



INFECTION PREVENTION AND CONTROL

Annual Report 2013/2014



How you want to be treated.

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EXECUTIVE SUMMARY

On behalf of the Infection Prevention and Control (IPAC) team at Providence Health Care (PHC), I am pleased to share you with the 2013/14 IPAC Annual Report.

In keeping with the *Providence Plan*, IPAC is a critical component of Providence Health Care's "Quality and Safety" strategic direction. We strive to prevent healthcare-associated infections (needless harm) through standard, evidence-based practices, and the 2013/14 IPAC Annual Report summarizes some of our recent accomplishments.



As you will read in the pages of this report (and based on historical comparisons), overall rates of antibiotic resistant organisms (MRSA, VRE) and *C. difficile* infection are stable or decreasing.* Cases of patients infected and/or colonized with Carbapenemase Producing Organisms (CPO) have been increasingly detected in British Columbia, with a number of BC hospitals reporting nosocomial transmission of these antibiotic resistant bacteria. In collaboration with the PHC Medical Microbiology Laboratory, IPAC has implemented a comprehensive prevention strategy for CPO, including the development of a rapid molecular assay for laboratory confirmation of CPO.

While hand hygiene practices have improved considerably over time, compliance with hand hygiene recommendations has recently reached a plateau at PHC, with overall compliance reaching approximately 80%. IPAC continues to work at all levels of the organization to improve hand hygiene practices, especially by emphasizing the importance of this intervention before patient (and resident) contact – the first opportunity to clean hands as defined by the World Health Organization.

I would like to dedicate the 2013/14 IPAC Annual Report to the Infection Control Practitioners at Providence Health Care. Through their hard work, attention to detail, and dedication to the cause, countless nosocomial infections have been prevented at PHC.

Marc Romney, MD, FRCPC, DTM&H

Medical Director, Infection Prevention and Control

**In general, direct inter-hospitals comparisons of epidemiological surveillance data are discouraged. Differences in rates may be confounded by numerous factors, including: differences in patient populations, differences in testing frequency and intensity, differences in laboratory techniques, and differences in surveillance methodology.*

Biohazard
Room



INTRODUCTION TO INFECTION PREVENTION AND CONTROL

Infection Prevention and Control (IPAC) is aligned 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 focused on improving patient care and outcomes and 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.



St. Paul's Hospital



Mount Saint Joseph Hospital



St. Vincent's: Brock Fahrni



St. Vincent's: Langara



Holy Family Hospital



Youville Residence

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

Surveillance: Monitoring 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 interventions can be implemented.
2. Detect outbreaks of infectious diseases in order to implement control measures.
3. Monitor trends in PHC-associated transmission, and provide a means of determining when interventions are required.
4. Interpret trends with a focus on hospital-specific data as opposed to inter-hospital comparisons.
5. Determine the burden of specific infectious diseases at PHC.
6. Evaluate and improve 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.

Outbreak management: In collaboration with Vancouver Coastal Health Communicable Disease Control, IPAC is responsible for investigating clusters of cases and determining whether there is an outbreak at a PHC facility. Standardized control measures are promptly implemented when each outbreak is declared.

Education: IPAC provides education to staff, physicians, patients and visitors in order to increase awareness of appropriate IPAC measures. Education is provided via classes, presentations, consultations, and the IPAC website.

Research: IPAC reviews current literature and conducts research 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: IPAC continuously reviews, develops, and implements policies and procedures to guide evidence-based best practices.

METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA)

MRSA is an antibiotic resistant bacterium that is transmissible in hospital, long-term care, and community settings. MRSA has the potential to cause serious infections for which treatment options are limited. The majority of patients are colonized rather than infected with MRSA, but colonization may be the first step to infection. Medically complex patients, those with chronic diseases, and those who undergo invasive procedures (or harbour prosthetic devices) are at higher risk for MRSA infection. MRSA infection has been associated with longer hospital stays, higher hospital costs, and higher mortality^{1,2}. The primary mode of transmission within health care facilities is via the hands of health care workers. The data presented below represent newly identified cases of MRSA among patients admitted to a PHC facility.

In 2013/14, 579 new cases of MRSA were identified at PHC facilities. More precisely, 119/579 (21%) were classified as PHC-associated, of which 87% were associated with transmission on acute care wards at St. Paul's Hospital or Mount Saint Joseph Hospital. The overall incidence rate was 5.5 cases/10,000 patient-days (95% CI: 4.5-6.6) (Figure 1). Please refer to *Appendix C: Definitions* for the definition of a PHC-associated case.

The rate of PHC-associated MRSA cases was statistically significantly lower in 2013/14 compared to 2006/07, 2007/08 and 2011/12 ($p < 0.05$), but compared to last fiscal year remained unchanged.

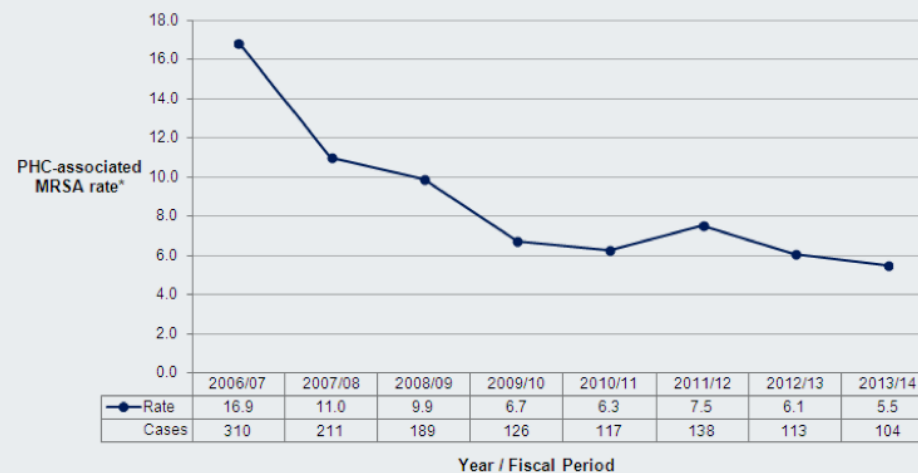
In 2013/14, 58% of PHC-associated cases were identified through hospital screening programs. The remaining cases were identified from clinical specimens. This past year, IPAC worked closely with Professional Practice, Operations Leaders and front line staff in order to improve adherence to a standardized risk assessment protocol, and to ensure the collection of screening specimens is conducted in a timely manner. With regards to screening patients for MRSA upon admission, universal screening is performed for patients admitted to ICU and general medical wards. The engagement and support of the Emergency and Medicine departments have been integral to the success of this initiative. For all other acute care units, a risk-factor based approach for screening is taken. IPAC is constantly working on improving compliance to screening protocols through auditing and education.



Overall, targeted interventions by IPAC and overall improved infection prevention and control practices have contributed to the declining incidence rate of PHC-associated MRSA cases. However, the complexities of MRSA cases, including patients with resistance patterns that are novel to our hospital (e.g., daptomycin non-susceptible strains), highlight the need to continue to monitor MRSA carefully.

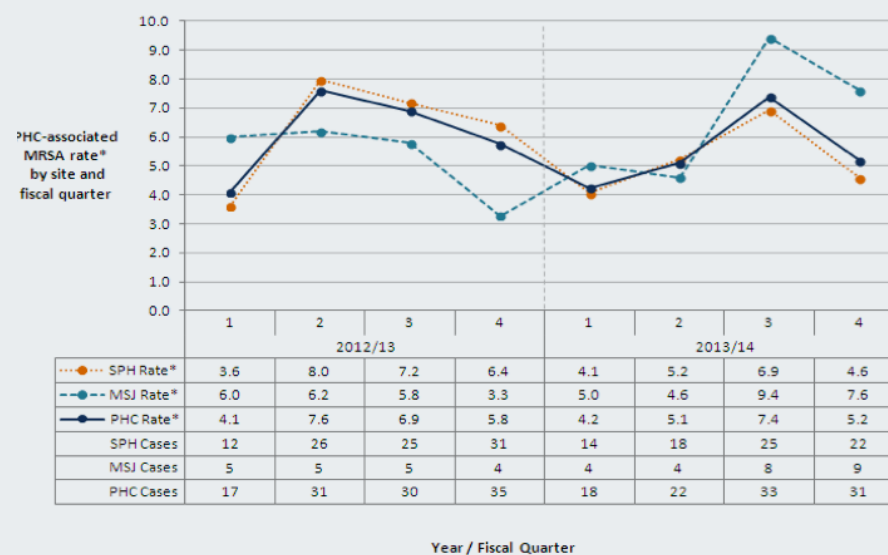
Additionally, accelerated laboratory result turn-around times (due to improved molecular testing) and downward MRSA trends in the community have likely contributed to decreasing rates. In an effort to further prevent MRSA transmission in hospital, an antiseptic cloth used for bathing (which is effective against MRSA) will be trialed on select Medicine units for the 2014/15 fiscal year.

FIGURE 1:
INCIDENCE RATE OF
PHC-ASSOCIATED
MRSA IN ACUTE CARE
FACILITIES FROM
2006/07 TO 2013/14



Note: * number of cases / 10,000 patient-days

FIGURE 2:
INCIDENCE RATE OF
PHC-ASSOCIATED MRSA
BY SITE AND FISCAL
QUARTER FROM 2012/13
TO 2013/14



Note: * number of cases / 10,000 patient-days

VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)

VRE are strains of enterococci that are resistant to vancomycin, making VRE infections more difficult and costly to treat. More patients are colonized rather than infected with VRE. Colonization, however, is considered to be the first step towards infection. Most VRE infections occur in hospitals.

In 2013/14, 567 new cases of VRE were identified at PHC. Nearly all of these new cases (89%) were admitted to a PHC hospital, and 376/567 (66%) of cases were classified as PHC-associated. Please refer to *Appendix C: Definitions* for the definition of a PHC-associated case.

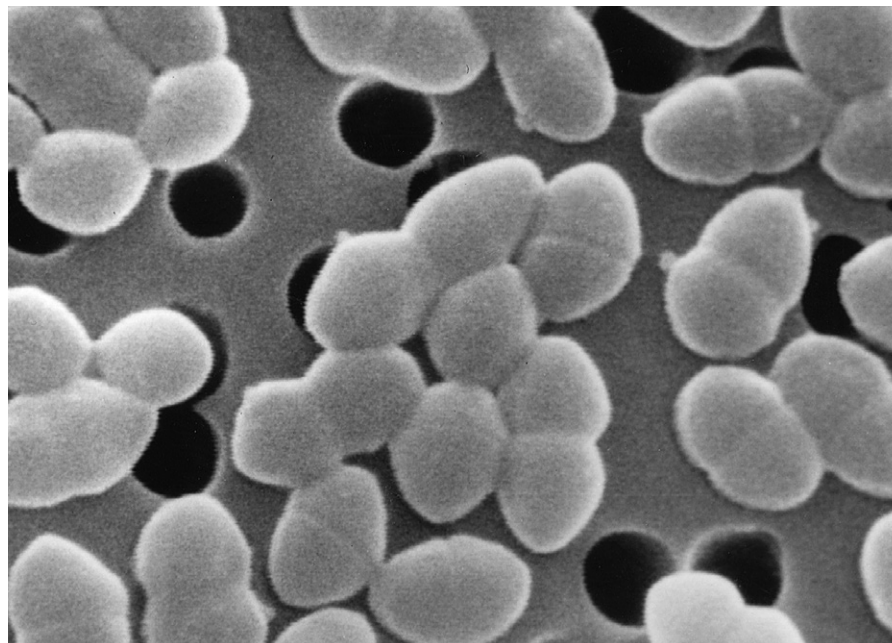
Of these, 369 cases (98%) were associated with transmission on acute care wards at either MSJ or SPH, corresponding to an incidence rate of 19.4 cases/10,000 patient-days (95% CI: 17.5-21.4) (Figure 3). This rate remained unchanged from the comparator of 2012/13 (16.8 cases/10,000 patient-days [95% CI: 15.0-18.8]).

Overall, the incidence rate at MSJ increased significantly ($p < 0.05$) from 16.4 (95% CI: 12.8-21.0) in 2012/13 to 27.0 (95% CI: 22.2-32.9) in 2013/14, but remained unchanged at SPH (Figure 4).

In Quarters 2 and 3 of 2013/14, we observed an increased number of cases on medical units at SPH and MSJ and this contributed to the significant increase in VRE cases at these sites. Interventions to control these clusters included: implementation of peer hand hygiene audits; regular education sessions for front-line staff; infrastructure (including dirty service room) improvements; use of chlorhexidine for bathing patients; and, emphasis on improved cohorting of patients.

In 2013/14, the majority (82%) of PHC-associated cases were identified through hospital screening programs. There is still a gap in timely collection of VRE screening specimens. We continue to work with unit staff and Professional Practice to address this issue. The remaining cases were identified through clinical specimens. Overall, VRE incidence rates have decreased by 28% since 2006/07.

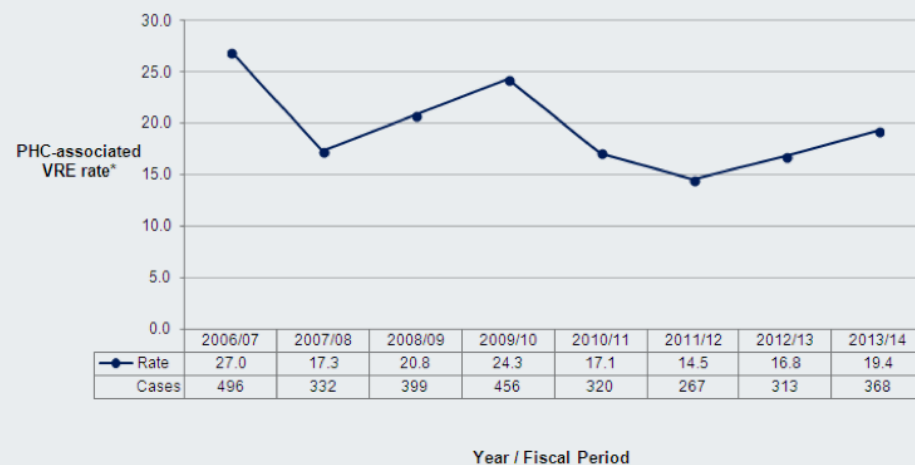
Over the last two years, there has been some controversy over the utility of VRE control programs in Canadian hospitals (although the



This scanning electron micrograph (SEM) revealed numerous bacteria, which were identified as being Gram-positive *Enterococcus* sp.

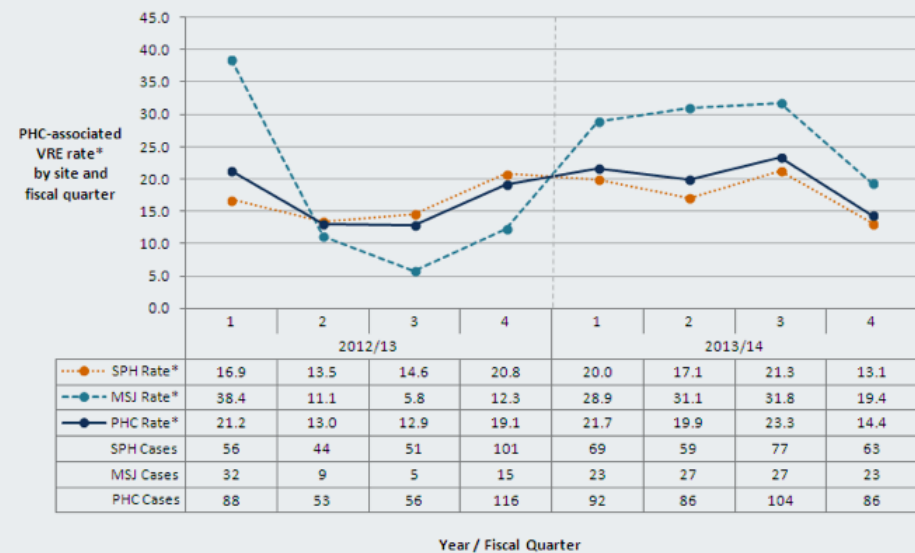
CDC and PHAC guidelines currently recommend Contact Precautions for patients with VRE). Some hospitals have either discontinued or scaled-back on their VRE prevention and control efforts. These changes may result in increased transmission of VRE in healthcare settings, with unexpected impacts on neighbouring facilities. At PHC, we have reviewed the literature and local surveillance data, and we recently conducted a cost analysis study of VRE based on locally derived data. Attributable cost and length of stay due to VRE were found to be substantial.³ IPAC has concluded that our current risk-based VRE control program is likely effective; moreover, it protects some of our most vulnerable patients. In an effort to further prevent VRE transmission in hospital, an antiseptic cloth used for bathing, which is effective against VRE will be trialed on select Medicine units for the upcoming fiscal year.

FIGURE 3:
INCIDENCE RATE OF
PHC-ASSOCIATED
VRE IN ACUTE CARE
FACILITIES FROM
2006/07 TO 2013/14



Note: * number of cases / 10,000 patient-days

FIGURE 4:
INCIDENCE RATE OF
PHC-ASSOCIATED VRE
BY SITE AND FISCAL
QUARTER FROM
2012/13 TO 2013/14



Note: * number of cases / 10,000 patient-days

CLOSTRIDIUM DIFFICILE INFECTION (CDI)

CDI is the most common cause of healthcare-associated infectious diarrhea in Canada, with associated morbidity, mortality, and healthcare costs.⁴ The clinical presentation of *C. difficile* infection varies from self-limited diarrhea to toxic megacolon (which may progress to death).

CDI is known to be more common in hospitalized persons who are >65 years old and those who have been on antibiotics in the preceding three months.⁵ Enhanced surveillance for CDI began at PHC on January 1, 2007, and polymerase chain reaction (PCR) for diagnosis of CDI was implemented in fiscal period 6 of 2010/11. To minimize the transmission of CDI, a broad range of interventions have been implemented, including: patient isolation and cohorting, appropriate hand hygiene, stringent environmental cleaning and disinfection with sporicidal agents, improved laboratory diagnostics, targeted education on all positive cases and regular education on units, and judicious use of antibiotics. However, there has been an increasing awareness of the changing epidemiology of CDI, and the potential for acquisition of *C. difficile* outside of healthcare settings^{6,7}. Subsequently, interpretation of healthcare associated CDI rates may be prone to misclassification and should not be confused with performance.

In 2013/14, 288 new cases of CDI were identified at PHC. 196 (68%) of these were classified as PHC-associated cases. Of these, 189 (96%) were associated with either SPH or MSJ, corresponding to an incidence rate of 8.8 cases/10,000 patient-days (95% CI: 7.6-10.3). This rate is stable compared to 2012/13 (Figure 5). As shown in Figure 6, the incidence rate of CDI at MSJ and SPH remained relatively unchanged over the four Fiscal Quarters of 2013/14. Please refer to *Appendix C: Definitions* for the definition of a PHC-associated case.

Complications related to CDI in the 30 days following diagnosis are considered an indicator of the severity of illness, and are also closely monitored as part of our surveillance program. In 2013/14, 8 cases (3%) were admitted to the ICU, 1 case (0.3%) was diagnosed with toxic megacolon and 1 (0.3%) case underwent colectomy. In addition, CDI was determined to be a probable contributing factor in the death of 3 (1%) cases.



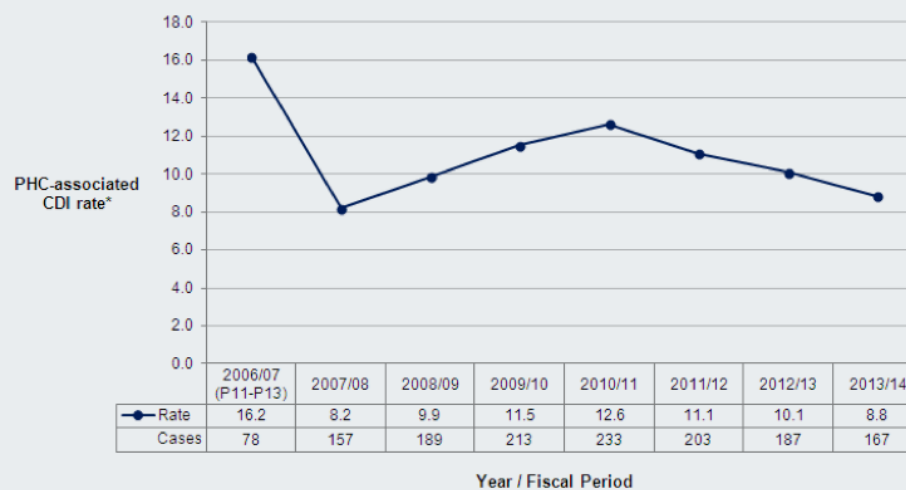
This micrograph depicts Gram-positive *C. difficile* bacteria

To ensure prompt initiation of enhanced environmental cleaning and disinfection, ICPs have increased the frequency of communication with environmental cleaning staff to inform them of patient rooms that require enhanced cleaning. ICPs actively follow patients with CDI to ensure that contact precautions are initiated and followed.

Overall, CDI incidence rates have been stable since 2007/08. However, we have seen a significant decrease when comparing the CDI rate from 2010/11 and 2011/12 to 2013/14. IPAC is currently reviewing infection prevention and control practices targeting *C. difficile* to identify potential areas that could result in a further decline in CDI rates.

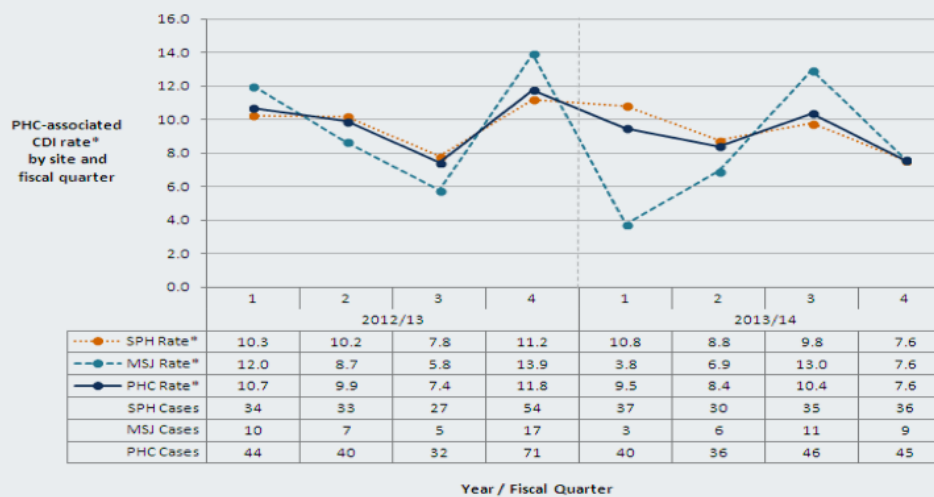
Recently, IPAC started a CDI collaboration with the PHC Antimicrobial Stewardship Program (ASP). The objective of the collaboration is to ensure patients with CDI receive optimal antibiotic treatment. ICPs alert the ASP pharmacist and physician in real-time when there is a new CDI diagnosis in a patient receiving concurrent antibiotics. ASP then assesses the need for concurrent antibiotics and provides feedback to clinicians via the existing ASP audit and feedback program.

FIGURE 5:
INCIDENCE RATE OF
PHC-ASSOCIATED CDI
CASES IN ACUTE CARE
FACILITIES, 2006/07
TO 2013/14



Note: * number of cases / 10,000 patient-days; PCR testing introduced in 2010/11 Fiscal Quarter 2 (Period 6)

FIGURE 6:
PHC-ASSOCIATED
CDI CASES BY
SITE AND FISCAL
QUARTER, 2012/13
AND 2013/14



Notes: * number of cases / 10,000 patient days
PCR testing introduced in 2010/11 Fiscal Quarter 2 (Period 6)

HAND HYGIENE

Hand hygiene (hand-washing with soap and water or using an alcohol-based hand rub (ABHR)) is the simplest measure for preventing health care-associated infections.⁸ However, overall compliance with hand hygiene among health care professionals continues to be a challenge.⁹ At PHC, we continue to make improvements in hand hygiene compliance and practices.

This past year, major hand hygiene educational and promotional activities included:

- Public displays of facility hand hygiene compliance data
- Expansion of hand hygiene audits to residential care
- Program specific hand hygiene action plans
- Improved access to and customization of ABHR dispensers
- Emphasis on hand hygiene before patient contact
- Main entrance hand hygiene promotional signs at St. Paul's Hospital
- Continuation of health care workers pledge and commitment to being reminded if there are missed opportunities
- ICP-led huddles on units focusing on hand hygiene
- Continued engagement with Physician Hand Hygiene Champions
- Specialized, customized clinical program Hand Hygiene Action Plans

Monitoring hand hygiene is an essential component of programs aimed at improving compliance. PHC has been monitoring compliance since 2005. Systematic quarterly hand hygiene audits, based on "gold standard" methodology of direct observation developed by the World Health Organization, began in the third Fiscal Quarter of 2008/09. ICPs measure compliance by direct observation of staff and compliance is calculated using the following formula:

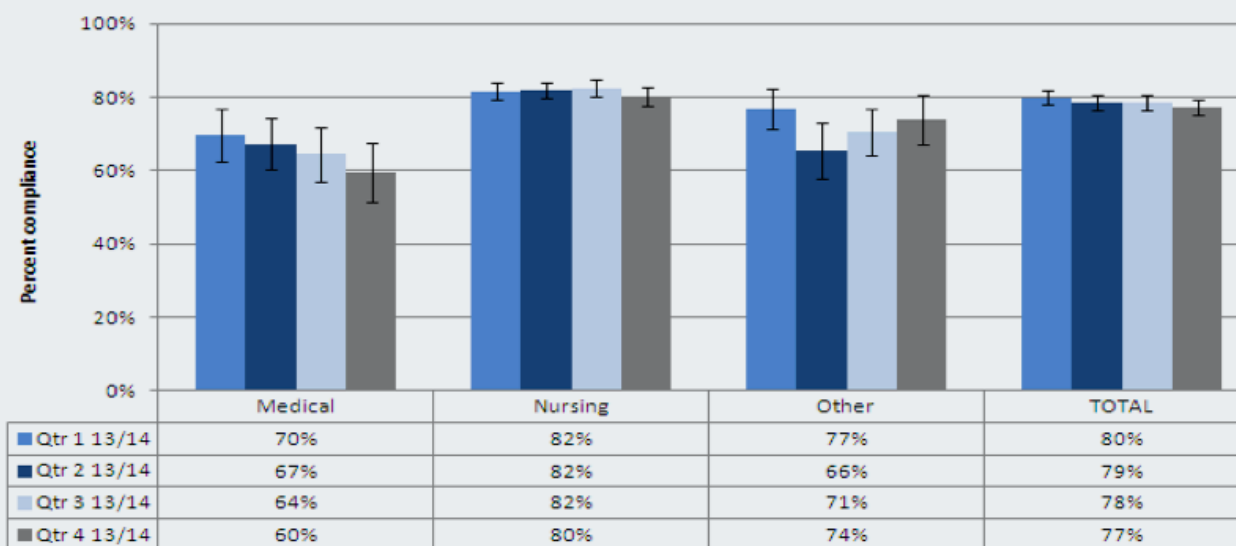
$$\% \text{ Compliance} = \frac{\# \text{ hand hygiene events}}{\# \text{ opportunities}} \times 100$$

Hand hygiene compliance was 79% for fiscal year 2013/14. Compliance varied by before and after patient contact, unit, health care worker type, and facility. Compared to last fiscal year, hand hygiene compliance remained unchanged in 2013/14 and also throughout the four quarters (Figure 7). Overall, hand hygiene compliance among PHC staff has significantly increased by 33% since 2009/10. However, there is opportunity for improvement. We will continue to disseminate our hand hygiene report for medical staff and provide hand hygiene orientation to new medical staff on a quarterly basis as well as refresh the Physician Hand Hygiene Champions program. Further initiatives to sustain and improve compliance above 80%*, including a focus on before patient contact are currently being implemented.

*Minimum compliance expectation from the BC Provincial Hand Hygiene Working Group



FIGURE 7: HAND HYGIENE COMPLIANCE BY HEALTH CARE WORKER TYPE, 2013/14



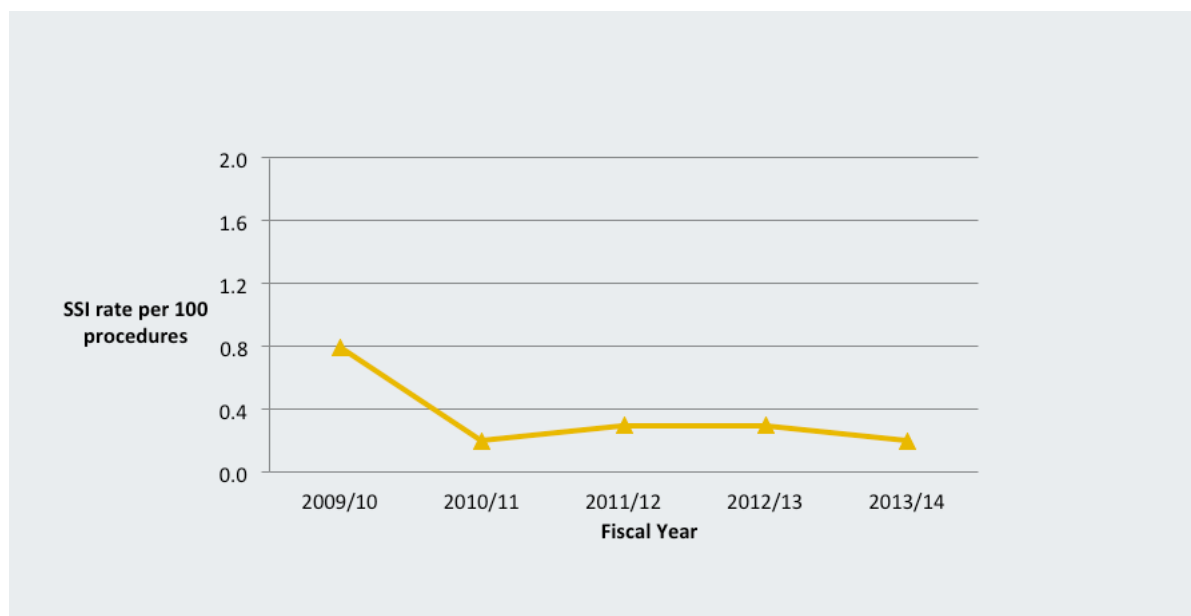
SURGICAL SITE INFECTION (SSI) SURVEILLANCE

Surgical site infections (SSI) are a major source of post-operative morbidity, longer hospital stays, increased health care costs, and readmissions to hospital. SSI surveillance has been identified as a key priority for IPAC and the PHC Surgical Program, and is an Accreditation Canada required organizational practice.

Surveillance for SSI is conducted while patients are in hospital; however, follow-up of patients following discharge is essential to provide an accurate description of SSI rates. For most surgeries, 30 days is the standard follow-up period. This period is extended to 90 days if a prosthetic device or material has been placed (e.g., prosthetic joint or heart valve). The case definitions used for our SSI surveillance are consistent with the most recent definitions used by the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN).¹

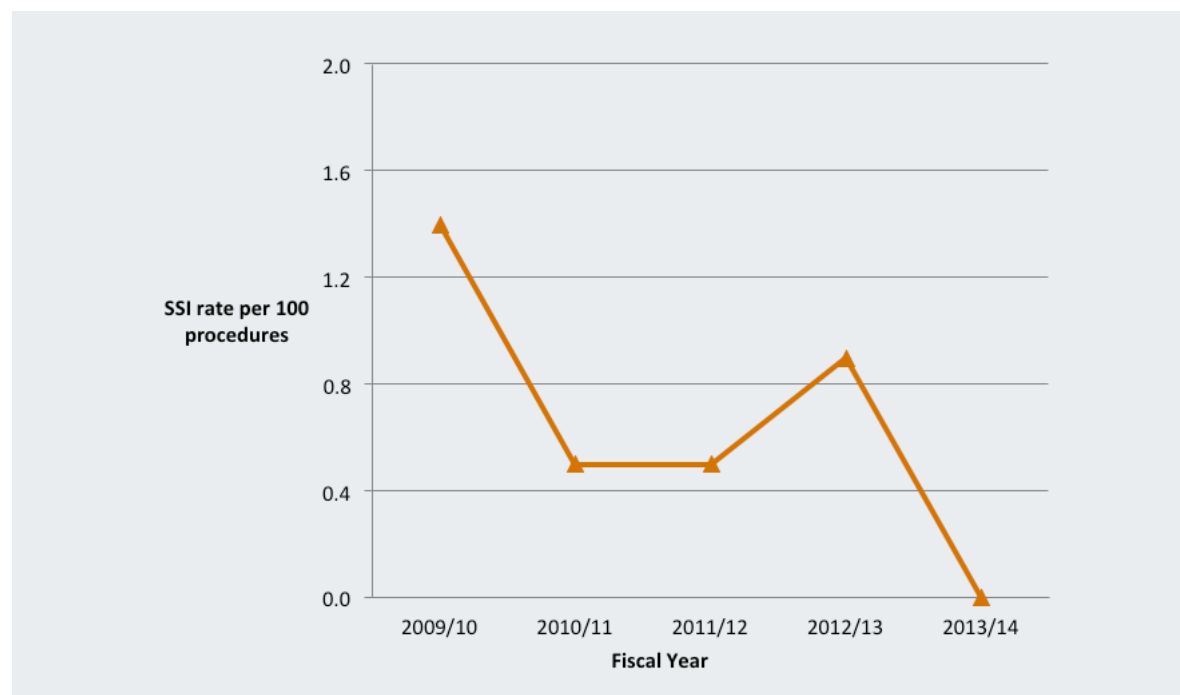
In collaboration with the Department of Surgery and the Surgical Program, IPAC has developed electronic and semi-automated SSI surveillance systems. Each surveillance system has been developed specifically for the surgical procedure of interest. IPAC's SSI surveillance programs are targeted to selected high-volume and/or high-risk procedures.¹¹ Procedures currently under surveillance include: Caesarean sections, hip and knee arthroplasties, and coronary bypass grafting and cardiac surgeries. In fiscal year 2014/15, SSI surveillance will be expanded to include colorectal procedures. To ensure a high degree of accuracy for our SSI surveillance, each presumed SSI case is reviewed and confirmed by one of the IPAC physicians.

FIGURE 8: SURGICAL SITE INFECTIONS AMONG WOMEN WHO UNDERGO CAESAREAN SECTION FROM 2009/10 TO 2013/14



Caesarean section: Since 2008/09, IPAC has worked closely with the Department of Obstetrics and Gynecology to conduct surveillance for SSI following Caesarean section. As displayed in Figure 8, the SSI rate, 0.2 per 100 procedures per year, was slightly lower than the previous year and significantly lower than 2009/10 (0.8 per 100 procedures per year). For this procedure specifically, post-discharge surveillance is critical.¹² Recently, post-discharge SSI surveillance for Caesarean section was enhanced by implementing a more systematic approach to detecting infections in the post-discharge period, including: a survey in the discharge package, telephone calls 30 days after discharge, and a review of re-admissions to hospital. The post-discharge SSI rate was 1.1 per 100 procedures, which is lower than the previous year (1.4 per 100 procedures). Combined, the total SSI from 2013/14 was 1.2 per 100 procedures per year, which is lower than last year (1.7 per 100 procedures). The SSI rate is below the NHSN pooled mean. In 2014/15, we plan to initiate electronic follow-up in order to improve the detection of cases and to improve operational efficiencies.

FIGURE 9: SURGICAL SITE INFECTIONS AMONG PATIENTS WITH A HIP OR KNEE ARTHROPLASTY FROM 2009/10 TO 2013/14



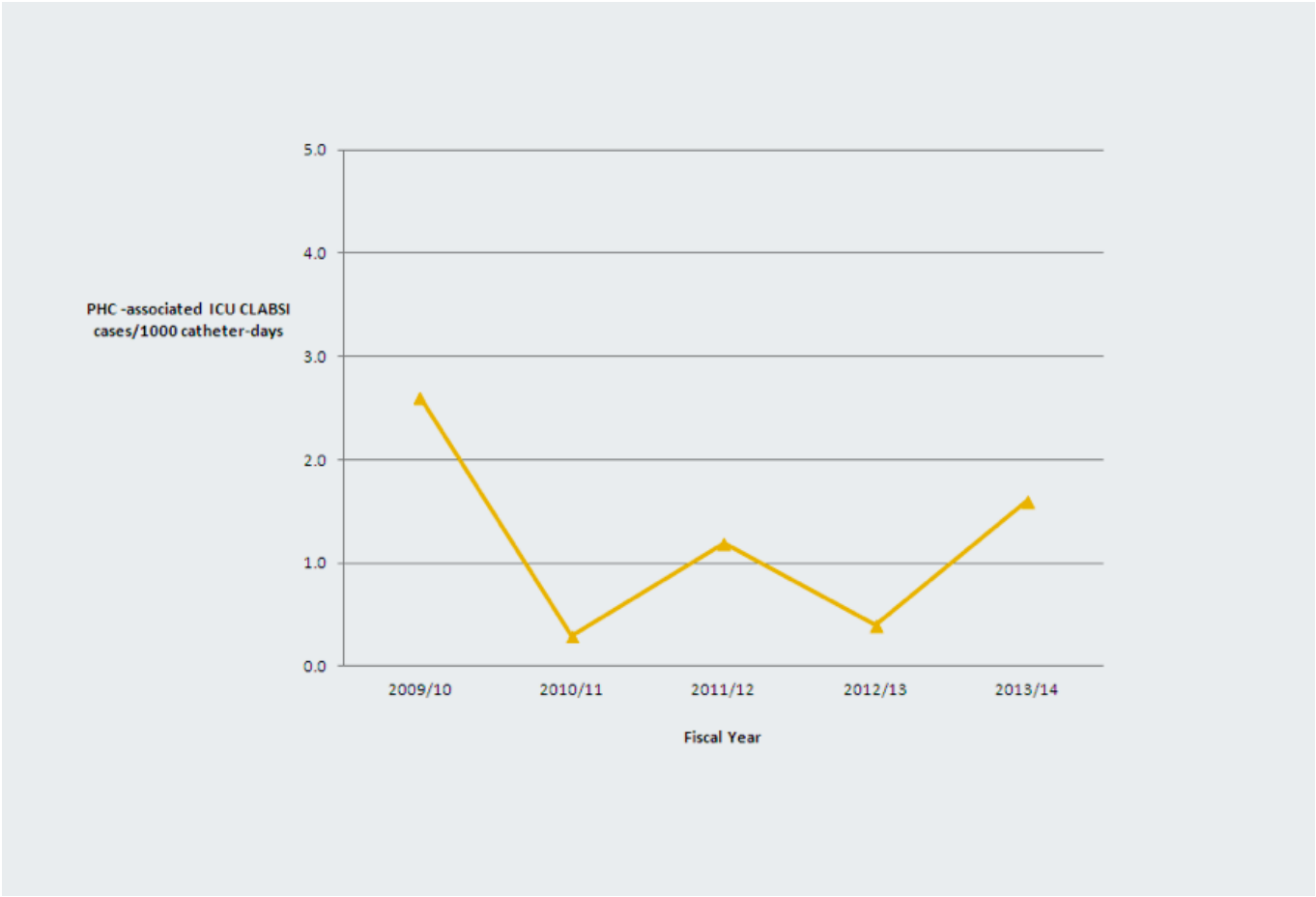
Hip and knee arthroplasty: The first SSI initiative at PHC began in 2007 with surveillance on hip and knee replacement procedures (“arthroplasties”). These procedures are recommended for surveillance by the CDC NHSN. This initiative was developed as a collaboration between IPAC and the Department of Orthopaedic Surgery at PHC. Figure 9 shows that the rate has dropped to 0 per 100 procedures per year compared to 0.9 per 100 procedures per year in 2012/13/. This is the first year that there have been no SSI detected for orthopaedic procedures under surveillance. The rate is well below the pooled mean from the NHSN. The logistics of post-discharge surveillance remain a challenge; however, no post-discharge cases were reported this past year.

Cardiac surgery: For the past 2 fiscal years, in collaboration with the Division of Cardiac Surgery and the Surgical Program, we monitored SSI for coronary artery bypass graft surgery, as well as cardiac valve replacement surgery. The overall rate was 2.5 per 100 procedures per year, which is slightly higher than last fiscal year (1.9 per 100 procedures per year). When stratified, the SSI rate was 1.5 per 100 procedures per year during the post-operative hospital stay and 1.0 per 100 procedures per year during the post-discharge period (either from re-admission or outpatient data). Of the SSI detected, 61% were reported during the postoperative hospital stay, while 39% were detected post-discharge.

Colorectal surgery: In collaboration with the Surgical Program and the Surgical Site Infection Working Group at PHC, we have expanded to conduct surveillance for infections following colorectal procedures. Colorectal procedure SSI was launched in fiscal year 2014/15, and we look forward to including SSI information in next year’s annual report.

CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION (CLABSI) SURVEILLANCE

FIGURE 10: CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS AMONG PATIENTS IN THE INTENSIVE CARE UNIT FROM 2009/10 TO 2013/14



CLABSI are one of the most costly hospital associated infections and result in prolonged hospital stay, and increased patient morbidity. Intensive care unit (ICU) patients are particularly vulnerable to CLABSI.¹³ Surveillance for CLABSI is an important component of hospital prevention and control activities. Using standardized case definitions and methodology, IPAC (in partnership with the ICU) has developed a sensitive and timely CLABSI surveillance system. The ICU has focused its efforts in decreasing CLABSI by enhancing education provided to those inserting central lines and implementing established prevention bundles.

Since 2009, IPAC has piloted a semi-electronic, semi-automated surveillance system that tracks the rate of CLABSI in the ICU at St. Paul's Hospital and Mount Saint Joseph Hospital. CLABSI data collected to date at PHC are shown in Figure 10. Since starting CLABSI surveillance in the ICU, the CLABSI rate has decreased from 2.6 per 1000 catheter days in 2009/10 to 1.6 per 1000 catheter days in 2013/14. However, the rate in 2013/14 represents an increase compared to recent years. While this increase likely relates to intrinsic variability due to small sample size, IPAC will continue to promote practices that reduce the risk for patients with central line catheters, as well as to monitor CLABSI cases associated with the ICU.

OUTBREAK MANAGEMENT

All PHC facilities are monitored for respiratory and gastrointestinal infection outbreaks. Surveillance allows for the early detection of clusters so that control measures can be swiftly implemented. Outbreaks are declared in collaboration with Vancouver Coastal Health Communicable Disease Control.

Recently, improved laboratory detection of influenza and norovirus using molecular methods has allowed for rapid implementation of control strategies. In general, however, the frequency, duration and severity of outbreaks depend on the circulating strains in the community. For example, there was recently a predominance of the GII.4 Sydney norovirus strain causing outbreaks of gastroenteritis.¹⁴ While increased severity of illness was expected due to this strain, this was not observed at PHC.

The following control measures are implemented to prevent and control nosocomial outbreaks:

- Prompt laboratory detection of the etiologic agent by the PHC Virology Laboratory
- Early involvement of the IPAC team to support frontline staff
- Thorough review of each patient case and application of outbreak case definitions
- Strict isolation of affected patients in private rooms (or cohorting of patients if private rooms not available)
- Closure of the affected patient unit or ward
- Enhanced surveillance for the duration of the outbreak
- Targeted staff education to reinforce the need to implement syndromic based precautions
- Exclusion of sick staff from the workplace
- Restriction of visitors and post-ponement of group activities
- Enhanced environmental cleaning capacity for the unit/facility

On average, gastrointestinal outbreaks lasted 10 days (range: 6-14 days). We experienced more norovirus outbreaks in 2013/14 compared to previous years. The increase in the number of norovirus outbreaks was likely due to GII.4 Sydney norovirus. Interestingly, however, outbreaks were shorter in duration (10 days compared to 20 days last year). We attribute this shorter duration to our aggressive approach to test possible cases and declare outbreaks as early as possible. Five gastrointestinal outbreaks were identified in acute care, while 3 were identified in residential care. All gastrointestinal outbreaks were caused by laboratory confirmed norovirus.

In 2013/14, 1 respiratory outbreak and 8 gastrointestinal outbreaks were identified at PHC facilities (Tables 1 and 2). The sole respiratory outbreak lasted 14 days and occurred in residential care. Unexpectedly, this outbreak was the result of 2 respiratory viruses (influenza A and parainfluenza 1). The predominant influenza strain circulating in 2013/14 was influenza A pH1N1 (the strain responsible for the 2009 influenza pandemic).

A description of our approach to the containment of the unusual respiratory outbreak caused by 2 co-circulating respiratory viruses was presented at an international Infectious Diseases and Infection Control conference. The concurrent identification of dual pathogens reinforced the utility of molecular testing for multiple respiratory pathogens. The use of this testing for all symptomatic patients enabled the IPAC team to tailor antiviral therapy for affected patients, and more accurately assess outbreak progression. This approach may also result in decreased consumption of antiviral medication.

Management of a respiratory outbreak due to concomitantly circulating influenza A and parainfluenza 1 in a residential care facility. Lowe C, Leung V, Pincock T, Badawi M, Gustafson R, Lloyd-Smith E and Romney MG. Abstract presented at IDWeek 2014 in Philadelphia, Pennsylvania.

TABLE 1

Respiratory outbreaks at PHC facilities, 2007/08 TO 2013/14

Year	NUMBER OF OUTBREAKS			NUMBER OF CASES			CAUSATIVE ORGANISM	
	Total	Residential	Acute	Total	Residents/ patients	Staff	Influenza	Other
2013/14	1	1 (100%)	0 (0%)	14	12 (86%)	2 (14%)	1* (100%)	0 (0%)
2012/13	2	2 (100%)	0 (0%)	18	15 (83%)	3 (17%)	2 (100%)	0 (0%)
2011/12	4	4 (100%)	0 (0%)	55	46 (84%)	9 (16%)	4 (100%)	0 (0%)
2010/11	1	0 (0%)	1 (100%)	3	2 (67%)	1 (33%)	1 (100%)	0 (0%)
2009/10	0	0 (0%)	0 (0%)	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)
2008/09	2	2 (100%)	0 (0%)	25	20 (80%)	5 (20%)	2 (100%)	0 (0%)
2007/08	4	4 (100%)	0 (0%)	116	107 (92%)	9 (8%)	2 (50%)	2 (50%)

Outbreak was due to influenza A and parainfluenza 1*TABLE 2**

Gastrointestinal outbreaks at PHC facilities, 2007/08 TO 2012/13

Year	NUMBER OF OUTBREAKS			NUMBER OF CASES			CAUSATIVE ORGANISM	
	Total	Residential	Acute	Total	Residents/ patients	Staff	Norovirus	Other
2013/14	8	3 (38%)	5 (63%)	127	69 (54%)	58 (46%)	8 (100%)	0 (0%)
2012/13	3	2 (75%)	1 (25%)	112	79 (71%)	33 (29%)	3 (100%)	0 (0%)
2011/12	4	2 (50%)	2 (50%)	80	51 (64%)	29 (36%)	4 (100%)	0 (0%)
2010/11	4	1 (25%)	3 (75%)	59	39 (66%)	20 (34%)	4 (100%)	0 (0%)
2009/10	2	2 (100%)	0 (0%)	56	50 (89%)	6 (11%)	2 (100%)	0 (0%)
2008/09	6	2 (33%)	4 (67%)	103	80 (78%)	23 (22%)	6 (100%)	0 (0%)
2007/08	6	0 (0%)	6 (100%)	48	28 (58%)	20 (42%)	3 (50%)	3 (50%)

PULMONARY TUBERCULOSIS (TB)

Tuberculosis (TB) is an infection caused by the bacterium *Mycobacterium tuberculosis* (and other members of the *Mycobacterium tuberculosis* complex). TB is spread primarily via the aerosolization of respiratory secretions when an individual with active pulmonary disease coughs or sneezes. TB can be a diagnostic challenge and failure to consider TB on the differential diagnosis can result in nosocomial transmission.¹⁵ Canadian TB Standards recommend the establishment of a defined process for promptly identifying, isolating and treating patients suspected of having active pulmonary TB.¹⁶

Over the past year, IPAC continued to improve its approach for enhanced monitoring of patients requiring airborne precautions through the “TB Airborne Line List” (TALL). TALL enables a systematic, timely, and consistent approach to identify and follow patients with suspected TB based on laboratory orders for Acid Fast Bacilli (AFB) smears. The approach also includes the TB Assessment, Monitoring and Communication (ACE) Tool. ACE is essentially a worksheet used to assist IPAC and interdisciplinary health care teams in the investigation of potential TB cases and the need for airborne precautions.

In 2013/14, 418 patients were identified using TALL and were evaluated by IPAC. Of these cases, 248 (59%) required ongoing monitoring of airborne precautions until an alternate diagnosis was determined. The majority of patients suspected of having active pulmonary TB were placed on precautions appropriately. When a delay to implementing airborne precautions was noted, we identified and attempted to remove barriers to the timely initiation of airborne precautions.

In 2013/14, 14 new cases of active pulmonary TB were diagnosed at PHC acute care facilities; 9 (64%) were among admitted patients. Investigation of TB was not part of the differential diagnosis for 3 of the admitted cases. Nevertheless, 63% of the admitted TB cases had appropriate precautions within 4 hours of admission. One case had roommates who required TB exposure follow-up. No nosocomial transmission of TB was detected in 2013/14. Patients entering the



hemodialysis program (as well as pre-renal transplant patients) continue to be screened routinely for TB using interferon gamma release assays.

The implementation of TALL has resulted in improved isolation practices for patients with suspected or proven TB, and has been credited with a decreased overall number of TB exposures at PHC.

Automated microbiology lab notification of MTB orders; resulting in timely implementation of airborne precautions Sidhu B, Richards D, Kind T, Sharma A.

Abstract was awarded Top Poster and presented at IPAC Canada Conference in Halifax, Nova Scotia (2014).

URINARY TRACT INFECTIONS (UTI) AND ASYMPTOMATIC BACTERIURIA (ASB) IN RESIDENTIAL CARE

Urinary tract infections (UTI) occur frequently in the elderly. Comprehensive management of UTI starts with the correct diagnosis. Asymptomatic bacteriuria (ASB) is a condition in which the urine culture (microbiologic test) is positive for bacterial growth but the individual has no symptoms of a UTI. Residents of care facilities who develop non-specific symptoms, including delirium, are often diagnosed as having UTI and are over treated with antibiotics. Excessive diagnostic testing (i.e., urine cultures) is the primary driver of inappropriate antibiotic use and this contributes to the emergence of antibiotic-resistant bacteria, adverse effects from drug interactions, reactions to antibiotics, and *Clostridium difficile* infection. These represent financial costs to the health care system, but more importantly result in preventable patient harm.

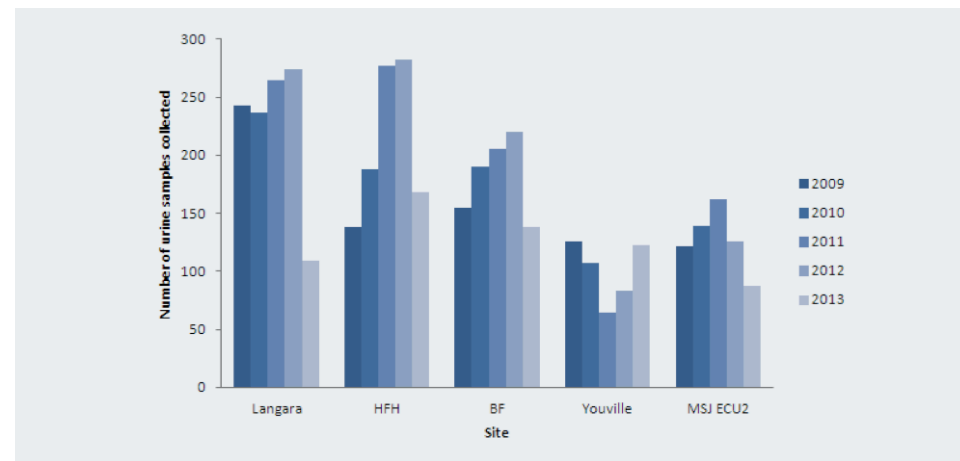
From January 1 to December 31, 2014, IPAC (in collaboration with the Antimicrobial Stewardship Program) piloted a multifaceted intervention targeting nurses and physicians at St. Vincent's Langara residential care. The goals of the intervention were to reduce the number of urine cultures collected when there was no indication of a UTI, to improve communication between nurses and physicians, and to improve the use of antibiotics for suspected UTI.

The targeted interventions included:

- Weekly review (progressed to bi-monthly review) of residents who had urine cultures collected to determine the indication
- Direct feedback using the UTI/ASB teaching tool and diagnostic algorithm to provide point-of-care education
- Continuing medical education rounds for residential care physicians
- Feedback on antimicrobials used for suspected UTI

During the pilot program (which lasted one year), the number of urine cultures sent to the PHC Medical Microbiology Laboratory decreased by 60% compared to the same time period in the previous year. The number of urine cultures submitted from all PHC residential care facilities from 2009 to 2013 are shown in Figure 11 for comparison. Urine culture volumes also decreased at other residential care sites; we believe this was a result of

FIGURE 11: NUMBER OF URINE CULTURES COLLECTED FROM PHC RESIDENTIAL CARE, 2009-2013



Note: HFH = Holy Family Hospital, BF = Brock Farhni, MSJ ECU2 = Mount Saint Joseph Hospital Extended Care Unit second floor.

nurses and physicians who were trained with the tools and work at multiple sites. The largest decrease in urine cultures, however, was seen at St. Vincent's Langara where audit and feedback was fully implemented.

In the first few months of the project, we noted that urine cultures were frequently sent for testing based on inappropriate indications including cloudy or foul smelling urine, and change in behavior without localizing urinary tract symptoms. As the pilot project progressed, the frequency of appropriately collected urine cultures increased (i.e., from residents with localizing urinary tract symptoms), while the number of urine cultures collected for inappropriate reasons decreased.

In collaboration with the residential care leadership team, clinical nurse educators, residential care pharmacy and the Antimicrobial Stewardship Program, IPAC plans to expand the interventions to all residential care facilities at PHC.

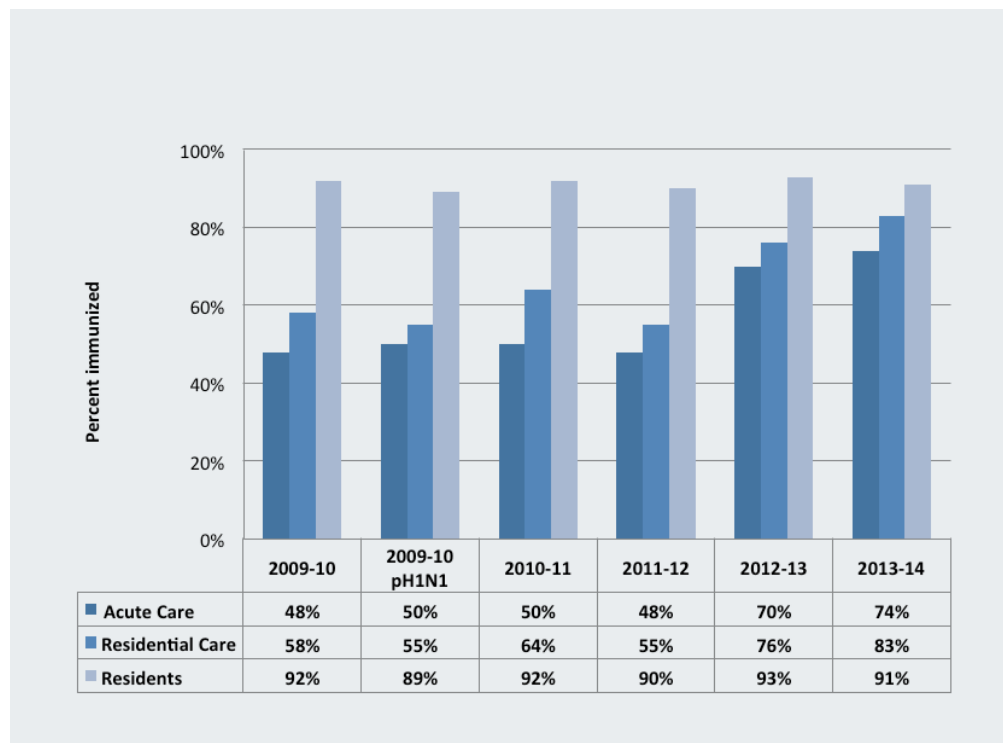
INFLUENZA

Every year, influenza infections result in hospitalizations and deaths. The elderly, pregnant women, and those with underlying medical conditions are at increased risk for influenza-related complications. In 2013/14, and consistent with previous years, nearly all of the residents at PHC residential care facilities were vaccinated against influenza (Figure 12).

Health care workers are also at an increased risk for acquiring and transmitting influenza. Immunization is the most effective way to control the spread of influenza. Vaccine uptake rates among health care workers have improved in the last two years. In 2013/14, the percent of acute care staff immunized against influenza increased to 74% for seasonal influenza. Additionally, 83% residential care staff at PHC facilities were immunized against seasonal influenza, which has also increased in the last two years (Figure 12). This immunization coverage is consistent with those reported in other health care facilities in BC.

IPAC is working closely with Workplace Wellness and Safety and VCH Communicable Disease Control to implement evidence-based approaches to improve vaccination coverage. In addition to receiving the influenza vaccine, health care workers are encouraged to always practice hand hygiene, respiratory etiquette, and to stay home from work if they have influenza-like symptoms.

FIGURE 12: INFLUENZA IMMUNIZATION COVERAGE AMONG PHC STAFF AND RESIDENTS, 2009/10 TO 2013/14



CARBAPENEMASE PRODUCING ORGANISMS (CPO)

The emergence and dissemination of multi-drug resistant Gram-negative bacteria represent a serious threat to hospitalized patients and to public health. More specifically, carbapenemase producing organisms (CPO) are considered a “triple threat” because: (1) they are resistant to last line antibiotics, (2) they are associated with a high mortality rate, and (3) they are difficult to control once established in health care facilities.

Since being reported in 2001, CPO have disseminated widely in many countries, including a number of outbreaks in Canada. These outbreaks have been difficult to control and are a drain on health care resources. Patients who receive medical care in countries where these organisms are endemic can serve as reservoirs for transmission when they receive care locally.

The approach to controlling transmission of CPO in health care facilities includes:

- Understanding the epidemiology of CPO in our health care region
- Rapid identification and implementation of appropriate precautions for colonized and infected patients
- Implementation of regional and facility-based infection prevention and control interventions

In 2013-14, PHC cared for one patient with laboratory-confirmed CPO. The case had received recent medical care in India and was identified as CPO positive on admission to another local hospital. The patient was transferred to PHC for a medical intervention. Through timely communication between staff at both hospitals, infection control precautions were implemented for CPO for the duration of the admission with no evidence of patient-to-patient transmission.

There was no nosocomial transmission of CPO at PHC for fiscal year 2013/14.

PHC has been developing a systematic process to screen high-risk



individuals who present to acute care or hemodialysis units. The Medical Microbiology Laboratory has implemented a selective bacterial growth medium to screen for CPO. A real-time PCR (polymerase chain reaction) assay for CPO detection has been validated in the Medical Microbiology Laboratory and is currently in use. PHC has been collaborating with other health authorities to develop a provincial approach to preventing CPO transmission in acute care facilities in British Columbia.

IPAC LINKS

The PHC IPAC Links program was established following the implementation of the Infection Control Champions (ICC) project. The ICC project goal was to evaluate the feasibility and cost-effectiveness of supporting local front-line nurses in infection control initiatives.

Following stakeholder approval and success of the project, the ICC project was renamed and re-launched as the IPAC Links program. The scope of the Links program continues to broaden and include Social Workers, Licensed Practical Nurses, Respiratory Therapists, Laboratory Technologists, Ward Aides and Radiology Technicians as well as Registered Nurses. The Links program has oriented over 200 participants to the Link Program since its inception.

The orientation program was reviewed and redesigned in 2013. Over 50 new Links have successfully completed this enhanced orientation program which has incorporated interactive adult learning strategies. The Links Workbook is distributed as part of the orientation program and serves as a valuable tool and resource for Links when working in their clinical areas. The Workbook also encourages Links to check-in with their Infection Control Practitioner and complete educational activities on the units.

IPAC-related updates are highlighted and shared with the Links through education in-services and a quarterly newsletter entitled *The Bug Brief*.

Many Links continue to play a vital role in a number of IPAC initiatives including: Provincial Hand Hygiene Action Plans, Accreditation, infrastructure audits, access to point of care alcohol-based hand rub, transmission-based precautions, clean and dirty service room checks, and promotion of education material and surveillance data on Infection Control Education boards on the units.

Over the last year, Links have played an active role on numerous committees, primarily as an IPAC voice and resource. In general, their contributions are constructive, current, unit specific and effective. The IPAC Links program continues to be a sustainable initiative due to the engagement and commitment of the Links.



APPENDIX A:

INFECTION PREVENTION AND CONTROL TEAM 2013/14

Marc Romney, MD FRCPC DTM&H

Howard Green, BSc MBA

Victor Leung, MD FRCPC

Christopher Lowe, MSc D(ABMM) MD FRCPC

Elisa Lloyd-Smith, PhD

Mary McNaughton, RN MSA CIC

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Azra Sharma, MLT MSc

Danielle Richards, RN MA

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Leah Diamond, RN

Jay Estoque, RN

Camillia Palacios

Luz Vierende

Sylvie Champagne, MD FRCPC

Christopher Sherlock, MD FRCPC

Medical Director, Infection Prevention and Control / Medical Leader, Medical Microbiology
Leader, Infection Prevention and Control

Infection Control Physician / Medical Microbiologist / Infectious Diseases Consultant

Infection Control Physician / Medical Microbiologist

Epidemiologist

Infection Control Practitioner

Infection Control Practitioner

Infection Control Practitioner

Infection Control Practitioner

Infection Control Practitioner

Infection Control Practitioner

Infection Control Practitioner

Infection Control Practitioner

Nursing Clerk

Administrative Assistant

Medical Microbiologist

Medical Microbiologist

APPENDIX B: PROVIDENCE HEALTH CARE FACILITIES

NAME	TYPE OF FACILITY	ACUTE CARE BEDS	RESIDENTS
St. Paul's Hospital	Acute care	427	0
Mount Saint Joseph Hospital	Acute care Residential care	100	100
St. Vincent's Hospitals			
—Brock Fahrni Pavilion	Residential care	0	148
—Langara	Residential care	0	217
Holy Family Hospital	Rehabilitation care Residential care	73	142
Youville Residence	Residential care	0	74
Marion Hospice	Hospice Care	0	8
Total		600	689

APPENDIX C: DEFINITIONS

SURVEILLANCE DEFINITIONS

Colonization: The presence, growth, and multiplication of an organism without observable clinical symptoms or immune reaction.

Infection: Invasion by and multiplication of a microorganism in body tissue resulting in clinical manifestations of disease.

CDI case: Laboratory confirmation of *Clostridium difficile* in an unformed stool specimen.

MRSA case: Laboratory confirmation of methicillin-resistant *Staphylococcus aureus* from specimens indicative of colonization or infection.

VRE case: Laboratory confirmation of vancomycin-resistant enterococci from specimens indicative of colonization or infection.

CPO case: Laboratory confirmation of carbapenemase producing organisms from specimens indicative of colonization or infection.

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 4 weeks/12 months.

Non PHC-associated case: Admitted for < 72 hours in a PHC facility AND has not been admitted to a PHC facility within the preceding 4 weeks/12 months. The assumption is that these cases were acquired in the community or in another healthcare facility other than PHC.

Patient-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. Patient 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) patient days are used as the denominator. For *C. difficile* rates, acute care patient days exclude newborns.

Fiscal year/period: April 1 to March 31 of the following year, divided into 13 fiscal periods, and 4 fiscal quarters.

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.

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