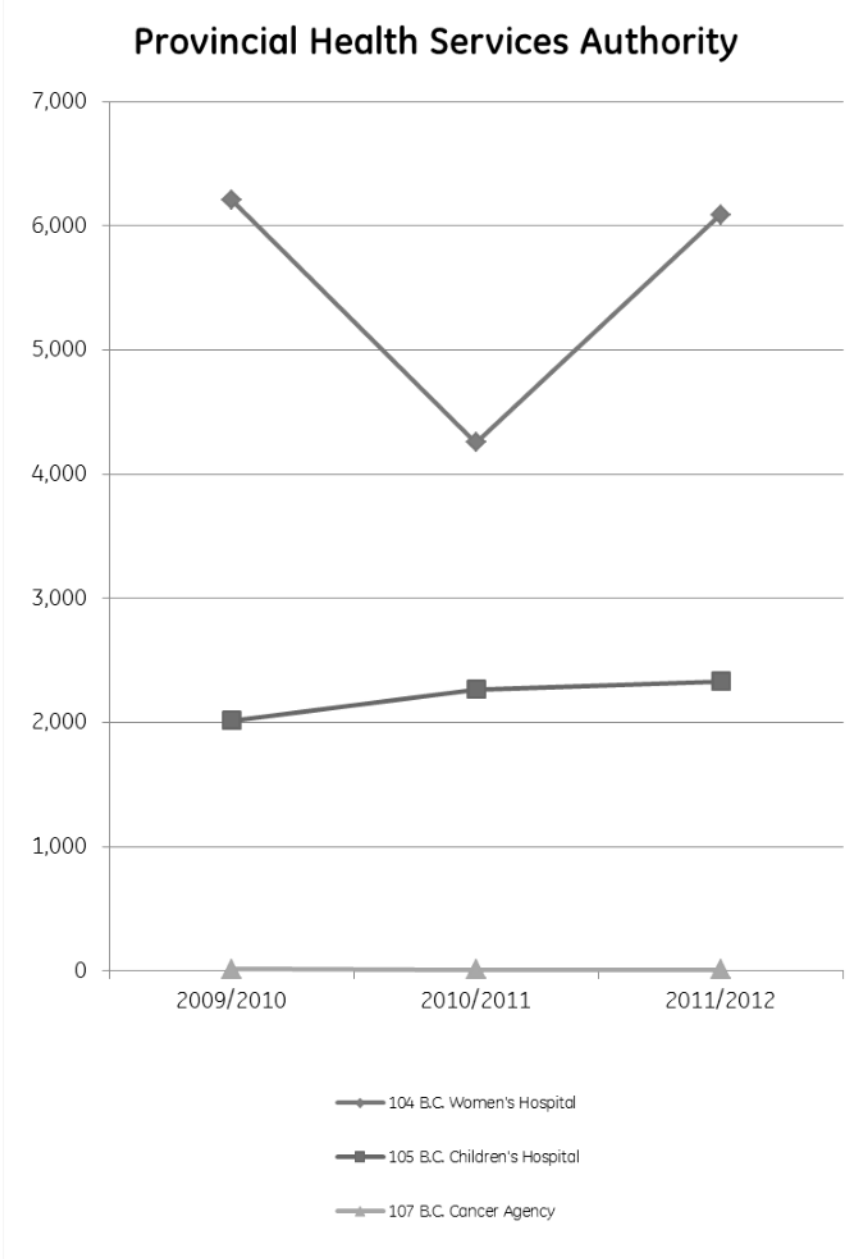

Figure 25: Annual Other Surgical volumes for Provincial Health Services Authority.
Note the significant decrease in Other Surgical volumes at BC Women's Hospital in 2010/11 is due to a temporary DAD intervention location coding change, wherein approximately 2000 inpatient C-section procedures were coded as being performed in Main ORs instead of Obstetrical ORs. A corresponding increase in Main OR volumes is seen in 2010/11 at BC Women's Hospital.

Day Surgery Cases as a Percentage of Total Surgical Volumes by Hospital

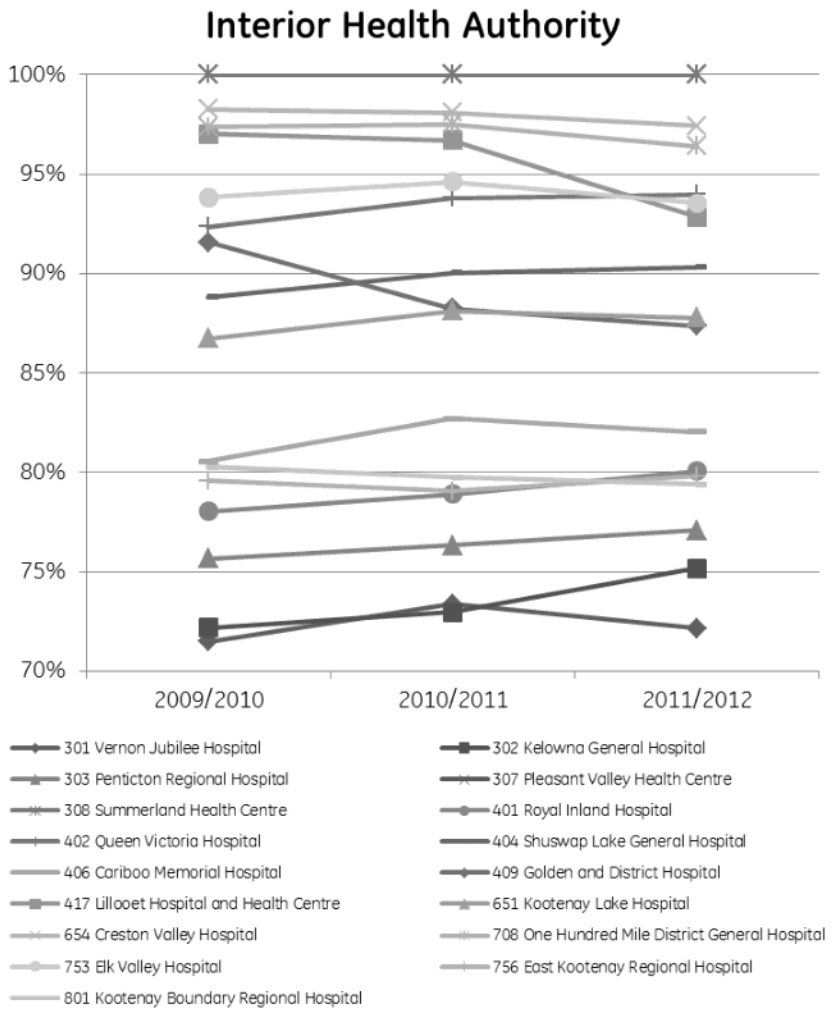

Figure 26: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes) for Interior Health Authority.

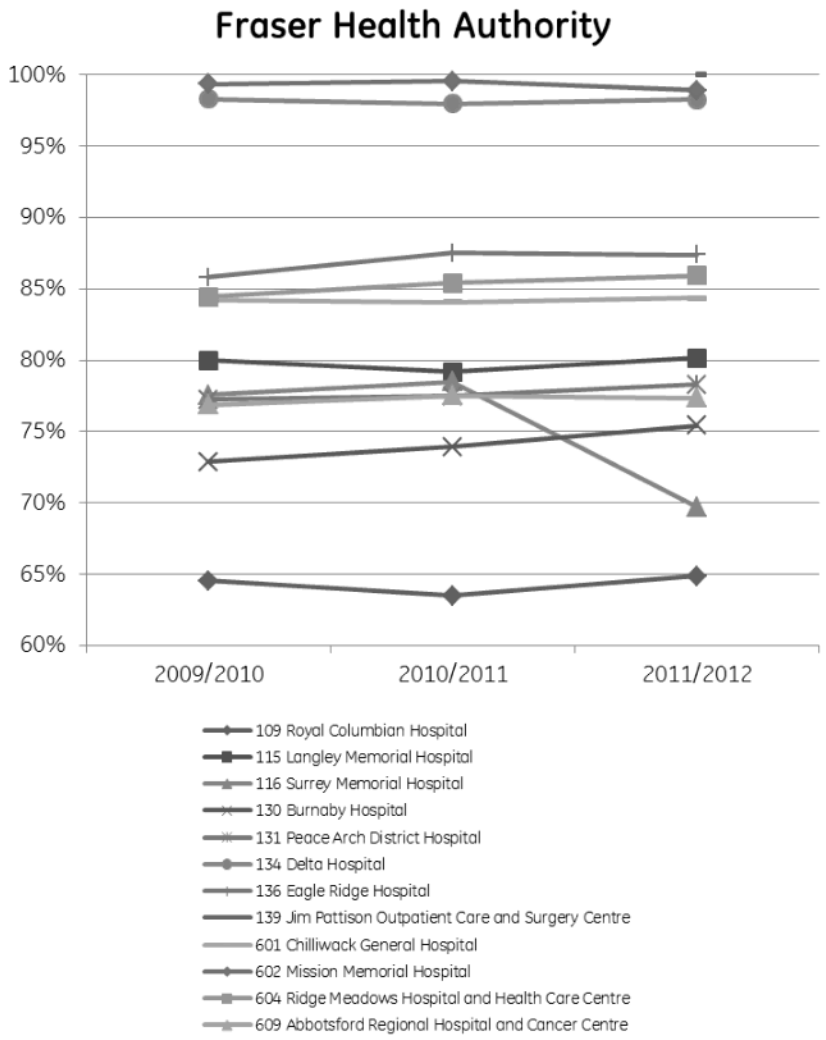

Figure 27: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes) for Fraser Health Authority.

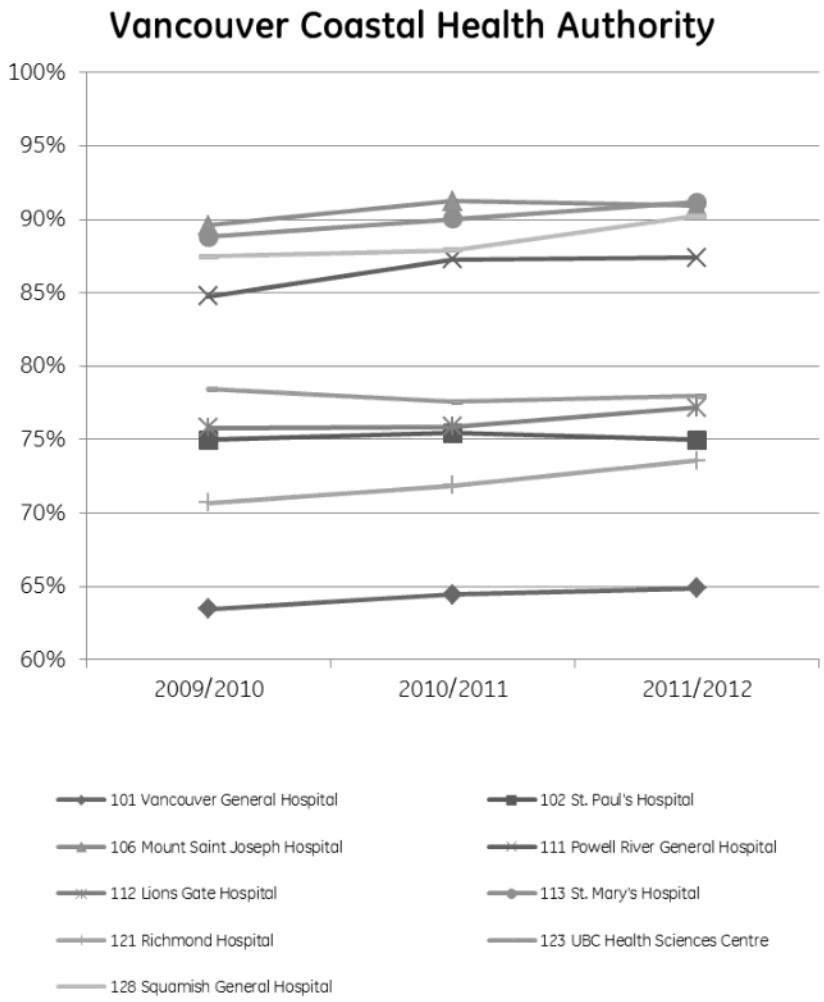

Figure 28: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes) for Vancouver Coastal Health Authority.

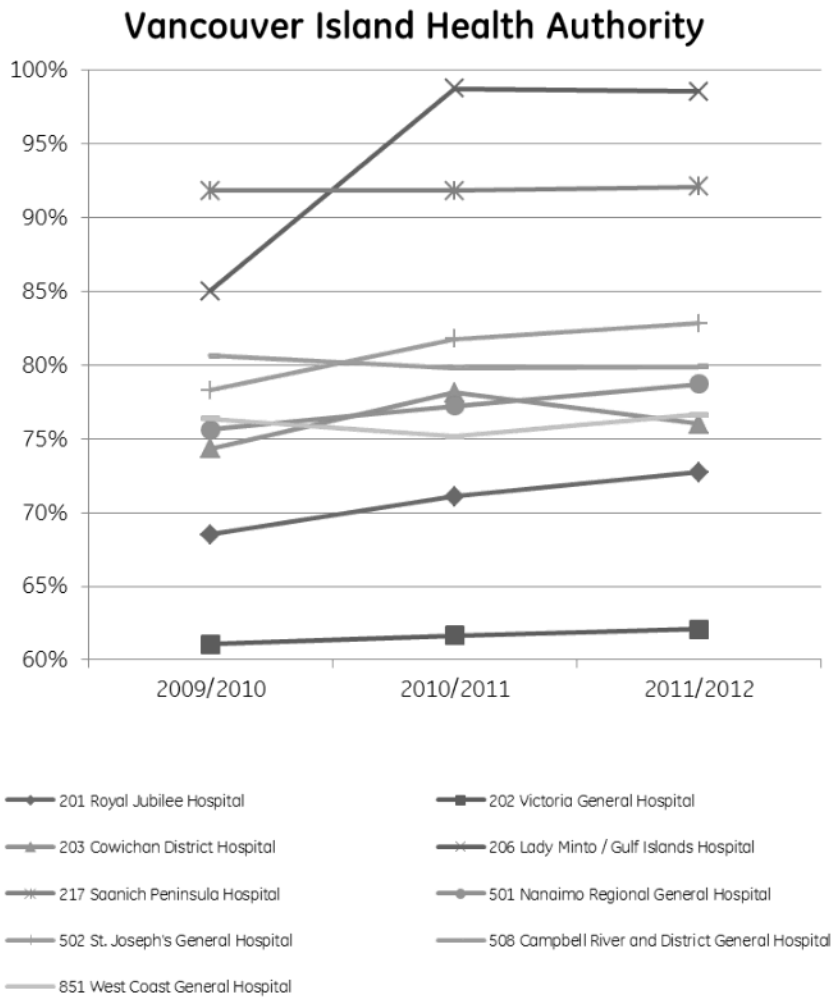

Figure 29: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes) for Vancouver Island Health Authority.

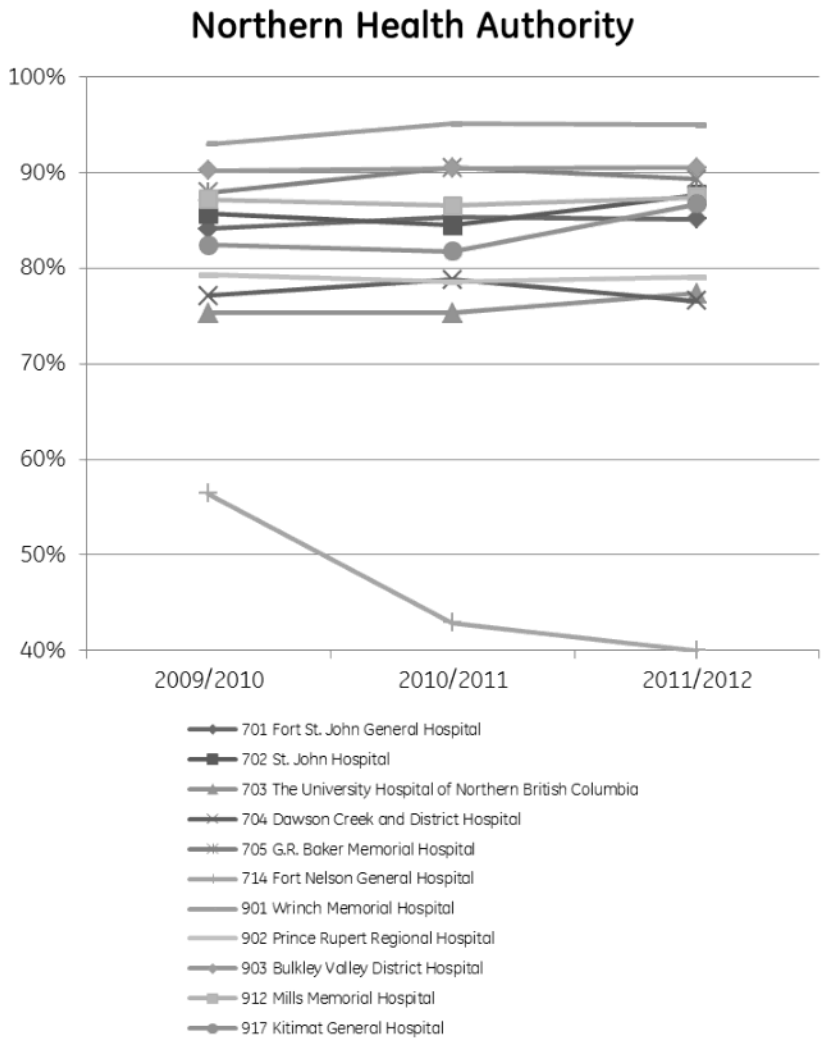

Figure 30: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes) for Northern Health Authority.

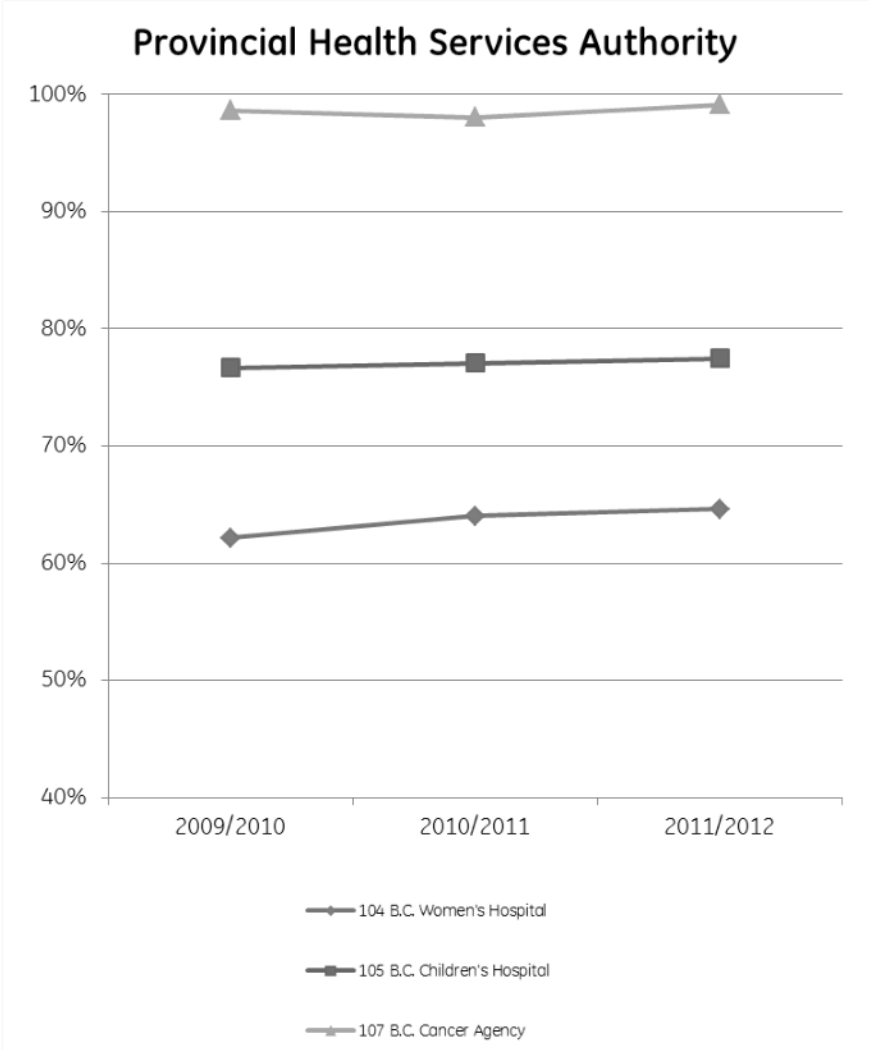

Figure 31: Day surgery cases as a percentage of total cases for all surgical volumes (Main OR and Other volumes) for Provincial Health Services Authority.

Percentage of Unplanned Cases for Main OR Volumes by Hospital

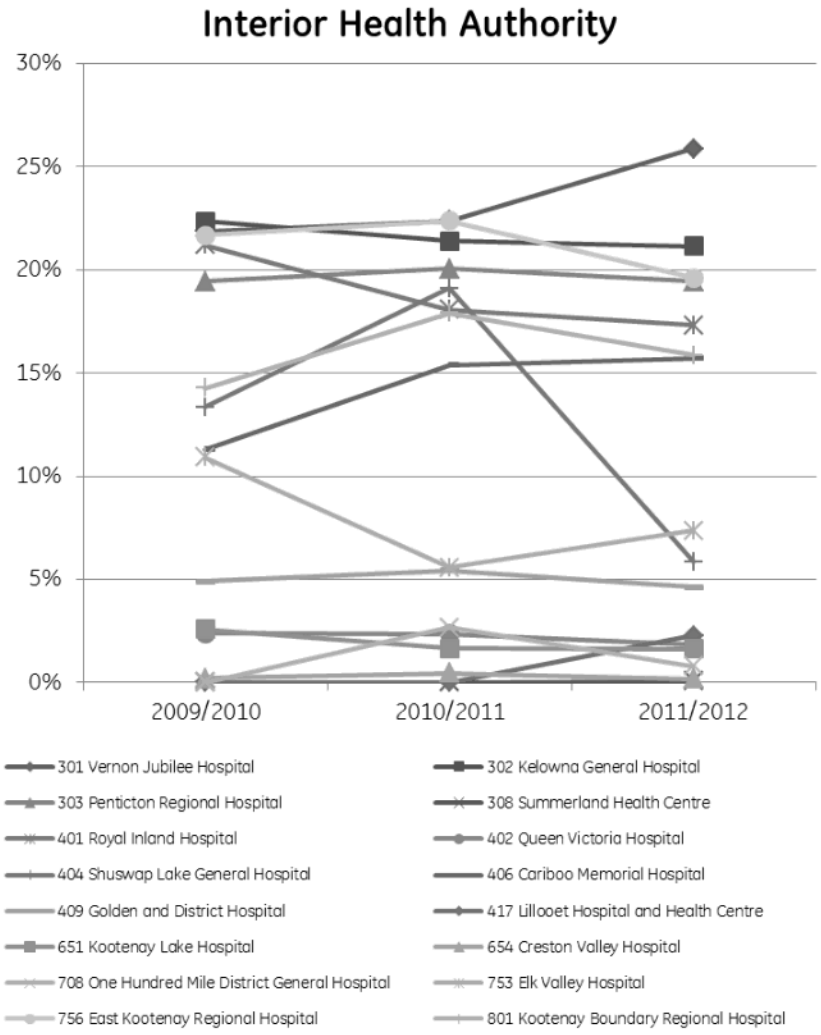

Figure 32: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes at Interior Health Authority. Note the significant decrease in the percentage of unplanned cases at Shuswap Lake General Hospital (from 2010/11 to 2011/12) is likely impacted by DAD intervention location coding changes resulting in higher overall Main OR volumes (as previously noted).

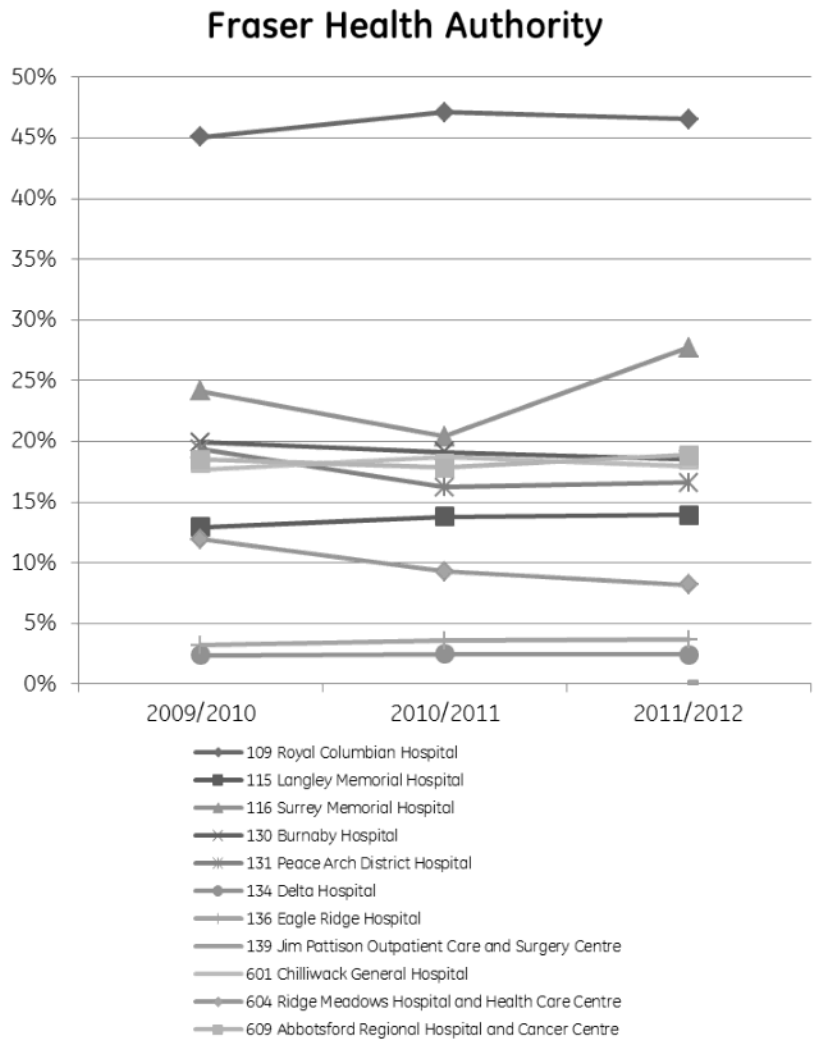

Figure 33: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes at Fraser Health Authority.

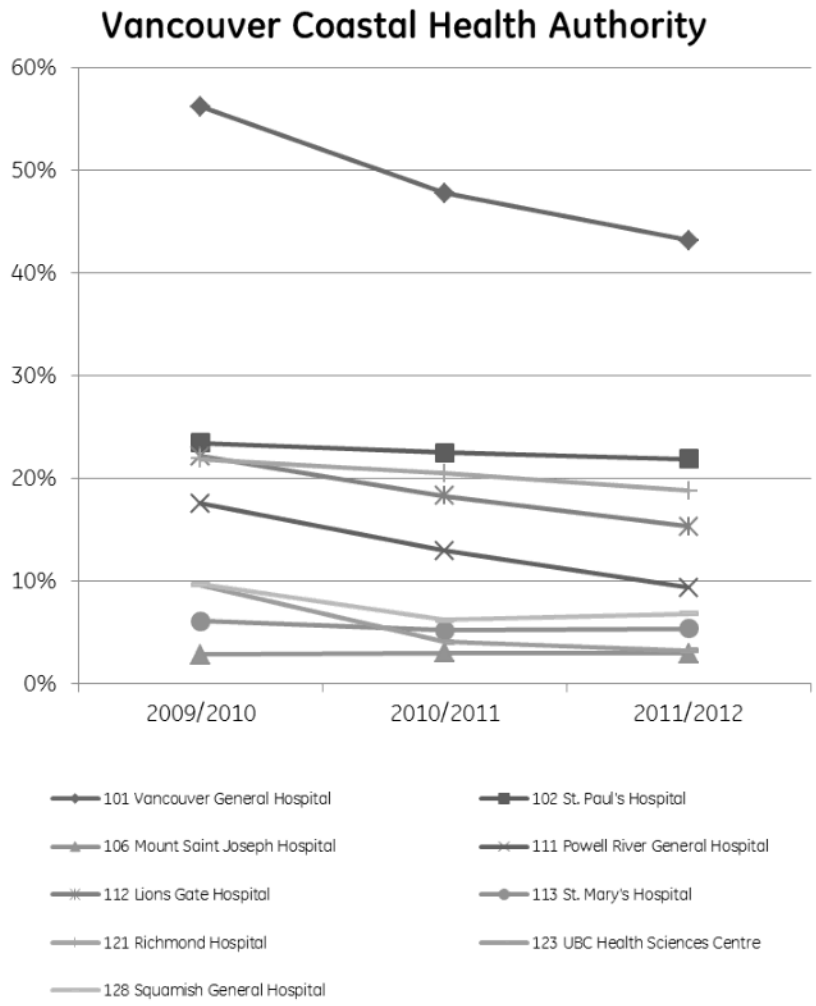

Figure 34: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes at Vancouver Coastal Health Authority.

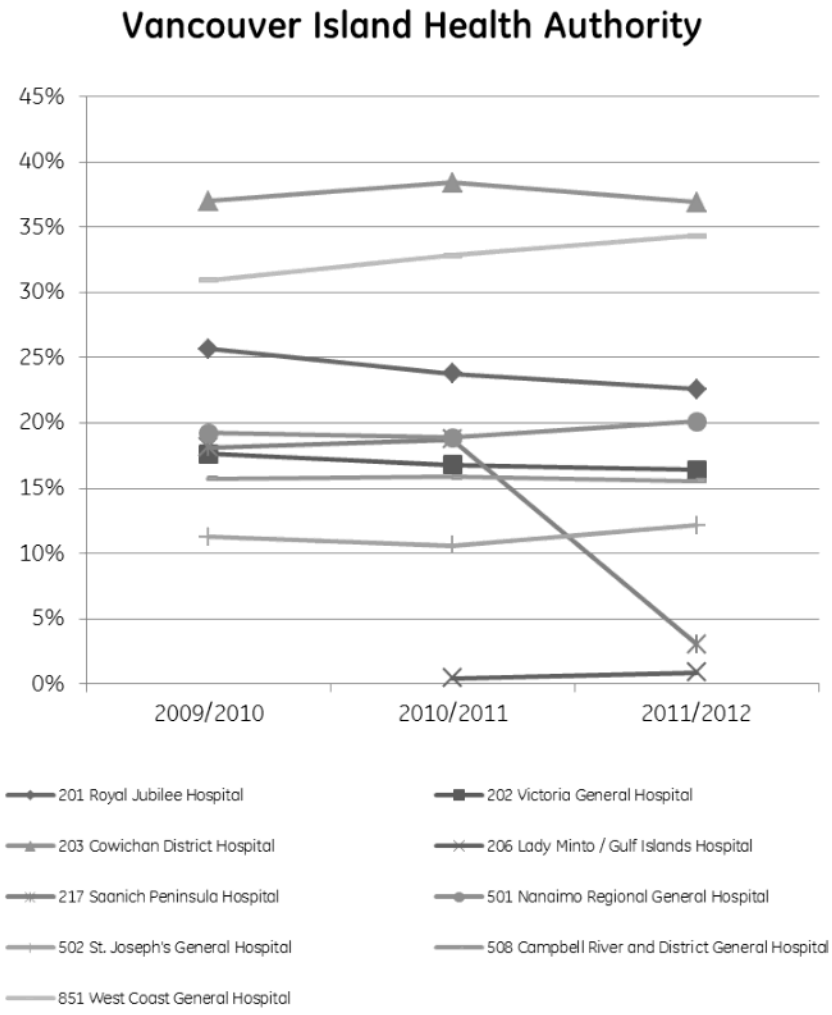

Figure 35: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes at Vancouver Island Health Authority.

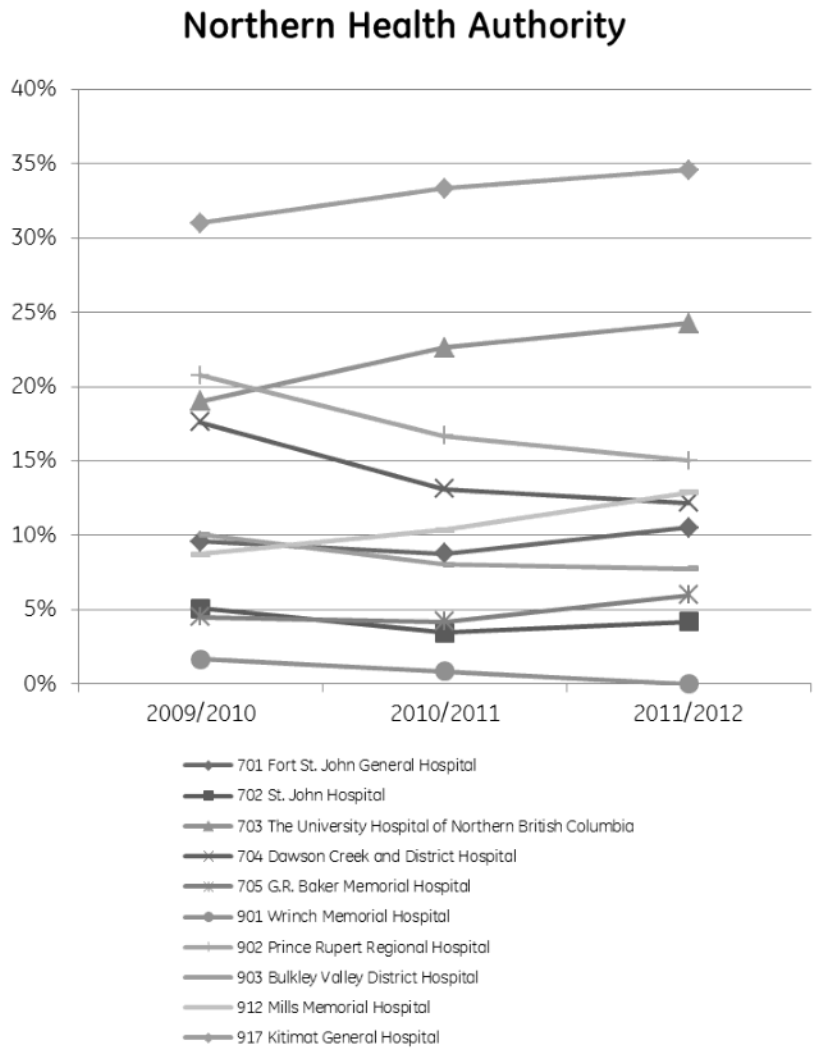

Figure 36: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes at Northern Health Authority. Note the significant decrease in the percentage of unplanned cases at Prince Rupert Regional Hospital (from 2009/10 to 2010/11) is likely impacted by DAD intervention location coding changes resulting in higher overall Main OR volumes (as previously noted).

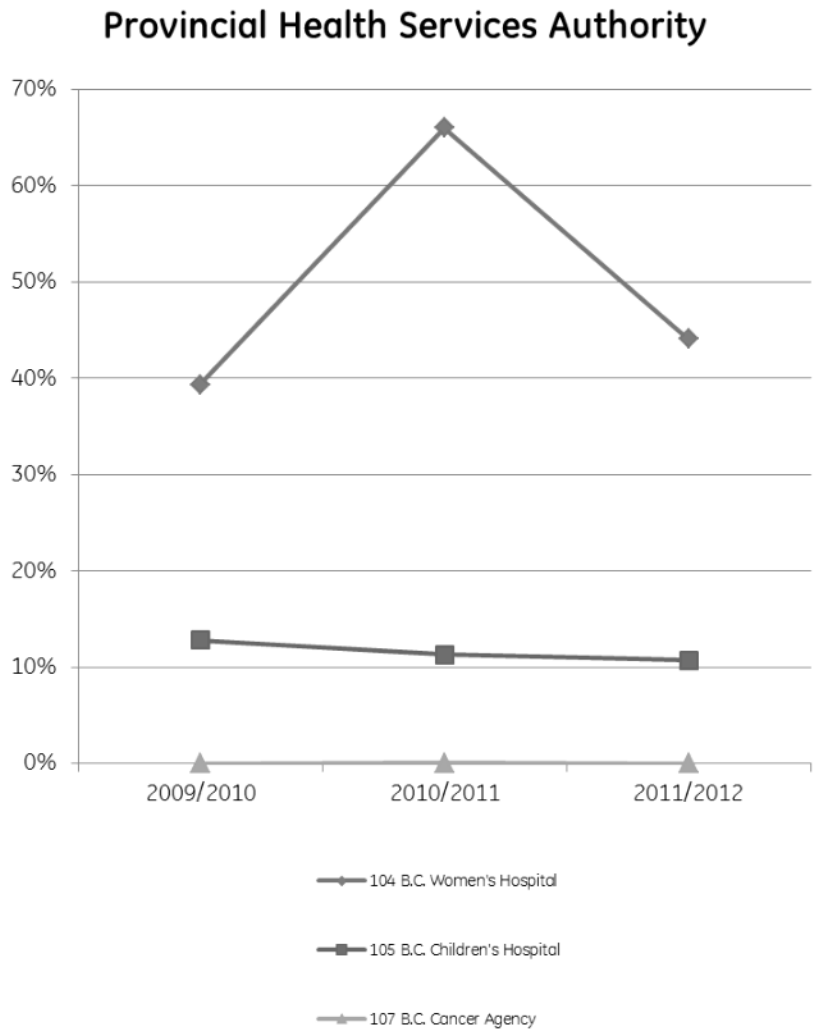

Figure 37: Unplanned cases as a percentage of total cases (excluding C-sections) for Main OR volumes at Provincial Health Services Authority. Note that the significant year-over-year variability in the percentage of unplanned cases at BC Women's Hospital is due to an increase in unplanned Main OR cases in 2010/11 compounded by their relatively low overall non-C-section Main OR volumes (approximately 100-200 cases per year).

C-Section Volume Trends by Hospital

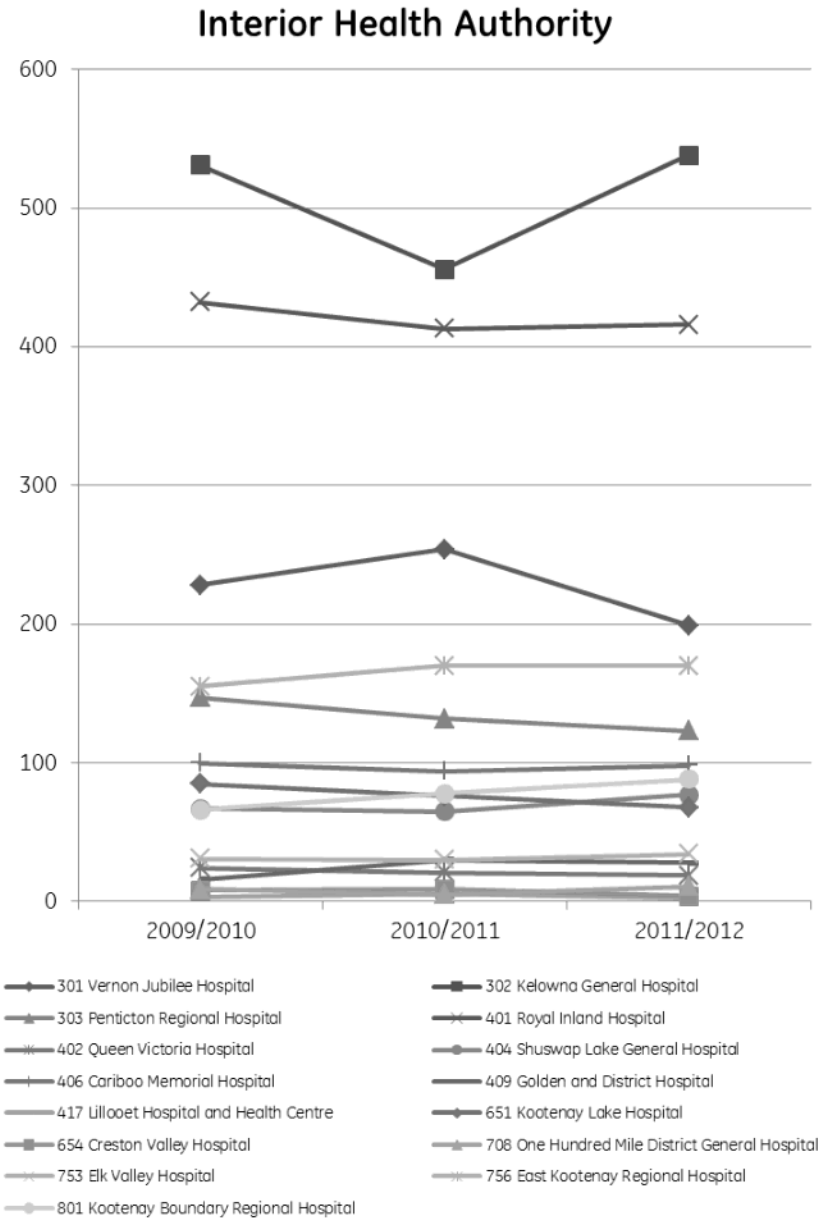

Figure 38: Total annual C-section volumes for Interior Health Authority.

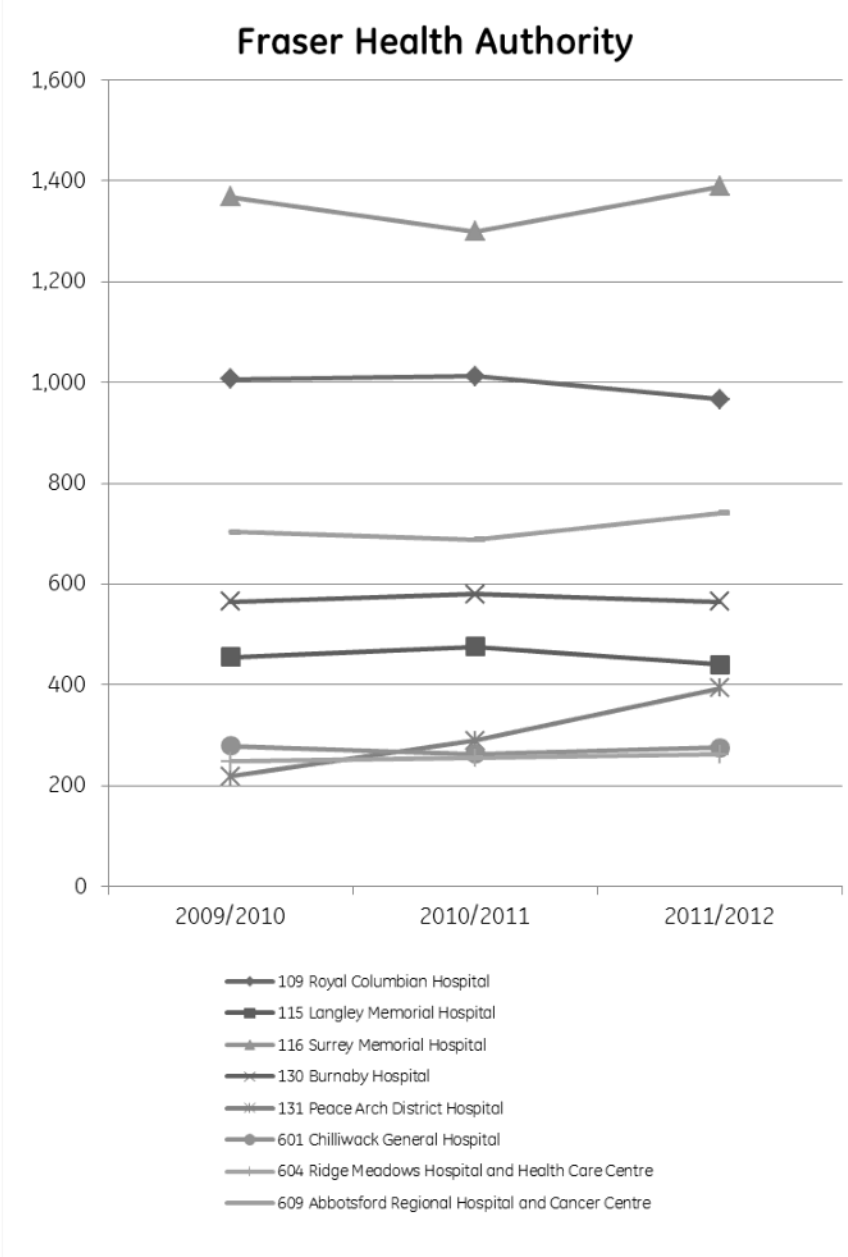

Figure 39: Total annual C-section volumes for Fraser Health Authority.

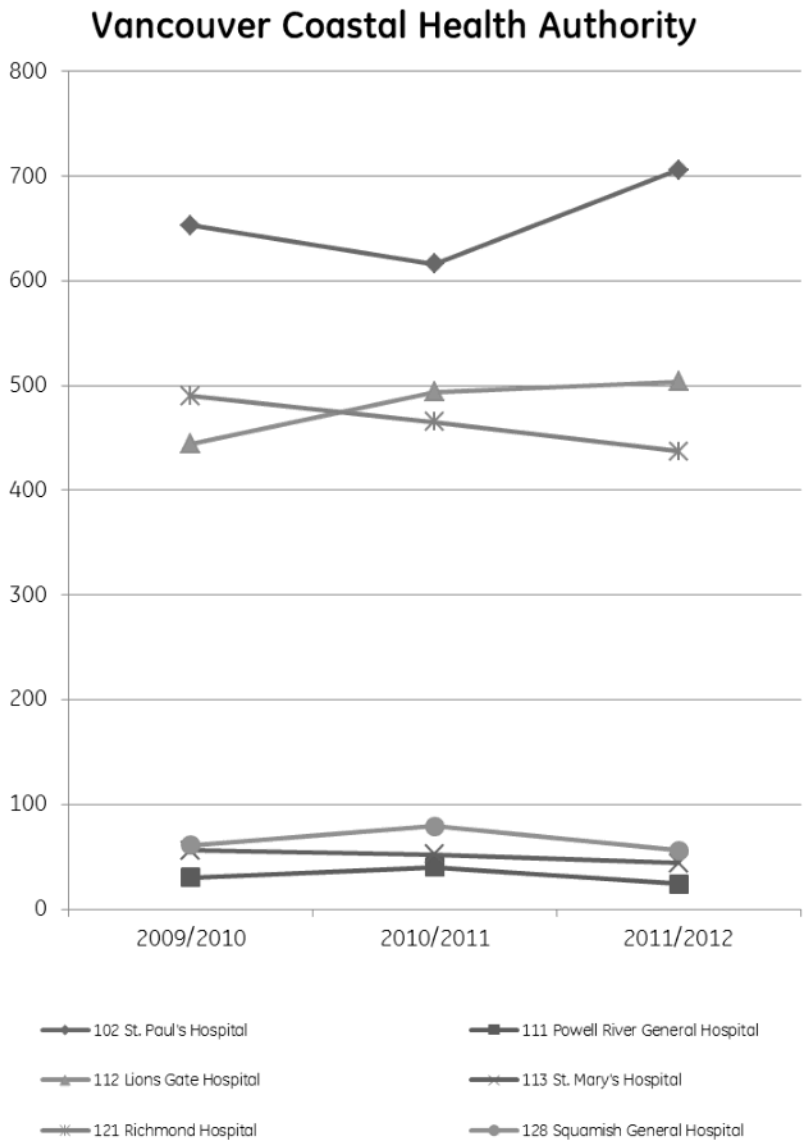

Figure 40: Total annual C-section volumes for Vancouver Coastal Health Authority.

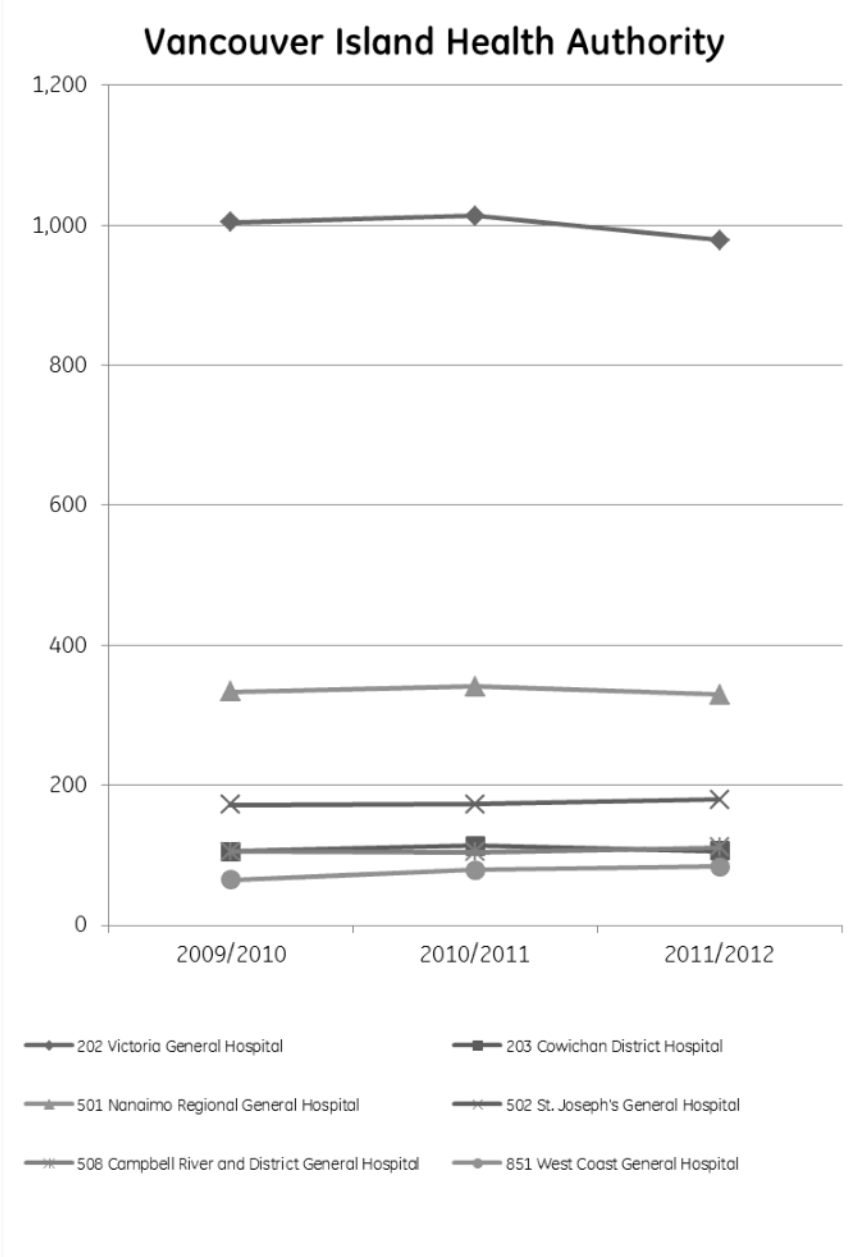

Figure 41: Total annual C-section volumes for Vancouver Island Health Authority.

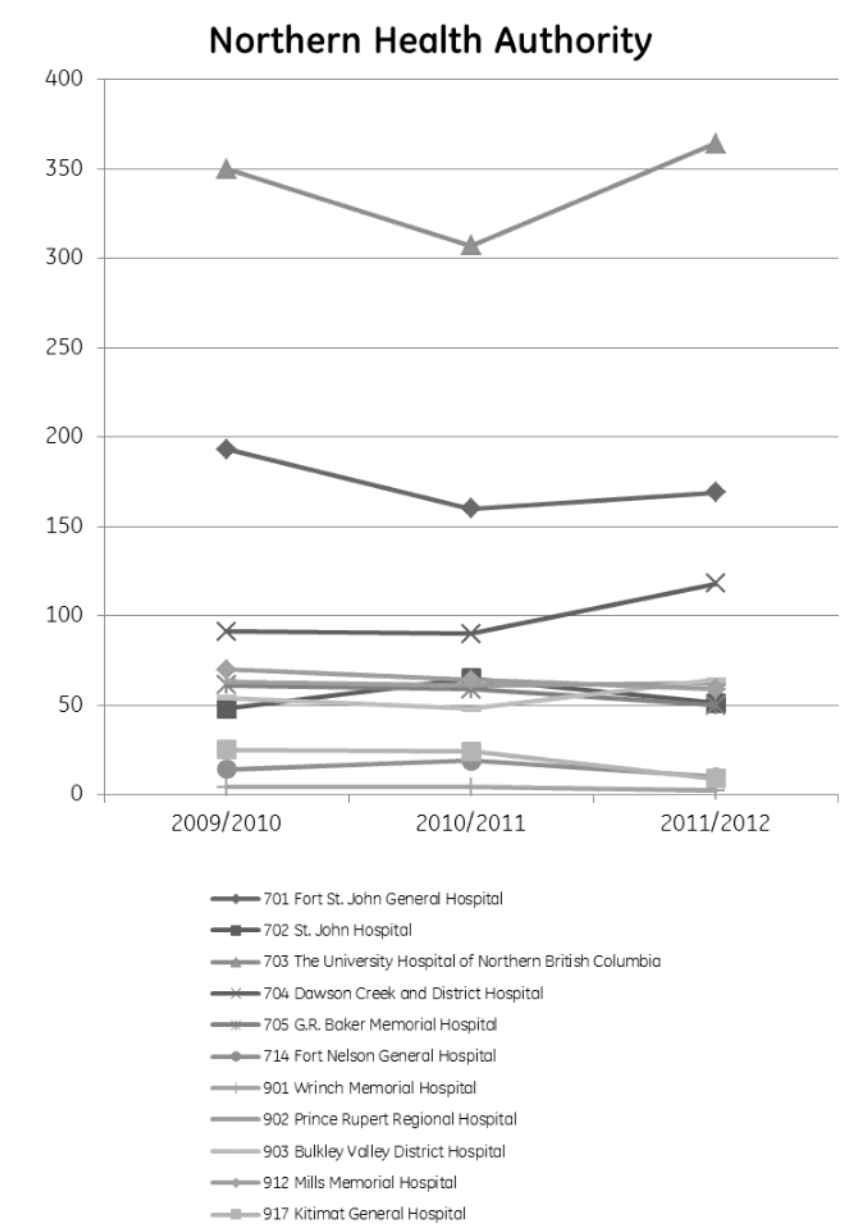

Figure 42: Total annual C-section volumes for Northern Health Authority.

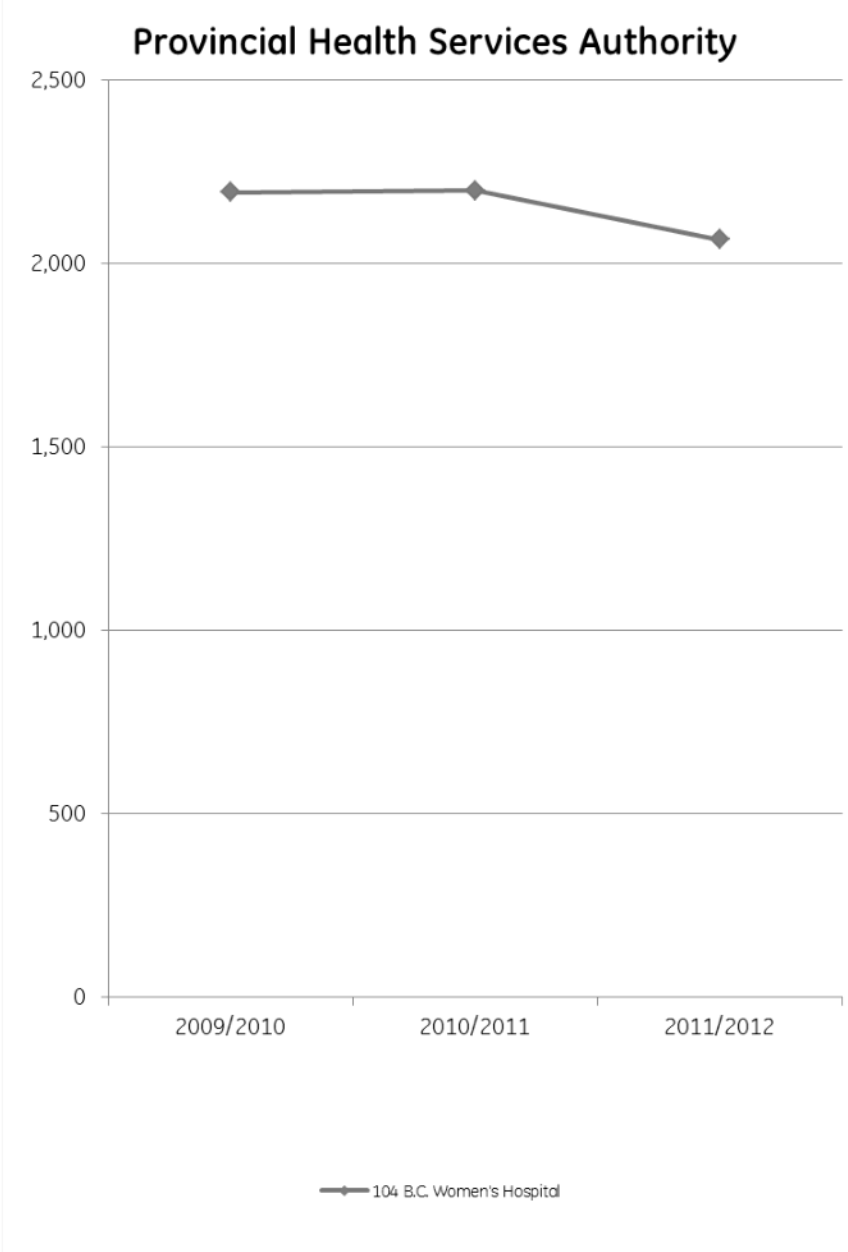

Figure 43: Total annual C-section volumes for Provincial Health Services Authority.

Appendix C: Inventory Data File

The raw physical inventory data file is provided below:

OR Physical
Inventory Analysis v3