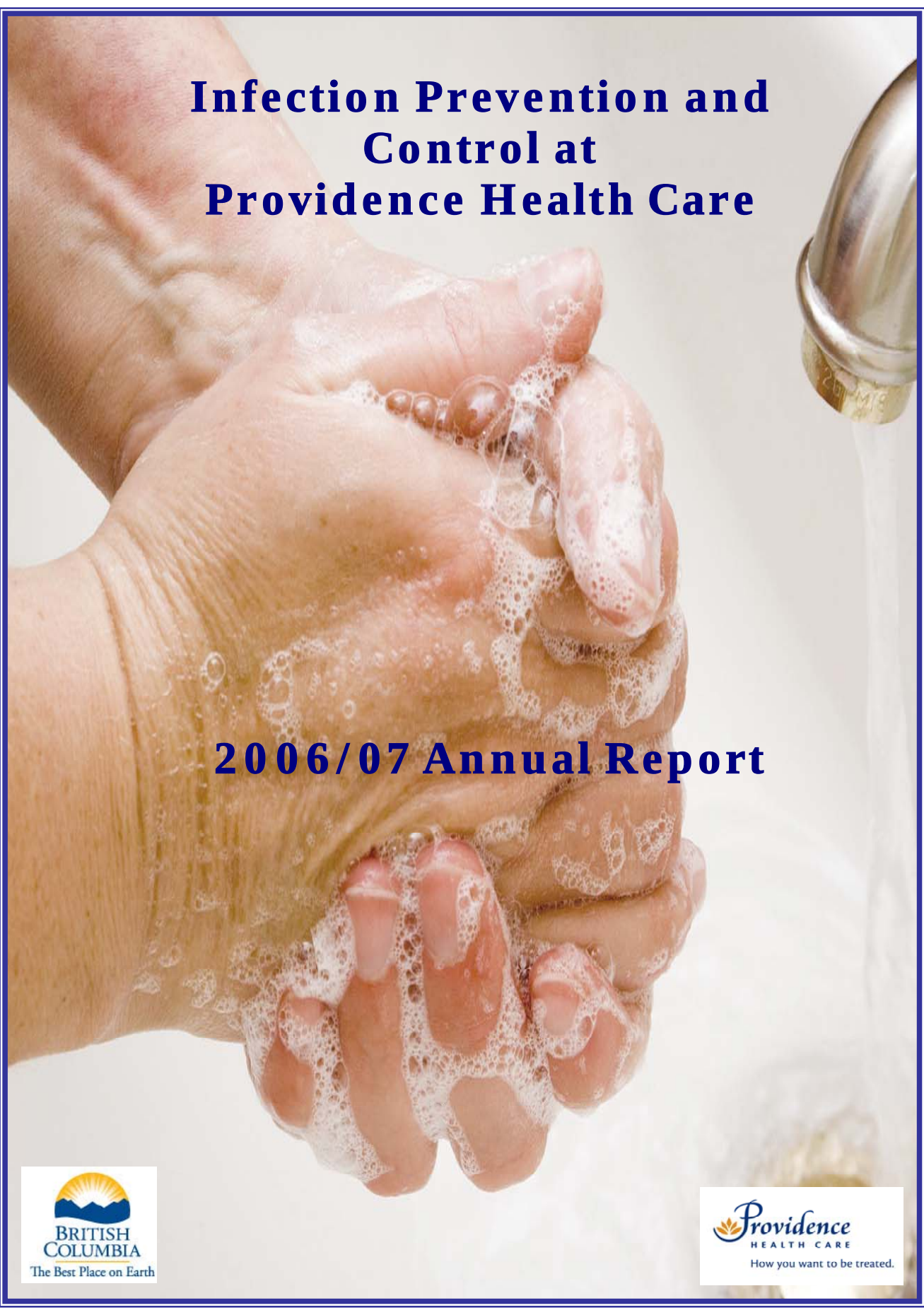




Infection Prevention and Control at Providence Health Care

2006/07 Annual Report

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Executive Summary

Infection prevention and control (IPAC) is an integral component of Providence Health Care's (PHC) commitment to improve staff and patient safety. Health care settings present some inherent risk for acquiring infections, as patients with complicated medical conditions and weakened immune systems come together to receive care. In addition, the continual emergence of new infectious diseases – both in the community and the hospital – poses a further challenge to the control of infections. The risk of health care-associated infections can be reduced, however, with the implementation of effective infection prevention and control strategies. The purpose of this report is to highlight the success of these IPAC strategies at PHC and identify areas for improvement.

We are very pleased to report that the implementation of the *Clean Hands for Life*™ campaign was a success: overall hand hygiene compliance increased through the campaign from 44% to 66%. Proper hand hygiene is one of the most important measures to prevent infections. The IPAC team has done a tremendous job in raising hand hygiene awareness, and improving access to hand gel/foam and handwashing stations.

Surveillance for health care-associated infections is a key component of assessing the effectiveness of various IPAC strategies. It should be noted that rates may not be comparable between PHC and other facilities due to differences in case definitions, surveillance methods, and populations served. Rather, rates are compared to previous years at PHC in order to monitor trends and improve IPAC practices. This past year, the rate of new MRSA cases (incidence) associated with admission to a PHC facility was 1.7 cases/1000 acute care inpatient days. This rate has remained stable over the past five years despite an increase in community-associated MRSA cases. Similarly, the incidence of VRE cases was similar to that in 2005/06 at 2.7 cases/1000 acute care inpatient days. Surveillance for *Clostridium difficile* began on January 1, 2007. Between January 1 and September 20, 2007, 185 PHC-associated cases were identified corresponding to an incidence of 1.3 PHC-associated cases/1000 acute care inpatient days.

We also strive to improve our control strategies when following up with pulmonary tuberculosis cases and responding to outbreaks. In 2006/07, four respiratory outbreaks and ten gastrointestinal outbreaks were identified in PHC facilities, and were primarily caused by influenza A and norovirus, respectively. For each outbreak identified, control measures were successful in reducing the risk of further transmission. In 2006/07, no cases of pulmonary tuberculosis acquired within a PHC facility were identified; 34 cases were admitted to a PHC acute care facility for an overall rate of 1.7/1000 acute care admissions.

We look forward to the coming year with new initiatives underway to continue to sustain a culture which promotes infection prevention and control strategies across PHC. The success of infection prevention and control initiatives are dependent on the involvement from front-line health care workers, physicians, hospital administrators, patients, residents and visitors. We thank everyone who has contributed to this success and look forward to continued work together.

Sincerely,

The Infection Prevention and Control Team

Introduction to Infection Prevention and Control (IPAC)

Infection Prevention and Control (IPAC) is consistent with the Values and Mission of Providence Health Care (PHC).

The Vision of the [IPAC team](#) is to create and sustain a culture in which infection prevention and control is integrated into all aspects of care at all [PHC facilities](#).

The Mission of the IPAC team is to be dedicated to the prevention and control of health care-associated infections in a supportive working environment. The practices of the IPAC team are based on sound scientific principles. Infection control services are provided to PHC with structure and authority in collaboration with local, regional, and provincial partners.

Our vision and mission are carried out using the initiatives described below.

Surveillance for health care-associated infections using [standardized case definitions](#) is critical to the prevention and control of hospital-based transmission of infectious agents. At PHC, the objectives of surveillance for PHC-associated infections are to:

1. Detect cases through enhanced screening so that appropriate precautions can be implemented
2. Detect infectious diseases outbreaks in order to implement control measures
3. Monitor trends in PHC-associated transmission, and provide a means of determining when interventions are required
4. Determine the burden of specific infectious diseases to PHC
5. Evaluate and enhance interventions

Case Management: Control measures for patients identified with a communicable disease are based on how infectious agents are transmitted, and include education and implementation of standard, contact, droplet, and airborne precautions. Where other patients, residents, or staff may have been exposed before a case was identified, contact tracing is conducted to ensure that the disease was not transmitted to others.

Outbreak management: In collaboration with Vancouver Coastal Health Public Health, IPAC is responsible for investigating clusters of cases and determining whether there is an outbreak within a PHC facility. For each outbreak declared, control measures are promptly implemented.

Environmental hygiene: IPAC works with multidisciplinary teams to implement environmental infection control strategies. This includes planning for construction projects, and advising on environmental decontamination and cleaning procedures.

Education is provided to staff and resources are provided to patients and visitors in order to increase awareness around appropriate IPAC measures. Education is provided via classes, presentations, consultations, and the IPAC website.

Research is conducted in order to support the integration of evidence-based practices into daily practice and evaluate the effectiveness of current strategies at PHC.

Policies and Procedures are continuously reviewed, developed, and implemented in order to guide the best evidence-based IPAC practices.

Hand Hygiene

Hand hygiene (hand-washing with soap and water or using a hand gel/foam) is considered the most important measure for preventing the spread of microorganisms in health care settings. However, overall compliance with hand hygiene is known to be low [1]. Monitoring hand hygiene is an essential component of programs aimed at improving compliance. Direct observation is the standard method used to measure trends in hand hygiene practices.

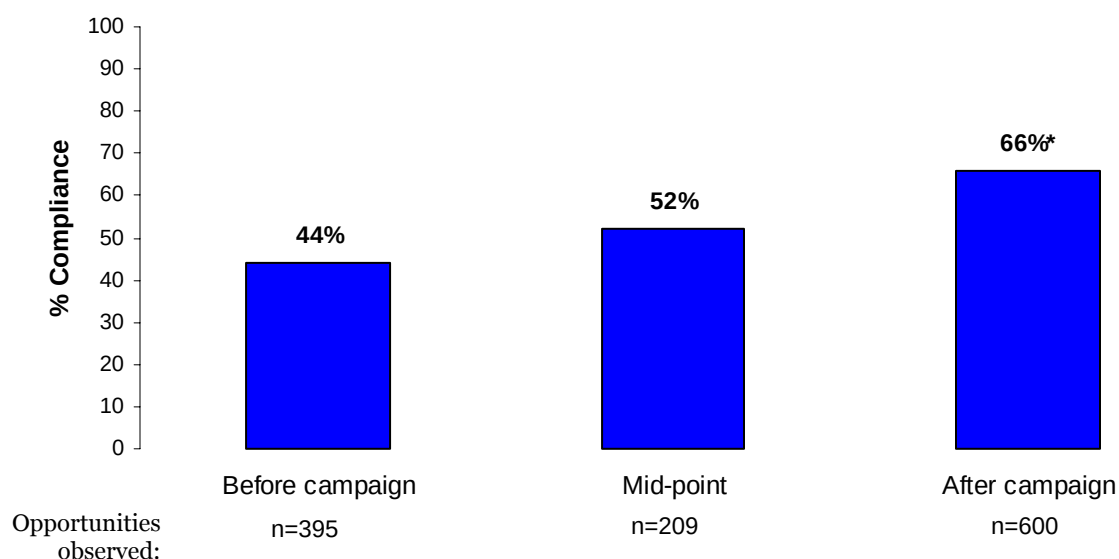
In October 2005, Providence Health Care launched a one-year hand hygiene campaign called *Clean Hands for Life™*, in collaboration with Vancouver Coastal Health and Bayer HealthCare (Canada). The goal of the campaign was to improve hand hygiene compliance by promoting awareness through posters, promotional materials, and educational sessions. Access to hand gel was greatly improved by distributing portable hand gel bottles and mounting additional wall-mounted gel dispensers. Front-line

nurses and doctors measured hand hygiene compliance by direct observation of staff before the campaign started, at the mid-point of the campaign, and after the campaign was over using the following formula:

$$\% \text{ Compliance} = \frac{\# \text{ hand hygiene events}}{\# \text{ opportunities}} \times 100$$

Overall, **hand hygiene compliance improved significantly** since the beginning of the hand hygiene campaign (Figure 1). Hand hygiene compliance improved both among nursing and medical staff. *Clean Hands for Life™* will be re-launched for the 2007/08 fiscal year. In order to further improve compliance, IPAC will continue to provide hand hygiene education, including a module specifically designed for medical staff. The methods used to monitor hand hygiene are being reviewed so that hand hygiene can be regularly monitored across PHC.

Figure 1. Hand hygiene compliance at PHC in relation to the *Clean Hands for Life™* campaign



* Statistically significant difference from before campaign ($p < 0.05$)

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Methicillin-resistant *Staphylococcus aureus* is a multi-resistant bacterium that can be easily transmitted from patient to patient. MRSA infections can also be difficult to treat, leading to an increased length of stay in the hospital. Over the past few years, the prevalence of MRSA in health care settings and in the community has greatly increased [2].

PHC has a policy for screening high-risk patients for MRSA carriage (i.e., those with a recent hospital admission, those self-reporting as positive, injection drug users, hemodialysis patients, and residents of long term care). All MRSA positive cases are placed on contact precautions to reduce transmission.

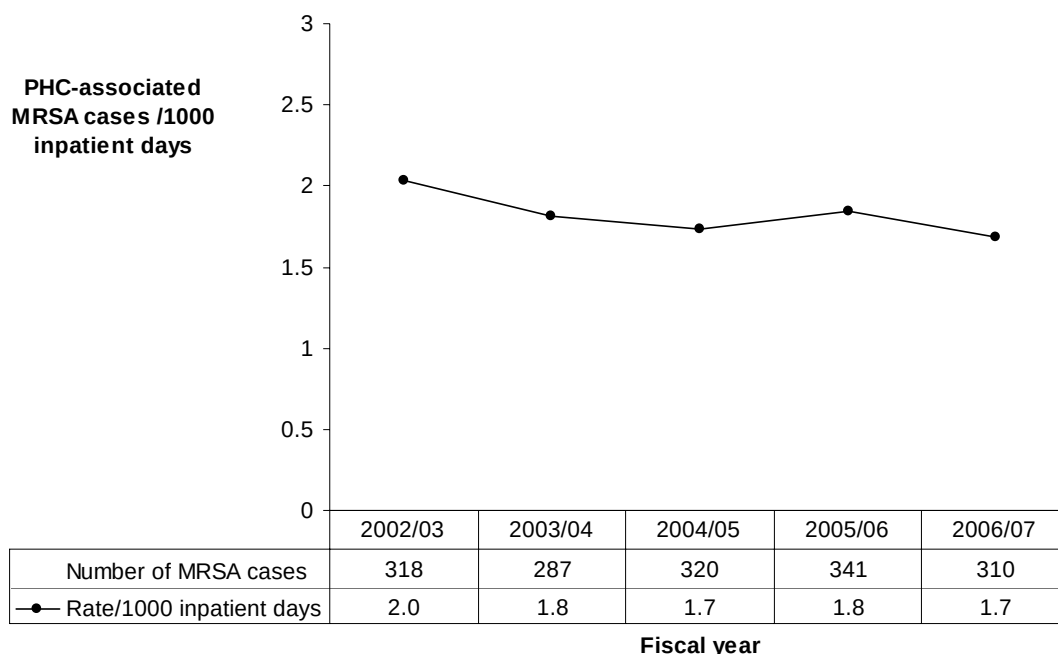
In 2006/07, 1280 new cases of MRSA were identified at PHC. 324 (25%) of these were classified as PHC-associated cases, corresponding to an overall incidence of 1.7 (95% CI: 1.5, 1.9) cases/1000 acute care inpatient days. The rate was the same at St. Paul's and Mount Saint Joseph hospitals where the majority (n=310, 96%) of the PHC-associated cases were admitted.

The incidence of PHC-associated MRSA cases has remained stable over the past five years (Figure 2). However, the number of non-PHC associated cases has increased, adding to the risk of PHC-associated transmission. In 2006/07, those who were MRSA positive accounted for 17% of all inpatient days. This compares to only 13% in 2004/05.

The MRSA cases described above include both colonization and/or infection. The majority of cases identified are simply colonized, and severe outcomes such as bloodstream infections are relatively uncommon. In 2006/07, 16/324 (5%) of PHC-associated cases and 50/956 (5%) of non-PHC associated cases developed an MRSA bacteremia.

The prevalence of community-associated MRSA is rising across the country. IPAC is working closely with the PHC Medical Microbiology laboratory and public health partners to investigate this issue and monitor the impact of CA-MRSA on transmission at PHC.

Figure 2. Rate of new PHC-associated MRSA cases in acute care facilities, 2002/03 to 2006/07



Vancomycin-Resistant Enterococci (VRE)

VRE refers to certain strains of enterococci that are resistant to the antibiotic vancomycin, making infections more difficult to treat. VRE was first identified as being transmitted within Providence Health Care facilities in the fall of 2004. VRE had previously caused outbreaks in health care facilities across Canada [3].

PHC has a policy for screening high-risk patients for VRE carriage (i.e., those with a recent hospital admission, those self-reporting as positive, injection drug users, hemodialysis patients, and residents of long term care). All VRE positive cases are placed on contact precautions to reduce transmission.

In 2006/07, 564 new cases of VRE were identified at PHC. 497 (88%) of these were classified as PHC-associated cases, corresponding to an incidence of 2.7 (95%

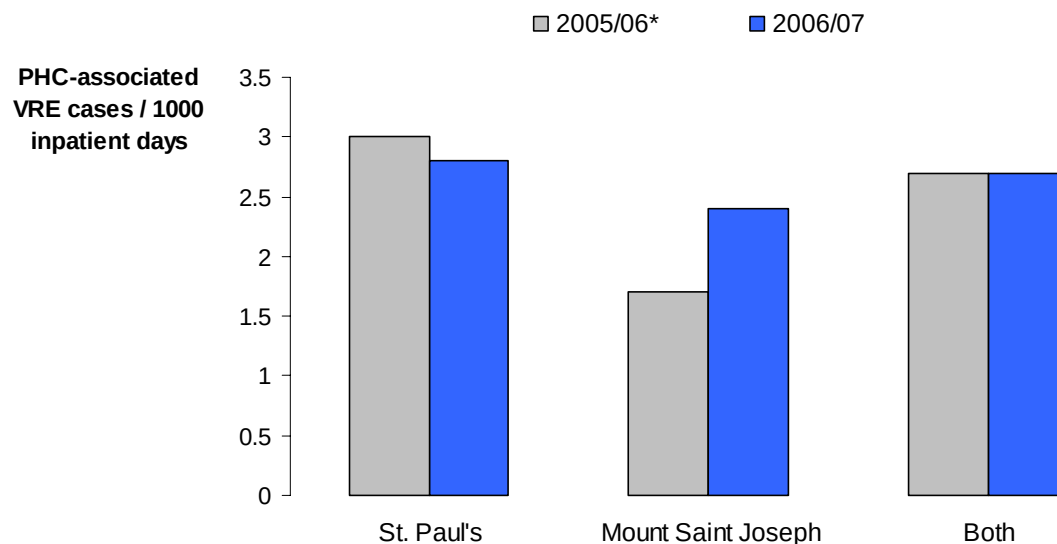
CI: 2.5, 2.9) cases/1000 acute care inpatient days (Figure 3).

The incidence of PHC-associated cases in 2006/07 was the same as that reported in 2005/06. Nearly all cases (98%) were identified at either St. Paul's Hospital or Mount Saint Joseph Hospital (MSJ). The rate at MSJ was higher in 2006/07 than in 2005/06.

The VRE cases described above include both colonization and/or infection. The majority of cases identified are simply colonized, and severe outcomes such as bloodstream infections are relatively uncommon. In 2006/07, only 5/497 (1%) of PHC-associated cases developed a VRE bacteremia.

IPAC will continue to work to monitor VRE transmission by facility and unit in order to refine our intervention strategies.

Figure 3. Rate of new PHC-associated VRE cases in acute care facilities, 2005/06 and 2006/07.



* Data available for fiscal periods 6-13 only (August 12, 2005 – March 31, 2006)

Clostridium difficile

Clostridium difficile is a bacterium that may result in diarrhea and has the potential to cause more serious intestinal complications. It is one of the most common infections acquired in health care settings [4;5]. Enhanced surveillance for *C. difficile* began at PHC on January 1, 2007.

Between January 1 and September 20, 2007, 248 new cases of *C. difficile* were identified at PHC. 185 (75%) of these were classified as PHC-associated cases, corresponding to an incidence of 1.3 (95% CI: 1.1, 1.5) cases/1000 acute care inpatient days. The vast majority of cases were identified at St. Paul's and Mount Saint Joseph hospitals, corresponding to incidences of 1.2 (95% CI: 1.0, 1.4) and 1.7 (95% CI: 1.2, 2.2), respectively.

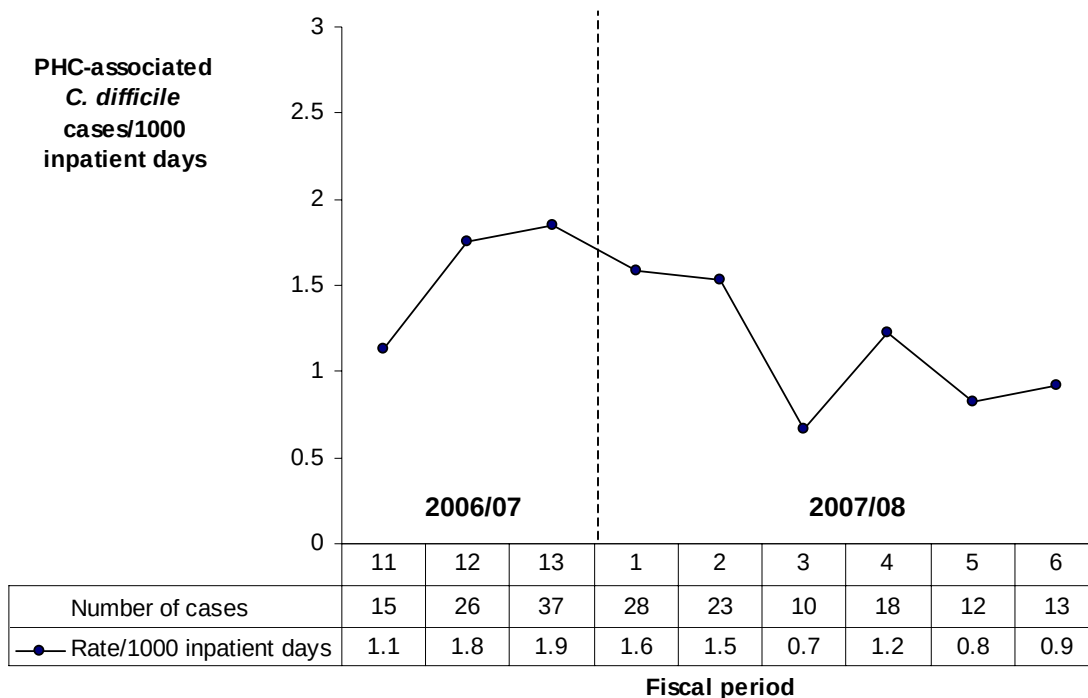
Preliminary results suggest that the incidence is slightly decreasing in 2007/08 compared to the 3 periods observed in 2006/07. These rates should be interpreted cautiously as they are based on only nine months of data; no comparisons

with previous years can be made. Age and co-morbidity are known risk factors for *C. difficile*; therefore, given the population served at PHC, increased rates may be expected.

Complications related to *C. difficile* 30 days following diagnosis are also closely monitored. Of the cases identified up to September 20, 2007, 25 (10%) had treatment failure, 4 (2%) underwent a colectomy, 2 (1%) were diagnosed with toxic megacolon, and 7 (3%) were readmitted with *C. difficile*.

The hyper-virulent strain of *C. difficile*, known to have caused major outbreaks in Quebec and elsewhere [6], was detected in PHC facilities during an investigation within the past year. This strain of *C. difficile* had previously been reported in other facilities in Western Canada. IPAC is working closely with the PHC Medical Microbiology laboratory to investigate this issue through enhanced surveillance and molecular testing.

Figure 4. Rate of PHC-associated *C. difficile* cases in acute care-facilities, 2006/07 to 2007/08



Pulmonary tuberculosis (TB)

Tuberculosis (TB) is caused by a bacterium called *Mycobacterium tuberculosis*. It is spread via the airborne route when someone with active pulmonary TB coughs or sneezes.

The risk of TB transmission in health care settings is driven by the prevalence of disease in the community and the effectiveness of prevention and control measures implemented. If a patient is suspected or known to have active pulmonary TB, the patient is placed on airborne precautions to reduce the risk of further transmission.

A facility is considered to have a high risk of TB transmission to health care workers if six or more individuals are seen with active TB annually [7]. In 2006/07, 34 cases of pulmonary tuberculosis were admitted to a PHC acute care facility for an overall rate of

1.7 cases/1000 acute care admissions (Table 1). No cases were identified in residential facilities.

Although PHC cares for a relatively high number of TB cases, no cases of TB acquired within a PHC facility were identified. The majority of cases (65%) were effectively screened and placed on airborne precautions immediately upon admission and throughout their stay at PHC. The remaining 12 (35%) cases required contact tracing either among roommates and/or among staff with whom they had been in contact.

IPAC will continue to conduct surveillance on pulmonary TB cases and develop strategies to ensure that all suspected or confirmed TB cases are adequately screened and isolated upon admission.

Table 1: Pulmonary tuberculosis cases identified in PHC acute care facilities, 2006/07.

	TB cases		Cases requiring contact tracing			
			Among patients		Among staff	
Facility	N	Rate/1000 admissions	N	%	N	%
St. Paul's	24	2.4	8	33	6	25
Mount Saint Joseph	10	1.5	1	10	1	10
Total	34	1.7	9	26	7	21

Outbreaks

Surveillance allows for the early detection of case clusters so that outbreak control measures can be implemented and the risk of further transmission reduced. The frequency, duration and severity of outbreaks that develop vary each season depending on the type of organisms circulating in the community.

In 2006/07, four [respiratory outbreaks](#) and ten [gastrointestinal outbreaks](#) were identified in PHC facilities, and were primarily caused by influenza A and norovirus, respectively (Table 2 and 3). Gastrointestinal outbreaks lasted nearly twice as long as respiratory outbreaks with a mean of 14.4 days (range: 6-28 days compared to 8.3 days (range: 5-13 days).

For each outbreak declared, the following control measures were implemented: closing the unit/facility to admissions or transfers; cohorting resident or patient cases together;

excluding staff cases from work; restricting visitors; limiting group activities; and decontaminating the unit/facility.

In November 2006, a community outbreak of invasive pneumococcal disease was identified when a higher than expected number of patients from the Downtown Eastside of Vancouver presented to PHC emergency departments with pneumonia and bloodstream infections. A Providence Response Team worked with Vancouver Coastal Health on a regional strategy that rapidly identified patients infected with *Streptococcus pneumoniae* and prevented new infections through enhanced infection control measures. A vaccination campaign in the Downtown Eastside and in acute care sites was launched. Although this was a large community outbreak, there was no evidence that the outbreak strain of *S. pneumoniae* was transmitted within PHC facilities.

Table 2 . Respiratory outbreaks at PHC facilities, 2006/07

Year	Number of Outbreaks			Number of Cases			Causative Organism	
	Total	Residential	Acute	Total	Residents /patients	Staff	Influenza A	Unknown
2006/07	4	4 (100%)	0 (0%)	84	82 (98%)	2 (2%)	3 (75%)	1 (25%)
2005/06	1	1 (100%)	0 (0%)	10	9 (90%)	1 (10%)	1 (100%)	0 (0%)
2004/05	3	3 (100%)	0 (0%)	52	52 (100%)	0 (0%)	3 (100%)	0 (0%)

Table 3. Gastrointestinal outbreaks at PHC facilities, 2006/07

Year	Number of Outbreaks			Number of Cases			Causative Organism	
	Total	Residential	Acute	Total	Residents /patients	Staff	Norovirus	Unknown
2006/07	10	5 (50%)	5 (50%)	214	124 (58%)	90 (42%)	5 (50%)	5 (50%)
2005/06	6	5 (83%)	1 (17%)	105	72 (69%)	33 (31%)	3 (50%)	3 (50%)
2004/05*	11	7 (64%)	4 (36%)	207	163 (79%)	44 (21%)	5 (45%)	5 (45%)

*One outbreak in 2004/05 was attributed to rotavirus

Education

The Infection Prevention and Control (IPAC) team strives to continuously provide PHC staff with relevant education, based on current evidence-based recommendations. Messages are communicated using various strategies with the goal to promote a culture in which infection prevention and control is integrated into all aspects of care at PHC.

Educational resources, such as the infection control manual, information brochures, results from current research, and links to online courses, are made readily accessible to all PHC staff via the IPAC intranet website. In addition, the IPAC team provides consultations on a daily basis to address patient-, procedure- or unit-specific concerns. IPAC physicians deliver

educational sessions to physicians, residents, and medical students.

Infection control practitioners (ICPs) also deliver educational sessions across PHC. **In 2006/07, ICPs spent 82 hours delivering educational sessions, reaching over 2700 staff** (Table 4). Based on 3 full-time ICPs, each ICP spends on average 27.3 hours or 1.3% of his/her time delivering these sessions. It should be noted that there is some overlap between categories presented in Table 4. For example, although only 5.5 hours of education specific to hand hygiene is reported below, hand hygiene messages are incorporated into all educational sessions.

Table 4. Number of hours spent and participants at IPAC educational sessions, 2006/07.

Type of education	Hours/year		Participants/year	
	N	%	N	%
Standard precautions	18.1	22	839	31
Community dialysis	16.0	20	44	2
New employee orientation	14.0	17	1179	43
Residential care	10.8	13	250	9
Hand hygiene	5.5	7	78	3
Student/resident orientation	4.3	5	102	4
Antibiotic resistant organisms	4.2	5	34	1
Gastrointestinal outbreaks	2.3	3	71	3
Tuberculosis	2.0	2	17	1
Other	4.8	6	123	4
Total	81.8	100	2737	100

New Initiatives

Infection Control Champions Project

The Infection Control Champions Project is an IPAC-led initiative to evaluate the feasibility and cost-effectiveness of adding a new position to the IPAC team—the local Infection Control Champion (ICC). The project is funded by the Canadian Institutes of Health Research (CIHR).

The ICC is a front-line nurse who, as part of his or her regular duties, promotes, teaches, monitors, and motivates other health care workers on his/her unit to implement best IPAC practices. We have designed a randomized-controlled trial where nine units

have an ICC, while nine units receive regular IPAC education. The effectiveness of the project at improving IPAC knowledge, hand hygiene compliance, and the association with rates of PHC-associated infections will be assessed.

The goal of the project is to supply each clinical unit with its own IPAC expert, which will then lead to a greater sense of ownership of IPAC issues and improve overall staff and patient safety. This initiative is consistent with our mission to create and sustain a culture in which infection prevention and control is integrated into all aspects of care.

Surgical Site Infection Surveillance

Surgical site infections (SSIs) can result in longer hospital stays and increased health care costs. Although not all infections are preventable, studies have shown that surveillance is one of the most important factors in the prevention of health care associated infections, including SSIs [8]

The IPAC team, in collaboration with the Departments of Surgery and Orthopedics, has developed an **electronic, semi-**

automated surveillance system for surgical site infections (SSI).

The system is currently in its pilot stage and is targeted towards high-risk orthopedic surgeries. Full implementation of the system for orthopedic surgeries is planned for the 2007/08 fiscal year, with the long-term goal to expand SSI surveillance for selected surgical procedures across PHC.

Community-Associated MRSA (CA-MRSA) Forum

In partnership with the British Columbia Association of Medical Microbiologists, PHC organized a provincial 1-day forum on the emerging issue of CA-MRSA, which was held on March 2, 2007, at St. Paul's Hospital. During the morning session, data and experiences from all 6 provincial health authorities were presented. Data from the British Columbia Centre for Disease Control were also presented, as were data from community-based private laboratories.

During the afternoon session, strategies for surveillance and various definitions for CA-MRSA were debated. Laboratory, epidemiological, and clinical aspects of CA-MRSA were also discussed.

All in all, the forum was considered a success and a report including recommendations for surveillance and control is available from the British Columbia Association of Medical Microbiologists.

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Appendices

Appendix A: Infection Prevention and Control Team

Name	Position
Dr. Marc Romney	IPAC Medical Director / Medical Microbiologist
Jim Curtin, RN	IPAC Practitioner
Mary McNaughton, RN	IPAC Practitioner
Craig Pienkowski, RN	IPAC Practitioner
Dr. Mark Hull	IPAC Physician, Acute Care
Dr. Debbie Jacobson	IPAC Physician, Residential Care
Dr. Sylvie Champagne	Medical Microbiologist
Dr. Christopher Sherlock	Medical Microbiologist
Renée Sebastian	Health Care Epidemiologist
Luz Vierende	Administrative Assistant

Appendix B: Providence Health Care Facilities

Name	Type of facility	Acute care beds	Residents
St. Paul's Hospital	Acute care	543	0
Mount Saint Joseph Hospital	Acute care Residential care	140	100
St. Vincent's Hospitals			
Brock Fahrni Pavilion	Residential care	0	150
Langara	Residential care	0	221
Holy Family Hospital	Rehabilitation care Residential care	0	142
Youville Residence	Residential care	0	84
Marion Hospice	Hospice Care	0	12
Total		683	709

*Source: PHC 2006-07 Annual Report (www.providencehealthcare.org)

Appendix C: Definitions

Hand hygiene definitions

Hand hygiene event (compliant): Performing any type of hand hygiene (hand-washing or using alcohol gel/form) immediately before or after patient contact, or putting new gloves on immediately before patient contact.

Hand hygiene opportunity: The period immediately before and after the staff member has contact with the patient.

Percent compliance: The number of hand hygiene events divided by the number of hand hygiene opportunities, expressed as a percentage.

Surveillance definitions

***Clostridium difficile* case:** Acute onset of diarrhea (more than three loose stools within a 24 hour period) AND laboratory confirmation (positive toxin or culture with evidence of toxin production) of *C. difficile*.

MRSA case: Laboratory confirmation of colonization or infection with methicillin-resistant *Staphylococcus aureus*

VRE case: Laboratory confirmation of colonization or infection with vancomycin-resistant enterococci

For MRSA, VRE and C. difficile cases, the following sub-classifications are made:

PHC-associated case: Admitted for ≥ 72 hours in a PHC facility **OR** admitted to a PHC facility within the preceding 30 days.

Non PHC-associated case: Admitted for < 72 hours in a PHC facility **AND** has not been admitted to a PHC facility within the preceding 30 days. The assumption is that these cases were acquired in the community or in another health care facility other than PHC.

Inpatient days: The number of patients currently admitted at a facility by day (counts are usually conducted at midnight) and multiplied by the number of days in a given time period. Inpatient days are used as denominators in the calculation of rates to adjust for length of stay. For MRSA and VRE rates, acute care (including newborns) inpatient days are used as the denominator. For *C. difficile* rates, acute care inpatient days exclude newborns.

Fiscal year/period: April 1 to March 31 of the following year, divided into 13 fiscal periods.

95% Confidence Interval (CI): An interval estimate of the rate with 95% degree of certainty

Outbreak definitions

Gastrointestinal outbreak: Three or more cases of suspected gastroenteritis among patients, residents, or staff, that cannot be explained by admitting diagnoses or by noninfectious causes of symptoms (i.e., recent use of laxatives or stool softeners, chronic diarrhea, etc.), within a four-day period in the same unit or patient care area.

Respiratory outbreak: Two or more cases of influenza-like-illness (fever, chills, headache, myalgia, sore throat, cough, nasal congestion, etc.) among patients, residents, or staff within a one-week period in the same unit or patient care area.