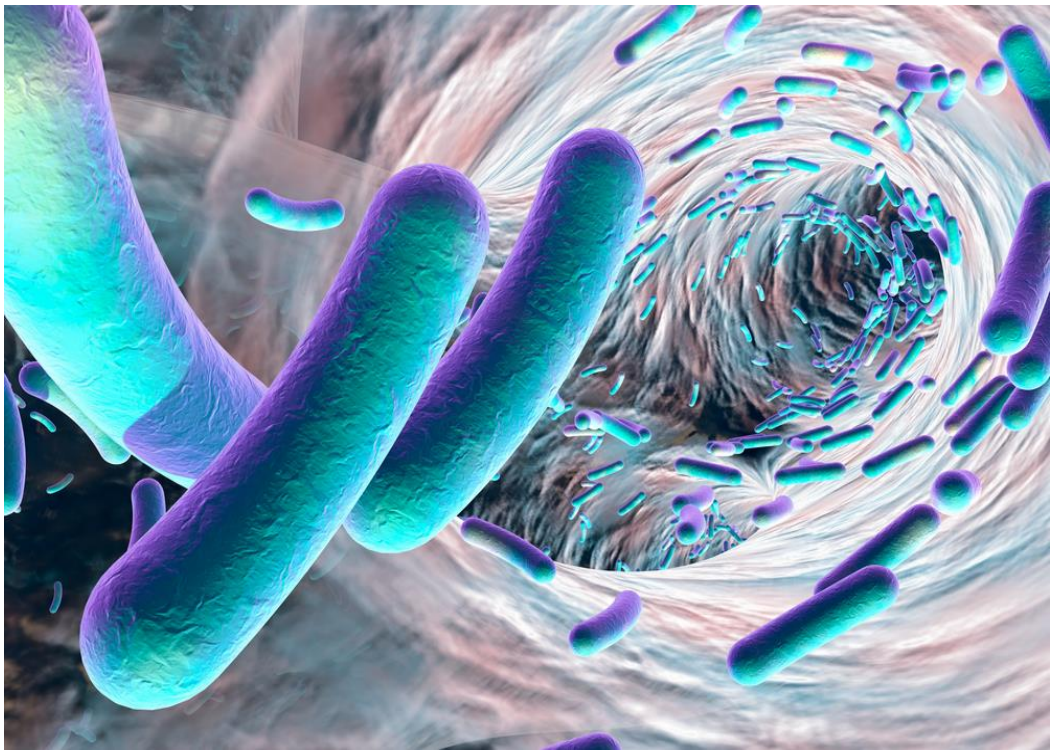
Annual Report
2017–2018



July 2018

Table of Contents

Table of Figures

List of Tables

Executive Summary

Under the leadership of Linda Dempster, VP Patient Experience, Dr. Elizabeth Brodkin, Infection Prevention and Control (IPC) Executive Medical Director, and Loraine Jenkins, Executive Director, Maternal, Child, Infant & Youth Clinical Program and IPC Operations, the IPC program at Fraser Health is pleased to present the IPC Annual Report for 2017/18; the sixth consecutive year that an IPC Annual Report has been published. IPC continues to grow and strengthen as a regional program, supporting Fraser Health in the achievement of excellence in healthcare through the implementation of IPC evidence-based practices.

During 2017/18, the program focused on the two Fraser Health Patient Safety Priorities that are under the leadership of IPC: (a) reducing *Clostridium difficile* infections (CDI) and (b) ensuring hand hygiene compliance met and exceeded the provincial target of 80% compliance. The IPC program also concentrated on completing the second IPC Service Plan (2016–2018) (IPC Program, 2016). The plan established priorities for the IPC program (and the organization) by providing clear goals, objectives, and actions based on strengths and gaps in the organization and on emerging pathogens and public health threats. All the components of the service plan were intended to meet or exceed industry standards and best practices, to improve patient safety by preventing healthcare-associated infections (HAI), to reduce the number of serious complications and deaths of hospitalized patients and residents, and to improve the use of valuable healthcare resources.

This Annual Report highlights the outcomes and accomplishments of the program and outlines major goals and continued priorities for the 2018/19 fiscal year.

Infection Prevention and Control Health Care Report Card and Indicators for 2017/18

Fraser Health Infection Prevention and Control Health Care Report Card Priorities					
Indicator	Status	Target	2017/18	Preferred Direction	Page #
Clostridium difficile Infections	●	≤4.5*	3.4*	↓	9
Methicillin-Resistant *Staphylococcus aureus*	▲	≤7.0*	6.7*	↓	11
Hand Hygiene Compliance	●	≥80%	87%^	↑	15

* cases per 10,000 patient days

^ please see the Hand Hygiene section for a further discussion regarding the 2017/18 hand hygiene compliance rates

● meeting target

▲ within 10% of target

◆ outside of target range by more than 10%

Additional IPC Indicators					
Indicator	Status	Target	2016/17	2017/18	Page #
Carbapenemase-Producing Organisms	■	Reduction in nosocomial transmissions	10†	12†	13
Hand Hygiene Observations	■	Increase in observations	105,769	85,488	15
Outbreak Management	■	Reduction in # of CDI outbreaks	7	3	17

† number of cases

■ = minimal concerns: actual is meeting the target of year-over-year improvement and data points are moving in the preferred direction

■ = concern area: actual is not meeting target of year-over-year improvement, or data points are not moving in the preferred direction, or indicator is a special consideration

■ = problem area: actual is not meeting target of year-over-year reduction, and data points are not moving in the preferred direction

Priorities for 2018/2019

- Consultation, communication, and support of healthcare-associated infection (HAI) reduction initiatives as a component of the Fraser Health Patient Safety Priorities, particularly methicillin-resistant *Staphylococcus aureus* (MRSA) and carbapenemase-producing organisms (CPO).

- Upgrade the Fraser Health hand hygiene audit program, including an update of the Fraser Health Hand Hygiene Policy and clinical practice guidelines, addition of external auditors, and implementation of a sustainable patient hand hygiene program.
- Enhance IPC surveillance systems and reporting tools for acute care.
- Ensure IPC involvement in all phases of Fraser Health construction and renovation projects to incorporate IPC best practices in both acute care and community facilities.
- Explore and implement new IPC-related technologies and best practices.
- Conduct research and quality improvement initiatives, and submit abstracts to IPC and quality improvement conferences and peer-reviewed journals.
- Further develop our staff in the LEADS Framework (LEADS Canada, 2017) and competencies, focusing on leadership, patient-centred quality, and safety.

In a healthcare environment, where accountability and transparency are at the centre of garnering public trust, the IPC program at Fraser Health welcomes your feedback on this report.

Please send comments to Petra Welsh, Director, IPC Strategy and Performance (petra.welsh@fraserhealth.ca)

Awards, Achievements and Presentations

Table 1. Presentations at Conferences by the IPC Program for 2017/18

Presentation Title	Individual	Conference	Date
Clostridium difficile Infection Surveillance: Application of the Case Definition in a Regional Health Authority in BC (oral presentation)	Louis Wong Tara Leigh Donovan Janie Nichols	Infection Prevention and Control (IPAC) Canada	June 2017
Implementation of a Pharmacy Escalation Tool for Patients with *Clostridium difficile* (oral presentation)	Dr. Elizabeth Brodkin Colin Lee Katy Short	British Columbia Patient Safety and Quality Committee Quality Forum	February 2018
Use of Whole-Genome Sequencing Data to Investigate a Cluster of NDM-Positive *Citrobacter freundii* in British Columbia (oral presentation)	Katy Short	Provincial Infection Control Network	March 2018
The Fraser Health Experience with Carbapenemase-Producing Organisms: Seven Years of Epidemiology and Control Measures (Top Poster Abstract award)	Katy Short Tara Leigh Donovan Petra Welsh Dr. Elizabeth Brodkin	Society of Healthcare Epidemiology of America (SHEA)	April 2018
Down the Drain: Sink Drains as a Reservoir for Carbapenemase-Producing Organisms (poster presentation)	Dr. Elizabeth Brodkin Dr. Dale Purych Katy Short Marc Dagneau Sandeep Badden	Society of Healthcare Epidemiology of America (SHEA)	April 2018

Healthcare-Associated Infection Indicators

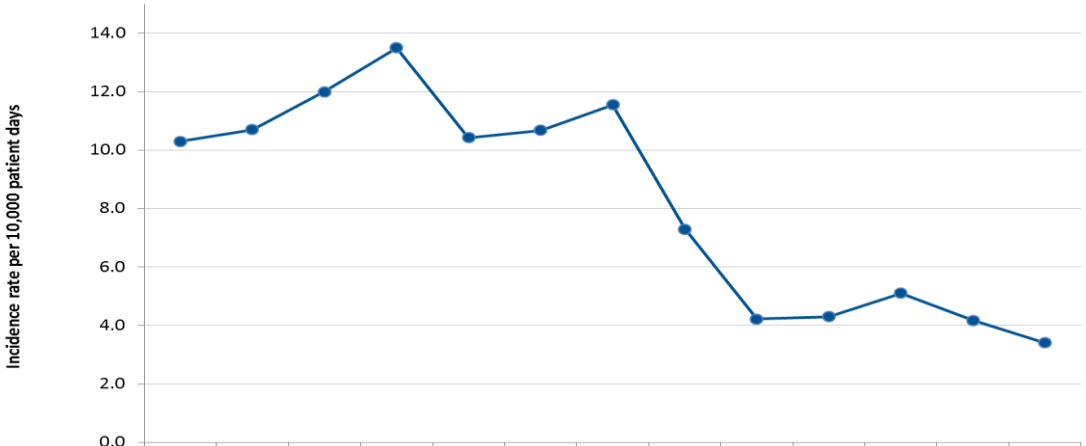
Clostridium difficile Infection

Status	Target	Actual (2017/18)	Preferred Direction
●	≤4.5*	3.4*	↓

*cases per 10,000 patient days

Clostridium difficile infection (CDI) is one of the most commonly acquired healthcare-associated infections (HAIs) in industrial countries. CDI is often related to antimicrobial therapy, which alters the normal bacteria found in the gastrointestinal tract. CDI may be a mild infection or can present as massive diarrhea that may be difficult to control, with the potential for toxic megacolon, sepsis, and even death.

As Fraser Health consistently met the CDI target of ≤ 6.0 cases per 10,000 patient days from 2013/14 to 2016/17, and national benchmarks decreased during this period, the target was reduced to ≤ 4.5 cases per 10,000 patient days beginning with the 2017/18 fiscal year. The Fraser Health rate of new CDI for 2017/18 decreased from the previous fiscal year from 4.2 (95% CI: 3.8–4.6) to 3.4 (95% CI: 3.1–3.8) cases per 10,000 patient days (Figure 1), a statistically significant decrease ($p < 0.05$). Moreover, this represents a 20% decrease in the number of facility-associated CDI incident cases and over 80 CDI cases prevented during the 2017/18 year.



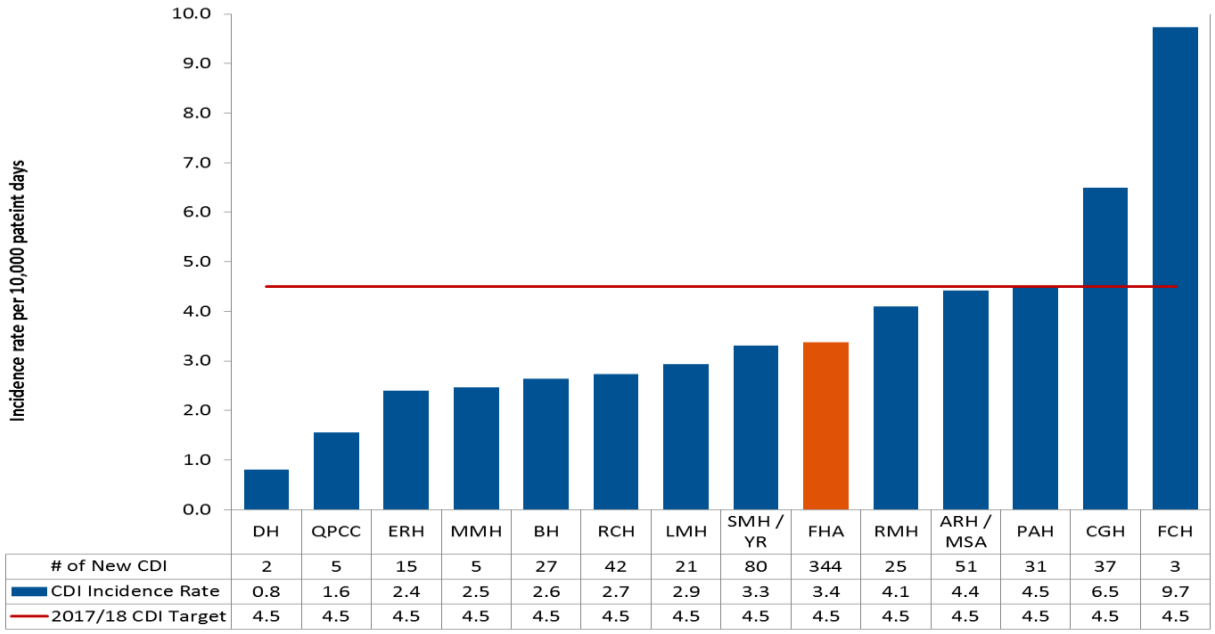
	FY 2005/06	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
# of New CDI	725	843	945	1150	909	1007	1141	738	437	447	550	426	344
CDI Incidence Rate	10.3	10.7	12.0	13.5	10.4	10.7	11.5	7.3	4.2	4.3	5.1	4.2	3.4

Source: Fraser Health CDI Surveillance Database, extract May 1st, 2018

Figure 1: Number of new facility-associated CDI and incidence rate per 10,000 patient days by fiscal year for Fraser Health

In 2017/18, the majority of Fraser Health acute care sites met the annual target of ≤ 4.5 new CDI cases per 10,000 patient days (Figure 2). Chilliwack General Hospital (CGH) and Fraser Canyon Hospital (FCH) exceeded the target, with an incidence rate of 6.5 and 9.7 CDI cases per 10,000 patient days, respectively.

Caution must be taken when interpreting rates because one case can result in an inflated rate for facilities and programs with a small number of beds and patient days (e.g., FCH). An increase of one or two cases can lead to a high facility rate. Moreover, additional factors that can account for a higher incidence of CDI include, but are not limited to, congestion, and over-capacity, and higher level of care sites that serve patients of higher acuity with an increased risk of complications.



	DH	QPCC	ERH	MMH	BH	RCH	LMH	SMH / YR	FHA	RMH	ARH / MSA	PAH	CGH	FCH
# of New CDI	2	5	15	5	27	42	21	80	344	25	51	31	37	3
CDI Incidence Rate	0.8	1.6	2.4	2.5	2.6	2.7	2.9	3.3	3.4	4.1	4.4	4.5	6.5	9.7
2017/18 CDI Target	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5

Source: Fraser Health CDI Surveillance Database, extract May 1st, 2018

Figure 2: Number of new facility-associated CDI and incidence rate per 10,000 patient days by Fraser Health site for 2017/18

Methicillin-Resistant *Staphylococcus aureus*

Status	Target	Actual (2017/18)	Preferred Direction
▲	≤7.0*	6.7*	⬇

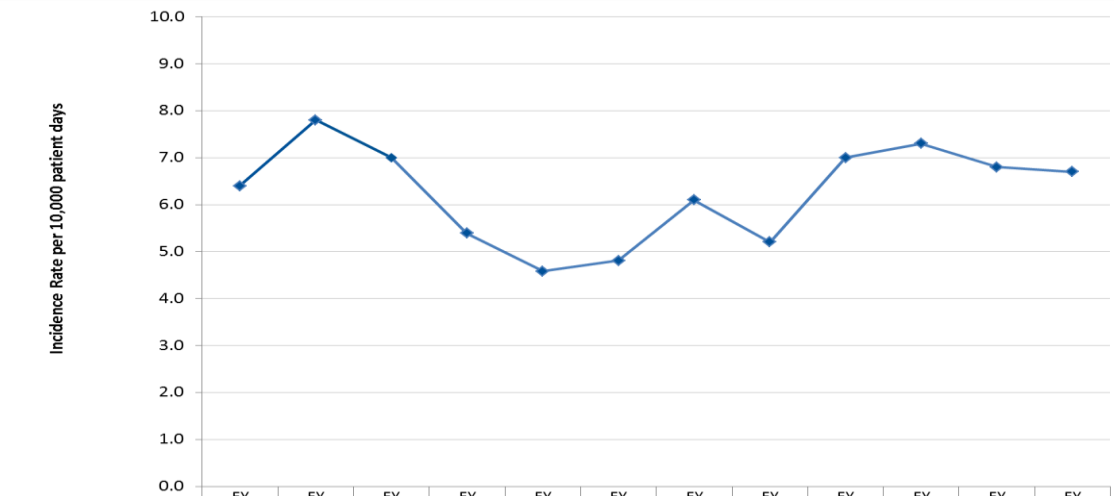
*cases per 10,000 patient days

Methicillin-resistant *Staphylococcus aureus* (MRSA) are strains of staphylococci that have become resistant to antimicrobial agents traditionally used to treat common skin and soft tissue infections (e.g., penicillins and cephalosporins). MRSA may be found in wound, skin, soft tissue, and bone infections as well as sites where foreign bodies have been inserted. Antimicrobial resistance makes these infections difficult to treat and causes increased length of hospital stay and increased morbidity and mortality.

A MRSA incidence rate of ≤ 7.0 cases per 10,000 patient days was the established annual target for Fraser Health for the 2017/18 fiscal year. The goal is a reduction in the MRSA rate year over year. The Fraser Health rate of new MRSA for 2017/18 was 6.7 (95% CI: 6.2–7.2) cases per 10,000 patient days, unchanged from the previous year's rate of 6.8 (95% CI: 6.3–7.1) (Figure 3).

The MRSA incidence rates among Fraser Health sites ranged from 4.6 per 10,000 patient days at CGH (27 cases) to 9.6 per 10,000 patient days at Delta Hospital (24 cases) (Figure 4). Five sites did not meet the target of 7.0 cases per 10,000 patient days.

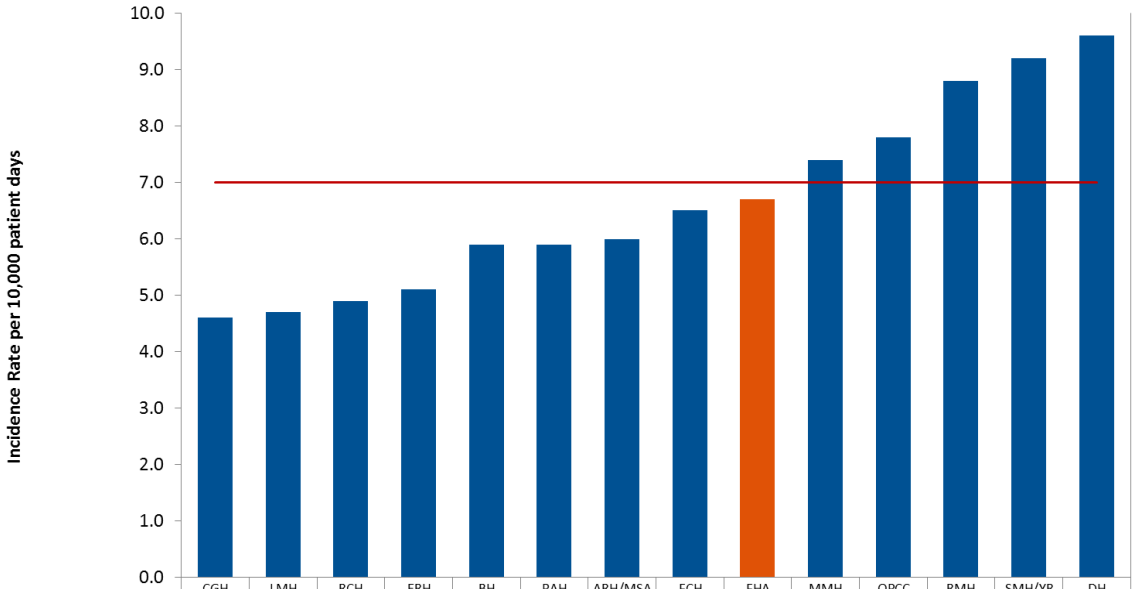
Two independent clusters of MRSA colonizations were identified at Surrey Memorial Hospital and Royal Columbian Hospital during the 2017/18 fiscal year. Both facilities instituted intensive MRSA screening during their investigations into the clusters, which may have contributed to the higher number of cases observed. Multiple improvements have been put in place on both units to prevent further transmission. Additionally, MRSA has been chosen as one of the six new Fraser Health Patient Safety Priorities, and an in-depth quality improvement plan is under development.



	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
# of New MRSA	524	643	608	492	453	498	644	566	759	822	723	715
MRSA incidence rate	6.4	7.8	7.0	5.4	4.6	4.8	6.1	5.2	7.0	7.3	6.8	6.7

Source: Fraser Health iTracker Surveillance Database, extract May 1st, 2018

Figure 3: Number of new facility-associated MRSA and incidence rate per 10,000 patient days by fiscal year for Fraser Health



	CGH	LMH	RCH	ERH	BH	PAH	ARH/MSA	FCH	FHA	MMH	QPCC	RMH	SMH/YR	DH
# of New MRSA	27	35	81	32	63	42	74	2	715	15	25	55	240	24
MRSA Incidence Rate	4.6	4.7	4.9	5.1	5.9	5.9	6.0	6.5	6.7	7.4	7.8	8.8	9.2	9.6
2017/18 MRSA Target	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

Source: Fraser Health iTracker Surveillance Database, extract May 1st, 2018

Figure 4: Number of new facility-associated MRSA and incidence rate per 10,000 patient days by Fraser Health site for 2017/18

Carbapenemase-Producing Organisms

Status	Target	Actual 2016/17	Actual 2017/18
■	Reduction in nosocomial transmissions	10*	12*

*number of newly identified cases

Carbapenems are a family of antibiotics used to treat serious infections caused by Gram-negative bacteria that are resistant to other antibiotics. Recently, some bacteria have become resistant to carbapenems through the production of enzymes that break them down; these are known as carbapenemase-producing organisms (CPO). CPO can arise through the sharing of carbapenemase genes between bacteria by means of mobile genetic material called plasmids.

There is potential for infection when CPOs move from the gastrointestinal tract (where they are usually found) into other body spaces, including wounds, the bladder, the respiratory tract, or the bloodstream. When these organisms cause infections, there are few treatment choices available. Carbapenem-resistant bacteria have become common in some parts of the world, and patients who travel to those areas may return home colonized with CPO, particularly if they were hospitalized while abroad. When colonized patients enter Fraser Health hospitals, other patients may be put at risk of acquiring the same organisms. The environment can also become contaminated with these organisms, providing another source of spread.

In fiscal year 2017/18, 89 patients with CPO were newly identified in Fraser Health. About half of these cases (50.6%) were associated with healthcare outside of Canada, while 12 (13.5%) were likely nosocomial (Table 2). The majority of newly identified cases reported in fiscal year 2017/18 were colonizations (92.1%) (Table 3).

Table 2. Patients with CPO in Fraser Health by Epidemiological Source and Fiscal Year

Fiscal Year	Fraser Health Healthcare Associated		Travel w/Healthcare		Travel Only†		BC Community Associated		Undetermined		Total	
2013/14	41	(61%)	19	(28%)	0	(0%)	0	(0%)	7	(10%)	67	(100%)
2014/15	26	(46%)	19	(34%)	3	(5%)	0	(0%)	8	(14%)	56	(100%)
2015/16	17	(25%)	37	(55%)	3	(4%)	0	(0%)	10	(15%)	67	(100%)
2016/17	10	(18%)	38	(67%)	1	(2%)	0	(0%)	8	(14%)	57	(100%)
2017/18	12	(13%)	45	(51%)	11	(12%)	10	(11%)	11	(12%)	89	(100%)

Source: Fraser Health MDRO Surveillance Database, extract May 4th, 2018.
† = On 14 March 2017, Fraser Health implemented an additional screening question "Have you travelled to the Indian subcontinent countries of India, Pakistan, and Bangladesh within the last 12 months?"

Table 3. Patients with CPO Infections versus Colonization in Fraser Health by Fiscal Year

Fiscal Year	Infections		Colonizations		Total	
2013/14	21	(31%)	46	(69%)	67	(100%)
2014/15	11	(20%)	45	(80%)	56	(100%)
2015/16	6	(9%)	61	(91%)	67	(100%)
2016/17	10	(18%)	47	(82%)	57	(100%)
2017/18	7	(8%)	82	(92%)	89	(100%)

Source: Fraser Health MDRO Surveillance Database, extract May 4th, 2018

IPC Best Practice

Hand Hygiene Compliance

Status	Target	Actual (2016/17)	Actual (2017/18)
●	80% compliance	86% compliance	87% compliance
■	Increase in observations	105,769	85,488

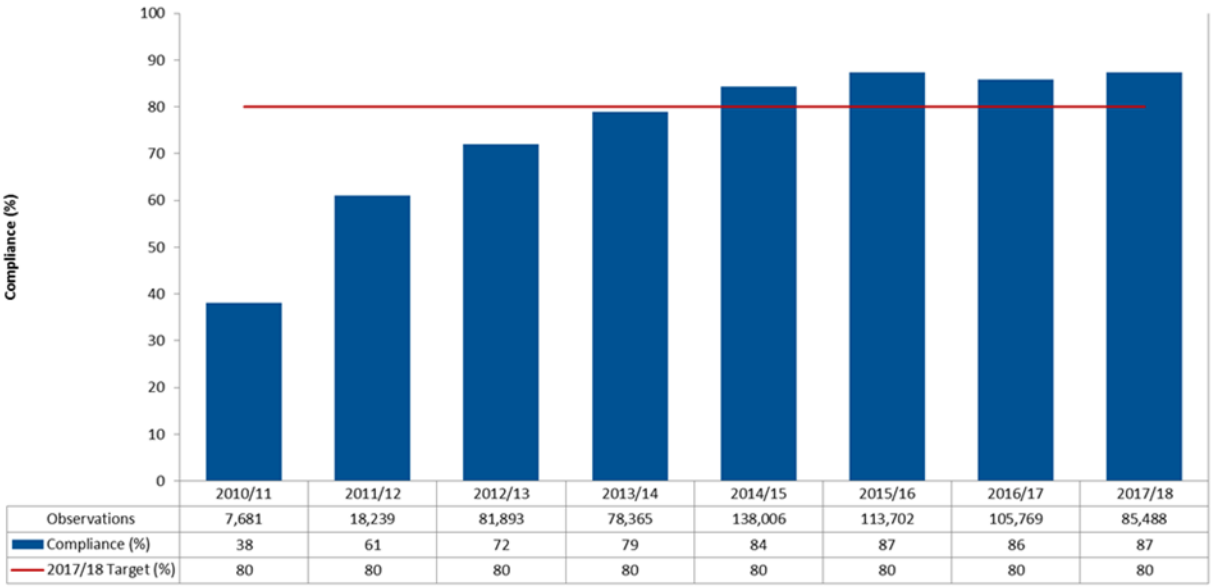
Hand hygiene is a critical patient safety initiative and one of the most effective, well-evidenced measures to reduce the transmission of HAIs worldwide. Hand hygiene education and training is provided across Fraser Health through new employee orientation sessions as well as on-the-job training and in-services provided by IPC Practitioners.

A total of 85,488 hand hygiene practice observations were completed in 2017/18 for Fraser Health acute care sites, with a total compliance of 87%, compared with 105,769 observations and 86% compliance in 2016/17 (Figure 5). This represents a slight increase in hand hygiene compliance and a 19% decrease in the number of observations from the previous fiscal year. Upon investigation, it was noted that there was a significant decrease in hand hygiene audits and observations in the fourth fiscal quarter of 2017/18. This decrease was most likely due to announcements about the major changes to the hand hygiene program planned for 2018/19.

In the spring of 2017/18, the IPC program was asked to validate the high rates of hand hygiene compliance across Fraser health acute care sites. This request was made due to the observation that MRSA rates were consistently high at some sites and for the health authority as a whole in spite of high hand hygiene rates. Hand hygiene is a major driver of MRSA rates, and organizations typically see less MRSA transmission when hand hygiene compliance is high; however, this was not the case at Fraser Health.

An experienced independent hand hygiene auditor employed by the regional IPC clinical program conducted "secret-shopper" audits across Fraser Health acute care sites in the summer of 2017/18 and found that actual hand hygiene compliance rates were 20–30% lower than reported compliance. This finding led to a recommendation from the Fraser Health Clinical Operations Committee that a regional independent hand hygiene auditor program be implemented across all Fraser Health acute care sites, beginning in 2018/19.

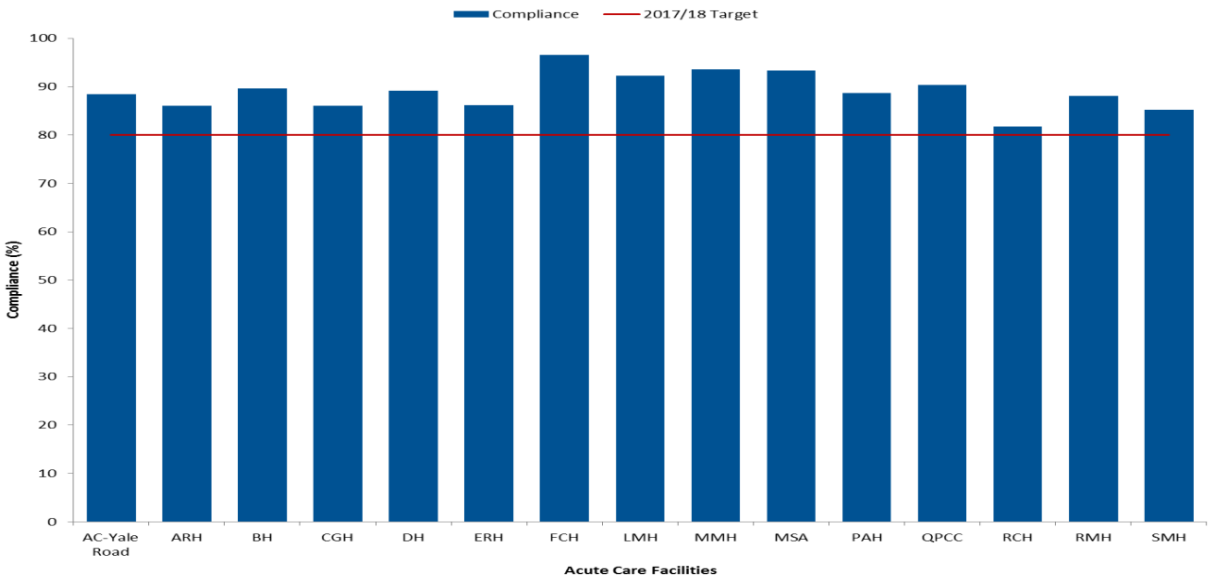
It is expected that the compliance rates for 2018/19 will be considerably lower than 2017/18 compliance due to deployment of independent auditors and a revamped hand hygiene program.



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Observations	7,681	18,239	81,893	78,365	138,006	113,702	105,769	85,488
Compliance (%)	38	61	72	79	84	87	86	87
2017/18 Target (%)	80	80	80	80	80	80	80	80

Source: Fraser Health FormAudit Hand Hygiene Module, extract May 17th, 2018

Figure 5: Comparison of hand hygiene compliance by fiscal year in Fraser Health acute care sites



Source: Fraser Health FormAudit Hand Hygiene Module, extract May 17th, 2018

Figure 6: Hand hygiene compliance among all staff by Fraser Health site for 2017/18

Outbreak Management

Fraser Health monitors and tracks the total number of gastrointestinal illness (e.g., norovirus), CDI and respiratory illness (influenza and non-influenza respiratory viruses) outbreaks and alerts, along with their impact on acute sites. Outbreaks and alerts are declared in consultation with the IPC Executive Medical Director.

Alert notifications were introduced to reduce the number of outbreaks in acute care sites by enabling IPC Practitioners to implement enhanced cleaning and other initiatives aimed at improving IPC practices and reducing the bio-burden on the unit, thus reducing the risk of transmission.

In Fraser Health, a CDI outbreak is defined as three or more new healthcare-associated cases of CDI attributed to a single unit (as defined by geographical area, nursing station, and unit mnemonic) in a seven-day period. A gastrointestinal illness (GI) outbreak is defined as three or more probable or confirmed GI cases in one unit within a four-day period.

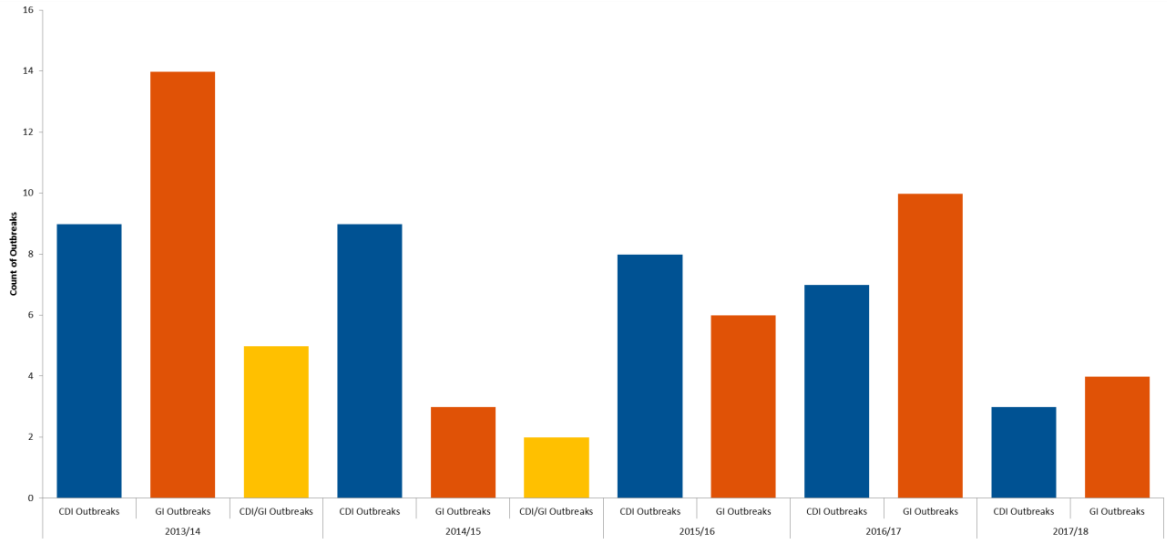
A respiratory illness (RI) outbreak is declared when there are two or more microbiologically and epidemiologically linked healthcare-associated RI cases on a unit.

Status	Target	Actual (2016/17)	Actual (2017/18)
■	Reduction in number of CDI outbreaks	7	3

Clostridium difficile Infection and Gastrointestinal Illness Alerts and Outbreaks

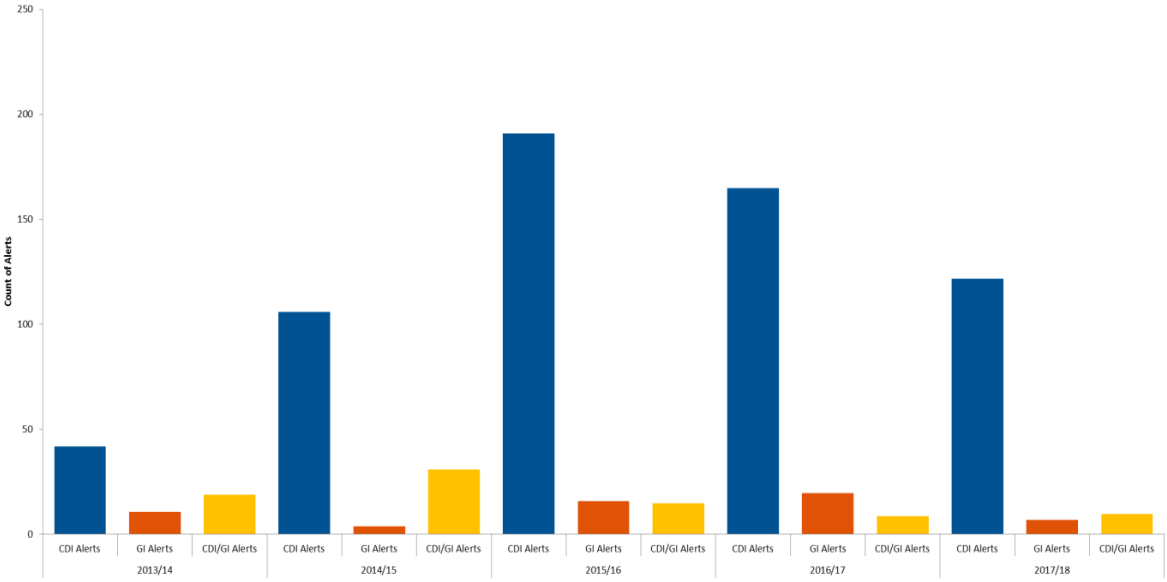
The outbreak management goal for the organization is to decrease the number of CDI outbreaks from year-to-year in acute sites. The number of CDI outbreaks in 2017/18 decreased from seven in 2016/17 to three in 2017/18, which represents a decrease of 57% (Figure 7). This decrease is consistent with the decrease in overall CDI rates across Fraser Health acute care sites. Similarly, there was a reduction in the number of GI outbreaks, from 10 in 2016/17 to four in 2017/18, a decrease of 60% (Figure 7).

The number of CDI and GI alerts issued by Fraser Health acute care sites decreased by 28% in 2017/18 (Figure 8). In fiscal year 2017/18, 139 alerts were issued. The majority (88%) of alerts were issued for CDI, which was consistent with the previous year.



Source: Fraser Health Outbreak and Alert Database, extract May 1st, 2018

Figure 7: Number of CDI and/or GI outbreak notifications issued for Fraser Health acute care sites by fiscal year and etiological agent



Source: Fraser Health Outbreak and Alert Database, extract May 1st, 2018

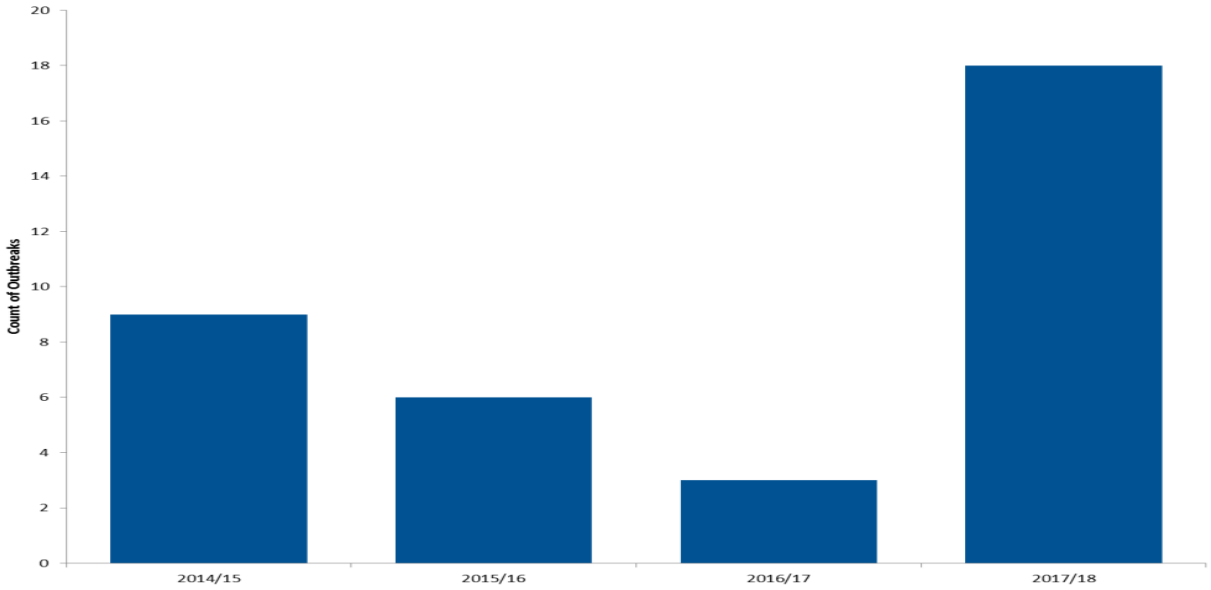
Figure 8: Number of CDI and/or GI alert notifications issued for Fraser Health acute care sites by fiscal year and etiological agent

Respiratory Illness Alerts and Outbreaks

In fiscal year 2017/18, there were 18 RI outbreaks declared in units across eight Fraser Health acute care sites; four of the outbreaks occurred simultaneously in a single facility, creating a facility-wide (inpatient) outbreak. There was a substantial increase in the number of RI outbreaks from the previous fiscal years (Figure 9). This increase may have been due to the relatively severe influenza season in British Columbia (BC) in 2017/18 compared to previous years (British Columbia Centre for Disease Control [BCCDC], 2018). Other factors that may have increased the number of RI outbreaks include increased influenza testing and severe congestion in the facilities.

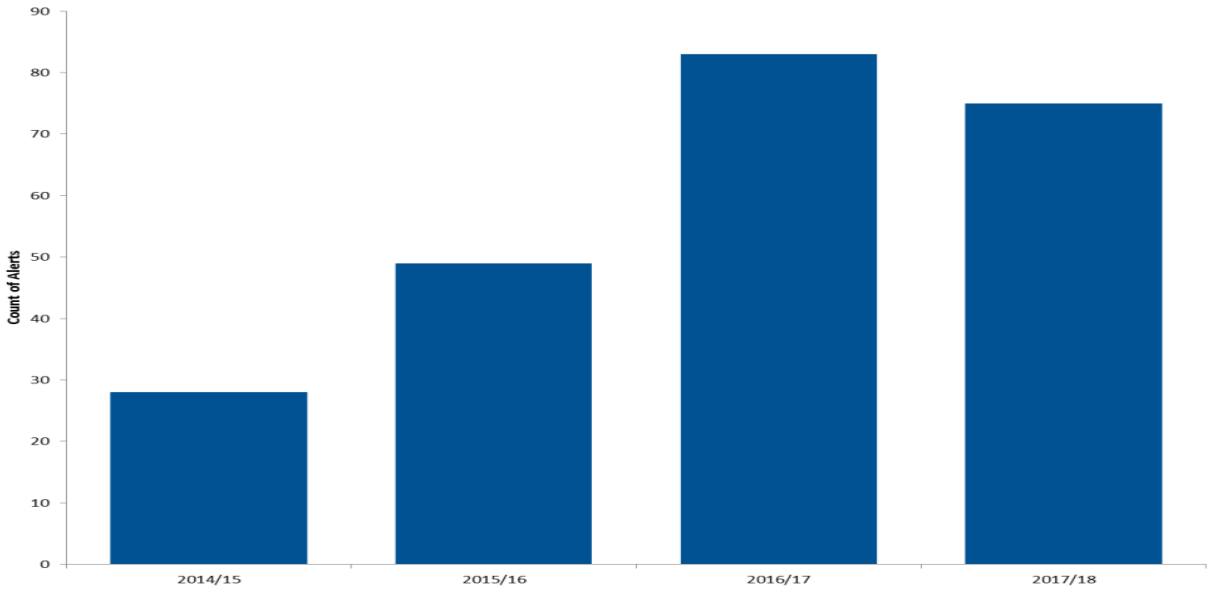
Influenza A or B was identified in all but one RI outbreak, while respiratory syncytial virus (RSV) was identified in seven outbreaks. The majority of the RI outbreaks involved laboratory-confirmed influenza A, similar to previous years. Influenza B made a greater contribution to the overall influenza activity in BC in 2017/18 compared to previous years (BCCDC, 2018). This trend was also observed in Fraser Health RI outbreaks, with eight out of 18 outbreaks, or 44%, involving influenza B in 2017/18 versus none in 2016/17.

There was a decrease in the number of RI alerts issued in 2017/18 (Figure 10) as well as a decrease in the duration of alerts. The average length of an RI alert for 2017/18 was 9.9 days. The proportion of RI alerts with an unidentified etiological agent decreased to 31% in 2017/18 from 49% in 2016/17. RSV was the most identified etiological agent in alerts (47% of alerts had at least one laboratory-confirmed RSV case), followed by influenza A (41%) and influenza B (39%).



Source: Fraser Health Outbreak and Alert Database, extract May 1st, 2018

Figure 9: Number of RI outbreak notifications issued by Fraser Health acute care sites by fiscal year



Source: Fraser Health Outbreak and Alert Database, extract May 1st, 2018

Figure 10: Number of RI alert notifications issued by Fraser Health acute care sites by fiscal year

Outbreaks: Lessons Learned

Clostridium difficile Infection and Gastrointestinal Illness Outbreaks

- **Timely Identification of Symptomatic Patients**: Standardized practice of documenting bowel movements ensures prompt identification of suspect CDI and GI cases and timely application of precautions.
- **Hand Hygiene**: Attention to hand hygiene for staff, patients, and visitors is vital in halting transmission of pathogens.
- **Staff Education**: Education on infection control practices provided to staff members who frequently travel among different units is integral to outbreak management and to prevent future outbreaks.

Respiratory Illness Outbreaks

- **Timely Application of Precautions**: Prompt initiation of droplet precautions for symptomatic patients or patients identified by IPC Practitioners through flu order reports helps to minimize transmission.
- **Pharmacy Support**: Ensuring pharmacy provides appropriate antiviral therapy to confirmed influenza cases, along with antiviral prophylaxis to asymptomatic patients on the unit, supports successful management of influenza outbreaks. In some cases, unimmunized staff may be asked to obtain a prescription for antivirals from their family physician.
- **Visitor Policy**: Ensure visitors check-in at the unit nursing station prior to visitation to receive information regarding hand hygiene and respiratory etiquette.
- **Multidisciplinary Approach**: Multidisciplinary collaboration facilitates effective teamwork in early detection and efficient management of outbreaks.

Improvement Initiatives

Clostridium difficile Infection

Patients with CDI are managed on specific precautions to prevent transmission of CDI to patients and staff. This includes adherence to best practices for hand hygiene, decluttering, donning and doffing personal protective equipment, dedicated medical devices and patient care equipment, and an escalated series of environmental cleaning and disinfection requirements. In addition, improvement work continued on the following strategies from 2016/17:

- **Fraser Health Patient Safety Priorities**: Ongoing consultation, communication and support of CDI and hand hygiene improvement initiatives as part of the Fraser Health Patient Safety Priorities.
- ***Clostridium difficile* Action Plans**: Targeted support and improvement work on those units that are at highest risk for CDI nosocomial transmission (i.e., vulnerable units).
- **Ultra-Violet Light Germicidal Irradiation (UVGI)**: Trialed an ultra-violet light disinfection system as an adjunct to the regular cleaning and disinfection of patient rooms. Based on the trial, completed an economic assessment of UVGI technology to inform implementation across Fraser Health acute care facilities.
- ***Clostridium difficile*/Antimicrobial Stewardship Program/Pharmacy Quality Improvement Pilot Project**: Developed a CDI quality improvement project in collaboration with Fraser Health's Antimicrobial Stewardship Program (ASP) Medical Director and Pharmacy that ensures every CDI case was reviewed by an IPC Practitioner, and any case with a possible gap in antibiotic management was escalated to a clinical pharmacist.

Methicillin-Resistant *Staphylococcus aureus*

In addition to contact precautions for MRSA (including best practices for hand hygiene, correct donning and doffing of personal protective equipment, and enhanced environmental cleaning), the following new strategies have been actioned to support MRSA reduction:

- **Patient Engagement**: Collaboration with the Patient Voices Network along with patients at the bedside to ensure the IPC program and front-line staff are

incorporating patients' and families' voices and requests into IPC best practices and processes, with a focus on patient hygiene.

- **Ultra-Violet Light Germicidal Irradiation (UVGI)**: Trialed an ultra-violet light disinfection system as an adjunct to the regular cleaning and disinfection of patient rooms. Based on the trial, completed an economic assessment of UVGI technology to inform implementation across Fraser Health acute care facilities.
- **Methicillin-resistant *Staphylococcus aureus* Action Plans**: Units that are at the highest risk for MRSA transmission (i.e., vulnerable units) are targeted individually to support improvement work.

Carbapenemase-Producing Organisms

In addition to enhanced contact precautions for patients with CPO (i.e., best practices for hand hygiene, correct donning and doffing of personal protective equipment, dedicated nursing care, dedicated medical devices and patient care equipment, enhanced environmental cleaning, and patient cohorting where possible), the following strategies have been actioned to contain and reduce transmissions of CPO:

- **Environmental Reservoirs**: The search for environmental reservoirs continued through 2017/18, with a focus on sink drains. A regional committee with representation from IPC, Facilities Management, and the laboratory has been collecting information on the extent of drain contamination in Fraser Health and recommending sink infrastructure remediation.
- **Whole Genome Sequencing**: The IPC program continues to collaborate with the BCCDC Public Health Laboratory to investigate clusters and identify risk factors for CPO acquisition using whole genome sequencing.
- **Carbapenemase-Producing Organisms Screening Questions**: A second CPO screening question was implemented for admitted patients who have travelled without healthcare to specific CPO-endemic countries.
- **Cohort Units**: Created additional spaces that allow for cohorting patients, where possible, to minimize transmission and optimize use of healthcare resources.

Hand Hygiene

In addition to the regular audits and hand hygiene improvement work that is conducted by the sites and community programs, the following new initiatives were put in place to support hand hygiene improvement work:

- **Fraser Health Patient Safety Priorities**: Ongoing consultation, communication and support of CDI and hand hygiene improvement initiatives as part of the Fraser Health Patient Safety Priorities.
- **Patient Hygiene**: A focus on patient hygiene, including hand hygiene, supporting patients with bathing and cleaning their hands, frequent linen changes, education on the importance of clean hands, and ensuring products available at the patient bedside.
- **Fraser Health Hand Hygiene Program**: Revisions to the Fraser Health hand hygiene program, including revising the Fraser Health Hand Hygiene Policy and Clinical Practice Guidelines and auditing methodology.
- **Audits in the Community**: Development of risk-based analysis tools, including a self-audit tool and supporting material to evaluate hand hygiene compliance in the community, primary care, outpatient areas, and home health.
- **Ministry of Health Hand Hygiene Guidelines**: Participation in a provincial hand hygiene working group to update the BC Ministry of Health Hand Hygiene Policy and Best Practices for Hand Hygiene in All Health Care Settings and Programs.

Other

- ***Candida auris***: *Candida auris (C. auris)* is globally emerging, multi-drug resistant yeast that is associated with invasive infections, high morbidity and mortality, and outbreaks in healthcare settings. It can persist in hospital environments and be transmitted to other patients. In September 2017, the first case of *C. auris* in BC, and only the second case in Canada, was identified in a patient who had received care at a Fraser Health site. This case was travel-related, and there were no transmissions to other Fraser Health patients. The regional IPC program is in the process of final approval of guidelines for managing *C. auris* at all Fraser Health acute care sites.
- **National Infection Control Week 2017**: The week of 16 October 2017 was National Infection Control Week. IPC Practitioners organized and hosted events at acute

care sites across the region, including education sessions, booths with games and IPC branded items, glow germ audits and guest speakers. Practitioners enjoyed the opportunity to promote the importance of infection prevention, while the sites gained a better understanding of the work being done to prevent healthcare-associated infections and improve patient safety.

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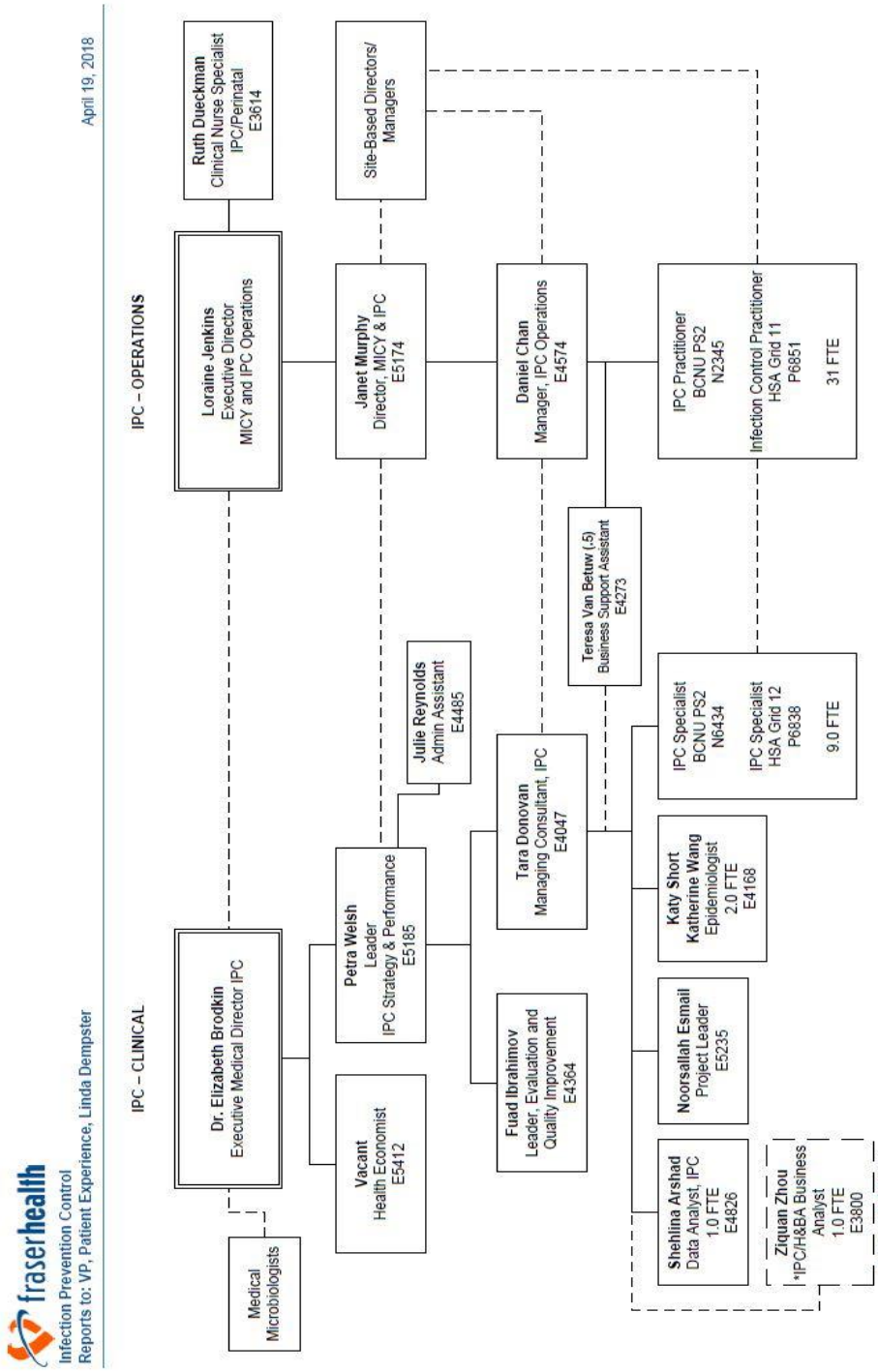
Appendices

Appendix A: Organizational Structure for the IPC Program



Appendix B: Terminology and Abbreviations

Acute Care Sites – sites where a patient receives active but short-term treatment for a severe injury or episode of illness, an urgent medical condition, or during recovery from surgery.
Alert – an alert is called when there is a high number or proportion of cases on a unit, but the number does not reach the pre-determined level for an outbreak to be declared.
Annual Target – a goal that is set on a fiscal year basis
ARH – Abbotsford Regional Hospital
BC – British Columbia
BH – Burnaby Hospital
Bioburden – the number of microorganisms contaminating an object. (https://medical-dictionary.thefreedictionary.com/bioburden)
Causative Organism – the organism causing the infection
CGH – Chilliwack General Hospital
CI – confidence interval
***Clostridium difficile* Infection (CDI) –** CDI is a micro-organism that produces a toxin that can cause diarrhea and serious illness of the gastrointestinal tract. Generally, *Clostridium difficile* (*C. difficile*) rarely causes problems in healthy people; however, CDI can be serious and even fatal, in people with co-morbid illnesses, the elderly, or who have weakened immune systems.
Cluster – a group of cases closely related in time and place
Colonization – the presence and multiplication of microorganisms without tissue invasion or damage. (https://medical-dictionary.thefreedictionary.com/colonization)
CPO – Carbapenemase-producing organisms refers to any gram-negative bacilli (e.g., Enterobacteriaceae, *Pseudomonas aeruginosa*, *Acinetobacter baumanii*, etc.) that are resistant to carbapenem antibiotics via production of enzymes encoded for by resistance genes that hydrolyze carbapenems.
DH – Delta Hospital
Etiological Agent – a chemical, biological or physical entity that may cause disease in an organism (https://definedterm.com/etiological_agents)
ERH – Eagle Ridge Hospital
Facility-Associated – a case that is acquired and identified at the same facility (i.e., nosocomial to the same facility)

FCH – Fraser Canyon Hospital
Gastrointestinal Illness (GI) – viral, bacterial or parasitic infections that cause diarrhea, vomiting and abdominal pain (http://www.biomerieux-diagnostics.com/gastrointestinal-infections).
Hand Hygiene – preventing the spread of illness through washing hands with soap and water or cleaning hands with alcohol-based hand-rubs.
Healthcare-Associated Infections (HAI) *also Nosocomial Infections* **–** infections patients get while staying in any healthcare facility, which include micro-organisms from other patients, the environment or staff—not to be confused with facility-associated infections, which are acquired and identified at the same facility (i.e., nosocomial to the same facility).
Healthcare-Associated to Facility/Unit – the facility or unit where the case most likely contracted the causative organism. Based on if the patient spent 72 hours or longer where the infection was identified or the previous location where the patient spent 72 hrs or longer either during the current admission or the previous admission, prior to symptom onset.
ICU –Intensive Care Units
IPC – Infection Prevention and Control
Incidence Rate – the rate of new cases of the disease within a period of time
Indicator – a statistical measurement that shows how well something is working or operating
JP/JPOCSC – Jim Pattison Outpatient Care and Surgery Centre
KPI – key performance indicator
LMH – Langley Memorial Hospital
MDRO – multi-drug resistant organisms
Methicillin-Resistant *Staphylococcus aureus* (MRSA) – *Staphylococcus aureu*s is a micro-organism that is normally found on the skin and in the nose of healthy people. Some strains have become resistant to the common antibiotics used to treat infections. MRSA is a type of *Staphylococcus aureus* that is resistant to antibiotics commonly used to treat skin and soft tissue infections, including penicillins and cephalosporins. *Staphylococcus aureus* can cause minor skin infections, such as boils or infections, in a surgical incision site.
Methodology – the methods, principles and rules used to for the activity or result
MMH – Mission Memorial Hospital
MSA – Matsqui-Sumas Abbotsford Hospital
NICU – Neonatal Intensive Care Units

Nosocomial Infections: *also Healthcare-Associated Infections (HAI)* **–** infections patients get while staying in any healthcare facility, which include micro-organisms from other patients, the environment or staff—not to be confused with facility-associated infections, which are acquired and identified at the same facility (i.e., nosocomial to the same facility).
Outbreak – occurrence of cases in excess of what would normally be expected. An outbreak is declared when number or proportion of cases on a unit meets a pre-determined threshold.
PAH – Peace Arch Hospital
QPCC – Queen's Park Care Centre
Resolution Date – the date after 72 hrs has passed since last diarrheal stool or stool returns to normal for the patient (e.g., May 1 – last liquid stool, May 2 – 24hrs, May 3 – 42hr, May 4 – 72hrs. Date = May 4)
Respiratory Illness (RI) – acute onset of respiratory illness symptoms usually caused by influenza and non-influenza respiratory viruses or bacteria.
RMH – Ridge Meadows Hospital
RCH – Royal Columbia Hospital
RSV – respiratory syncytial virus causes infection of the lungs and breathing passages and is a major cause of respiratory illness in children. RSV is easily spread by droplets containing the virus when someone coughs or sneezes (http://kidshealth.org/parent/infections/bacterial_viral/rsv.html).
Source – the person or thing that gave the information
SMH – Surrey Memorial Hospital
YR – Yale Road Centre

Appendix C: Methodology and Technical Notes

The following outlines methodological and technical considerations in the routine review of Fraser Health infection prevention and control data.

General Considerations

Under-Reporting

Surveillance systems such as the CDI surveillance system, iTracker, and MDRO that primarily rely heavily on laboratory reports of illness can be characterized by under-reporting of the true burden of illness. Case counts only represent known cases reported to IPC Practitioners and recorded in the respective surveillance systems. The resulting degree of under-reporting may vary among infection(s) due to a variety of factors, such as awareness, medical care seeking behaviours, availability of healthcare, methods of laboratory testing, reporting behaviours, clinical practice, and severity of illness. However, the extent of under-reporting for individual diseases has not been fully assessed in Fraser Health.

Data Management and Descriptive Measures

Case Counts

This measure refers to the number of confirmed cases of a disease reported in a calendar year or during a specified time frame.

Crude Incidence Rates

Crude incidence rates are calculated by dividing the total case count in a fiscal year by the total number of people at risk of acquiring the disease in that year (e.g., patient days). Please refer to the disease- or infection-specific key performance indicators as described below. Rates are presented per 10,000 patient days, unless otherwise specified.

Analysis Software

Data analysis and presentation of this report were completed using IBM SPSS Statistics 21 and Microsoft Excel 2010. Identified differences in rates and counts from one fiscal year, from one month to another, and between Fraser Health acute care sites are absolute and do not imply statistical significance.

Clostridium difficile Infection (CDI)

CDI case identification and confirmation is completed by the IPC Practitioners using a standardized case definition and protocol to identify cases from medical microbiology reports, admission reports and chart reviews. IPC Practitioners enter relevant, clinical details into an internal Fraser Health database that contains automated, electronic lab confirmation of *C. difficile* test results, combined with healthcare-related admission information that pertains to the Fraser Health patient. Patients diagnosed with CDI during surgery or scope procedures are manually entered into the database. The IPC health data analyst extracts and analyzes the data, and the epidemiologist provides interpretation and explanation of the findings and oversees the surveillance program.

Infection with *C. difficile* causes severe colitis with severe diarrhea. A positive lab result alone does not indicate an active infection that requires treatment; it may indicate colonization.

Population Under Surveillance	
Inclusion Criteria	All newly confirmed (or re-infected) healthcare-associated cases of CDI among admitted acute care patients.
Exclusion Criteria	Outpatients, residential care patients/residents, children less than one year of age, and relapses.

Key Performance Indicator (Crude Incidence Rate)		
$\frac{\text{Number of new healthcare-associated CDI attributed to the Fraser Health acute care site where CDI was most likely acquired}}{\text{Total patient days}}$	X	10,000 patient days

Limitations: What might have affected the quality if this measure?

Caution must be taken when interpreting rates because one case can result in a display of an inflated rate for facilities and programs with a small number of beds and patient days (e.g., MMH). An increase of one or two cases can lead to a high facility rate. Sites with a smaller number of beds and/or cases have been combined. Additionally, *C. difficile* testing practices and case definition application have varied over the years or across sites and programs, and case management as well as targeted intervention strategies have been implemented, which will affect the rates.

Provincial standardization of the definition for "prior admission to a healthcare facility" implemented April 1, 2013, may result in an increase in the number of Fraser Health healthcare-associated cases. The duration of admission to a healthcare facility was set to a minimum 24 hours when determining if a patient had an encounter to a healthcare

facility within the last four weeks before current hospitalization (constitutes part of the definition for healthcare-associated compared to community-associated cases). Previously, the timeframe ranged from overnight to 72 hours.

In addition, a resolution date became a requirement for CDI cases as part of a modified relapse definition in Fraser Health, introduced in July 2013. Resolution date is the date after 72 hrs has passed since last diarrheal stool or stool returns to normal for patient (e.g., May 1 is last liquid stool, May 2 is 24hrs, May 3 is 48hr, May 4 is 72hrs. Resolution date is May 4)[1]. A relapse is a confirmed case that meets case definition and experiences a recurrence of diarrhea within eight weeks of the resolution date (or discharge date if resolution date is not available) of the last CDI-related diarrhea. A reinfection is a confirmed case that meets case definition and experiences a recurrence of diarrhea greater than eight weeks from a resolution date (or discharge date if resolution date is not available). Previously, a relapse occurred when a patient with CDI had a recurrence of diarrhea within two to eight weeks of a previous CDI commencing and a reinfection occurred greater than eight weeks from a previous CDI commencing (as determined by the date of a previous lab test, chart note, or diagnosis by endoscopy or pathological specimen). The modification to these definitions may increase the number of relapses identified and, in turn, decrease the number of reinfections (i.e., new CDI cases) counted.

Finally, outpatients with *C. difficile* who meet case definition and are subsequently admitted to acute care directly from their outpatient visit are included in the population under surveillance. This change may slightly increase the total number of CDI cases in Fraser Health.

Fraser Health laboratories introduced Polymerase Chain Reaction (PCR) testing methods for CDI stool samples in fiscal year 2011/12. Compared to the previous cytotoxicity assay, the PCR test is more sensitive and has a reduced turn-around time; therefore, the numbers of reported positive cases likely increased and may be evident in the CDI statistics reported. Fraser South sites (DH, LMH, PAH, and SMH) implemented PCR testing on October 27, 2011. The remaining sites in Fraser North and East implemented PCR testing on March 19, 2012.

The timeframe for evaluating the healthcare history of a patient with CDI changed from eight weeks to four weeks in fiscal year 2010/11. Cases with symptom onset in the community or three days or less after admission to an acute care facility are deemed

[1] Discharge date is used in lieu of resolution date is unknown or unattainable.

healthcare-associated to that facility if the patient had a healthcare encounter in the previous four weeks (as opposed to eight weeks previously). This change may decrease the number of healthcare-associated CDI because the timeframe for the look-back period is shorter.

The IPC program continues to strive for standardization with accurate and effective application of infection prevention and control practices and definitions across Fraser Health. Data are updated and scrutinized on a regular basis, and as a result, numbers and rates may change slightly from previous reports based on case updates.

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

MRSA (colonization or infection) case identification and confirmation is completed by the IPC Practitioners using a standardized case definition to identify cases from medical microbiology reports. IPC Practitioners enter all cases into an internal Fraser Health database. The IPC health data analyst extracts and analyzes the data, and the epidemiologist provides interpretation and oversees the surveillance program.

Population Under Surveillance	
Inclusion Criteria	Any newly confirmed healthcare associated cases of MRSA infections or colonizations among admitted acute care patients for the first time ever.
Exclusion Criteria	Outpatients, residential care patients/residents.

Key Performance Indicator (Crude Incidence Rate)

$$\frac{\text{Number of new healthcare-associated MRSA attributed to the Fraser Health acute care site where MRSA was most likely acquired}}{\text{Total patient days}} \times \text{10,000 patient days}$$

Limitations: What may have affected the quality of this measure?

Caution must be taken when interpreting rates because one case can lead to an inflated rate for facilities and programs with a small number of beds and patient days (i.e., denominator). An increase of one or two cases can result in an inflated MRSA rate. Sites with a smaller number of beds and/or cases may have been combined. Additionally, case definition application has varied over the years and/or across sites and programs, and case management as well as targeted intervention strategies have been implemented, which will affect the rates.

Beginning April 1, 2013 (i.e., start date of fiscal year 2013/14), the duration of admission to a healthcare facility was standardized provincially at a minimum 24 hours when

considering if a patient had an encounter to a healthcare facility within the previous 12 months. Previously, no explicit timeframe was indicated and ranged from overnight to 72 hours. This change in admission duration could increase the number of Fraser Health healthcare-associated cases compared to community-associated cases. Historically, outpatients identified with MRSA were considered incidence cases of MRSA. Because the population under surveillance excludes outpatients with MRSA, this change could decrease the total number of new MRSA identified and reported in Fraser Health.

Classification of healthcare-associated MRSA cases, using a 12-month look-back period, is time consuming and requires chart review, which may not always be feasible, and records may not be complete or available.

Data collection only includes first incidence of MRSA, whether it be a colonization or infection. Colonizations that develop into infections are not captured; therefore, accurate numbers of colonizations and infections and corresponding rates for Fraser Health are not possible.

Screening practices as well as isolation and contact precautions among cases may have varied over the years or across sites and programs, thus affecting the rates. The IPC program continues to encourage standardization and accurate and effective application of infection prevention and control practices and definitions across Fraser Health.

Data are updated and scrutinized on a regular basis, and as a result, numbers may slightly change based on case updates.

Carbapenemase-Producing Organisms (CPO)

CPO (colonization or infection) reporting is carried out by the IPC Practitioners based on laboratory confirmation from medical microbiology reports. IPC Practitioners enter additional epidemiologic and clinical details into an internal Fraser Health database that contains an automated extraction of existing patient admission and laboratory information. The IPC epidemiologist mines and analyzes the data and provides interpretation and explanation of the findings and oversees the surveillance program.

Population Under Surveillance	
Inclusion Criteria	Patient admitted to a Fraser Health acute care facility or receiving dialysis at a Fraser Health renal unit/clinic identified to have CPO for the first time.
Exclusion Criteria	Patients who had the same gene identified previously, outpatients (e.g., ER visits, IV therapy clinic visits, etc.) and residential care patients/residents.

Limitations: What might have affected the quality if this measure?

As a result of the screening protocol that was implemented in 2014, there was an increased likelihood of identifying and, in turn, reporting cases.

Currently there is limited understanding of the community prevalence of CPO and the extent of transmission that is occurring in our communities. This will affect the number of CPO cases that may be identified in future.

Hand Hygiene Compliance

Hand hygiene audits are an ongoing performance measure across Fraser Health. The majority of hand hygiene observations in fiscal year 2017/18 were completed by audit-trained and certified healthcare providers on units as well as trained co-op students. Observations were completed in various settings, including acute care facilities; Residential Operated and Contracted facilities; Mental Health & Substance Use (MHSU) facilities; outpatient settings including JPOCSC, public health units, primary care facilities; and among home support and home health.

All auditors received standardized training based on the hand hygiene audit toolkit available to all staff via the FHPulse and were certified through a practice audit by IPC Practitioners or specialists. Auditors collected the hand hygiene observations on unit-specific audit forms that are faxed to a central provider and submitted into an electronic hand hygiene audit system (FormAudit), where it is stored on a secure server. Data are accessible to all Fraser Health staff on the FHPulse. Observations for hand hygiene compliance included before-and-after opportunities based on the four moments for hand hygiene. Use of both soap and water and alcohol-based hand rub (ABHR) were included for compliance. Missed opportunities occurred when hand hygiene compliance was not adhered to.

Each audit included a minimum of five healthcare providers who were observed up to 10 opportunities for hand hygiene; a valid audit required at least 25 total observations. This requirement was to ensure the reliability of the results and provide consistency when comparing percentage of hand hygiene compliance over time.

Classification of staff/healthcare provider types is collated into four category codes:

Nurse	NP/RN/RPN, LPN, Care Aide/Student Aide, Student (Nursing)
Physician	Physician, Medical Student/Resident
Clinical	Medical Technician, Respiratory Therapy, Lab personnel, Porter, Social Worker, Rehab Therapy, Dietician, Pharmacist
Other	Housekeeping, Maintenance, Volunteer, Food Services, Other

Key Performance Indicator (% Hand Hygiene Compliance)		
$\frac{\text{Number of Compliant Hand Hygiene Moments}}{\text{Number of Opportunities}}$	X	100

Limitations: What may have affected the quality of this measure?

Data collection methods and auditors have varied over the years and should be considered when comparing rates. The variety of auditors could impact inter-observer variability (i.e., variation between auditors) or intra-observer variability (i.e., variation in an observer's classification over time), but use of the best practice hand hygiene toolkit should minimize this variability by standardizing the education provided to auditors and the methodology used when conducting hand hygiene audits.

The total number of acute care observations varies from year to year; therefore, caution must be used when comparing fiscal year results. Some sites, programs, and types of staff have a smaller total number of observations and may not be as representative of the overall population.

Gastrointestinal Illness (GI) and Clostridium difficile Infection (CDI) Outbreaks

Surveillance and oversight of acute care outbreaks is carried out by IPC Practitioners who are notified by front-line staff of symptoms consistent with gastroenteritis, which include otherwise unexplained vomiting and/or diarrhea. IPC Practitioners use standardized case definitions to determine if a GI outbreak should be declared. A GI/CDI outbreak is declared in consultation with IPC Executive Medical Director when either of the following criteria is met:

a. ≥ three probable or confirmed GI cases in one unit within a four-day period (GI outbreak); OR

b. ≥ three laboratory-confirmed cases of *C. difficile* infection attributed to one unit (as defined by geographical area, nursing station, and unit mnemonic) within a seven-day period (CDI outbreak).

Acute care outbreaks are reported through standardized outbreak notification emails, which include posting all outbreaks that are in progress on the Fraser Health external website. IPC Practitioners monitor and record all acute care outbreaks in a Fraser Health internal database. In December 2017, a new surveillance tool, the Alert & Outbreak Notification iTracker Module, was implemented across Fraser Health to streamline and standardize the GI/CDI alert/outbreak notification process and enhance surveillance reporting.

Limitations: What may have affected the quality of this measure?

Norovirus and CDI outbreaks often coincide, as increased norovirus activity means that fecal material colonized with *C. difficile* spores is more prevalent and more likely to contaminate the environment and cause transmission. Diarrheal symptoms due to norovirus may prompt testing for *C. difficile* and mislabelling of patients who are only colonized with *C. difficile*.

Respiratory Illness Outbreaks

Surveillance and oversight of acute care outbreaks is carried out by IPC Practitioners who are notified by front-line staff of symptoms consistent with respiratory illness. An RI case is defined as:

a. laboratory confirmation of a known respiratory pathogen (e.g., Influenza, RSV, etc.), **OR**

b. new or worsening cough, **AND** fever of > 38° C or a temperature that is above normal for the individual.

Additional symptoms may include myalgia/arthralgia, prostration, nasal discharge, sore throat, and/or headache. IPC Practitioners follow a standardized outbreak definition for declaration. An RI outbreak is declared in consultation with IPC Executive Medical Director when there are two or more epidemiologically linked healthcare-associated RI cases on a unit (as defined by geographical area, nursing station, and unit mnemonic) within seven days. Acute care outbreaks are reported through standardized outbreak notification emails, which include Fraser Health-wide posting of all outbreaks that are in progress. IPC Practitioners monitor and record all acute care outbreaks in a Fraser Health internal database. In December 2017, a new surveillance tool, the Alert & Outbreak

Notification iTracker Module, was implemented across Fraser Health to streamline and standardize the RI alert/outbreak notification process and enhance surveillance reporting.