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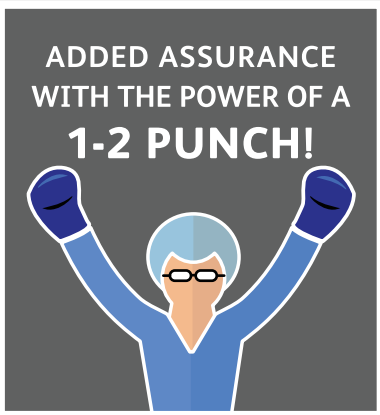

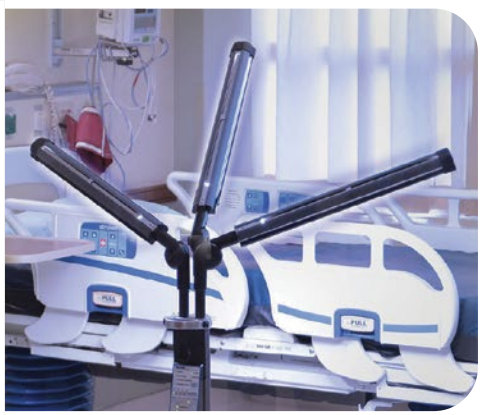

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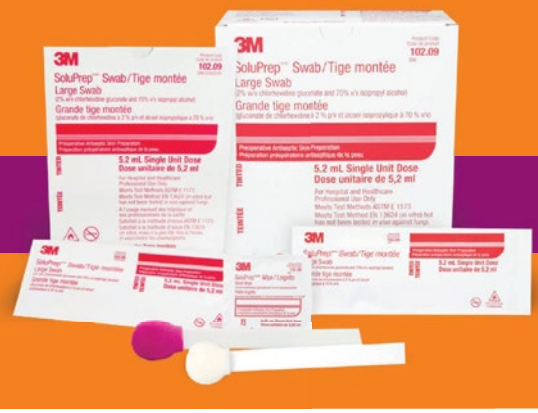

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POSITION PAPER: Surveillance in Long-Term Care Settings

This position statement was developed by the IPAC Canada Surveillance and Applied Epidemiology Interest Group:
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Original Date: September 2019

BACKGROUND

Infections contracted in healthcare settings, including in long-term care (LTC) settings, that were neither present nor developing on admission to the healthcare setting are healthcare-associated infections (HAI) [1]. HAIs include infections with antibiotic-resistant organisms (AROs), respiratory, enteric, urinary tract and other infections, and are often preventable [1]. Surveillance in LTC should include, (at a minimum) monitoring for enteric and respiratory infections and for pathogens and infections of concern based on local epidemiology, and while this is legislated in some parts of Canada (e.g., Ontario), its routine performance across all Canadian LTC settings is essential to provide national rates and inform infection prevention and control (IPAC) strategies [2,3]. Standardized case definitions provide a baseline for both internal and external comparison, and inform IPAC programs [3].

Surveillance is defined by the Public Health Agency of Canada (PHAC) as 'tracking and forecasting health events and determinants through the collection, analysis and reporting of data' [4]. Ongoing surveillance provides baseline HAI data and, over time, builds capacity for subsequent monitoring activities, including benchmarking of HAI rates both within and between LTC settings [3,4]. Surveillance data informs research and antimicrobial stewardship programming, and guides clinical practice in LTC, including identification of outbreaks and implementation and monitoring of interventions aimed at reducing rates of HAI [3,4].

Case definitions used in HAI surveillance are 'a set of standard criteria for classifying whether a person has a particular disease, syndrome or other health condition' [5]. The most recent case definitions for use in Canadian LTC settings were published by IPAC Canada in 2017 [6].

Point prevalence surveys can also be used to identify trends in HAI locally and nationally [5]. A point prevalence survey in Canadian LTC settings was piloted by PHAC in 2017, in partnership with IPAC Canada. The study provided preliminary information on infections caused by AROs and antimicrobial use in LTC, and demonstrated the feasibility of carrying out surveillance for HAI in LTC.

POSITION STATEMENT

Surveillance of Infections:

- LTC settings throughout Canada should routinely conduct surveillance for HAIs, regardless of whether or not this is a legislative requirement for their province or territory.
- Surveillance for HAIs should focus on infections most commonly associated with outbreaks and/or significant morbidity or mortality (e.g., respiratory and gastrointestinal) and those for which interventions can be implemented to limit or prevent further transmission and serious outcomes.
- Surveillance for other infections (e.g., urinary tract infections (UTIs), skin, soft tissue, and mucosal infections, and AROs) should be prioritized based on local epidemiology, and aligned with the vision and goals of the LTC home or organization.

Surveillance Definitions:

- Surveillance in Canadian LTC settings should be conducted using the IPAC Canada case definitions (2017) to ensure consistency of case identification and to allow for comparison within a facility over time or against other facilities in the same geographic region and across Canada.

Local and National Studies/Surveys:

- LTC settings should participate in point prevalence surveys, at the local and/or national level, to build a repository of data to provide a baseline for comparison for various infections. This enables consistent measurement of a facility's performance over time and the ability to 'benchmark' against that of other facilities to identify opportunities for further improvement.

STAKEHOLDERS

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ORIGINAL ARTICLE

Investigation of *Clostridioides (Clostridium) difficile* in a community hospital in Southern Ontario, Canada

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ABSTRACT

Background: In response to *Clostridioides (Clostridium) difficile* infections (CDI), infection prevention and control practices in hospital settings tend to focus on symptomatic patients, potentially neglecting other sources of *C. difficile*. The purpose of the study was to identify epidemiological connections between *C. difficile* positive patients to explore the possibility of transmission occurring. This would allow an assessment of IPAC practices to ensure resources were being optimized and targeted to the most appropriate strategies to prevent transmission.

Methods: *C. difficile* was isolated and characterized from 125 patient stool specimens. Isolates were subjected to toxin profiling and ribotyping. Patient locations in the hospital were mapped and epidemiological connections between patients with the same *C. difficile* ribotype were assessed.

Results: A total of 47 distinct ribotypes were identified, with the most common being ribotype 027/NAP1. Of the 41 cases identified as hospital-associated, only four (9.8%) of the cases could be epidemiologically linked to another patient with known CDI.

Conclusions: A small minority of hospital-associated infections were found to have an epidemiological link to another known case of CDI suggesting transmission from known cases is rare. This suggested that current IPAC practices were effective in preventing transmission from symptomatic patients, but other sources of *C. difficile* are potentially unrecognized.

KEYWORDS

C. difficile; Ribotyping; Transmission; Hospital

INTRODUCTION

Clostridioides (*Clostridium) difficile* is the leading cause of antibiotic-associated diarrhea and a common cause of healthcare-associated infections [1]. Infection prevention and control (IPAC) practices, such as the use of personal protective equipment and the use of sporicides for environmental disinfection, tend to target symptomatic patients with *C. difficile* infection (CDI) because they have been identified as important sources of *C. difficile* and pose a potential risk for transmission to other patients [2,3]. However, transmission to hospitalized patients may occur from a variety of sources in addition to symptomatic patients with CDI. Asymptomatically colonized patients, environmental sources such as contaminated surfaces or equipment, or the healthcare workers providing care may also be a source for transmission, or alternatively, the patients may be colonized prior to admission [4, 5, 6]. Despite transmission potentially occurring from a variety of sources and enhanced IPAC practices often only targeting symptomatic patients and the rooms they occupy, other potential sources are often left unaddressed.

Asymptomatically colonized patients are typically not recognized since testing formed stool for *C. difficile* is not recommended [7] and the contribution of asymptomatically colonized patients to the transmission of *C. difficile* remains unclear. Colonization rates in hospitalized patients have been reported to be low, between four to 13% [8, 9, 10], and isolating colonized patients has led to a reduction in hospital-associated cases of CDI [11]. Colonized patients are themselves at a greater risk of developing CDI than non-colonized patients [5].

Environmental sources such as shared patient equipment, computers in clinical care areas, medication carts and even laundered linens have been shown to be contaminated with spores and may also play a role in transmission [12, 13]. *C. difficile* spores have also been found in areas not involved in direct patient care, such as physician and nurse work areas [12]. Aithinne et al. (2018) [14] demonstrated that *C. difficile* can even persist in toilet bowl water after multiple flushes and can be aerosolized during flushing, potentially allowing spores

Conflicts of interest: None.
Funding: None.

to settle and persist on surfaces patients may have contact with. As such, many possible sources of exposure exist in hospital settings.

In recent years, investigations into *C. difficile* in hospital environments have suggested that, under non-outbreak conditions, transmission onward from symptomatic patients isn't as common as previously thought. Eyre et al. (2013b) [15] found only 35% of *C. difficile* cases were genetically related to a previous case, despite apparent epidemiological links. Walker et al. (2012) [16] also found that the majority of cases (66%) could not be linked to other known cases. These suggest that there might be over-diagnosis of hospital-associated transmission and outbreaks in situations where unrelated strains are causing disease in an epidemiologically similar fashion. Identifying the sources of *C. difficile* and how transmission occurs is complicated and remains poorly understood.

The objectives of this study were to isolate and characterize *C. difficile* from patients diagnosed with CDI at a healthcare facility over a two-year study period and to identify any epidemiological connections between patients that could support the possibility of transmission occurring. This would allow an assessment of IPAC practices to ensure resources are being optimized and targeted to the most appropriate strategies to prevent transmission.

METHODS

Specimen collection

The study took place in a 182-bed community hospital located in Southern Ontario, Canada. The hospital provides care for inpatients in medicine, surgery, obstetrics, paediatrics, step-down and intensive care units. *C. difficile* positive specimens from all inpatient and emergency department patients were included for study. All specimens came from patients who met the case definition for CDI [7]. All patients exhibited diarrhea defined as three or more watery or loose stools in a 24-hour period and tested positive for *C. difficile* by a polymerase chain reaction (PCR) based diagnostic test following the manufacturer's instructions (GenXpert® *C. difficile*/Epi Assay, Cepheid, Sunnyvale, CA) in the hospital microbiology laboratory. All specimens testing positive from June 2014 – June 2016 were included. The specimens were stored at -80°C until at least 10 specimens were available for sending to a microbiology research laboratory at the University of Guelph. This study was approved by the research ethics board at the participating hospital and the University of Guelph.

Case classification

Hospital-associated infections (HAIs) were defined as cases of CDI in a patient with diarrhea having an onset of symptoms at least 72 hours after admission or within four weeks of a previous hospitalization, when they had not had a *C. difficile* infection in the previous eight weeks. Infections attributed to another healthcare (other HAIs) facility were defined as cases of CDI in a patient with the onset of symptoms less than 72 hours into admission and having been exposed to another healthcare facility within the last four weeks. Infections classified as community-acquired (CAIs) or indeterminate were defined as cases of CDI in a patient with the onset of symptoms less than 72 hours after admission and no known exposure to a healthcare facility within the previous four weeks, or where the source of infection could not be determined, respectively. Cases were classified as a relapse if symptoms recurred within eight weeks of the previous infection.

C. difficile culture

Stools specimens were refrigerated at 4°C and cultured within 24 hours of receipt from the hospital. Approximately 200 mg of the stool specimen was immersed in 9 ml of *C. difficile* moxalactam norfloxacin broth with 0.1% sodium taurocholate and incubated anaerobically at 37°C for seven days. Cultures were alcohol shocked (at a 1:1 ratio with anhydrous ethanol) for one hour for spore selection, centrifuged and plated onto CDMN plates (Oxoid, Nepean, Canada). The plates were incubated anaerobically at 37°C for 48 hours *C. difficile* was initially identified by colony morphology, characteristic odour, and a positive l-proline aminopeptidase activity test (Pro Disc, Key Scientific Products, Stamford, TX, USA).

DNA extraction

DNA was extracted using a commercial kit following the manufacturer's instructions (Instagene Matrix, Biorad, Richmond, CA). Briefly, a 10 µl loopful of the culture was suspended in 1 ml sterile water in a 1.5 mL microcentrifuge tube, centrifuged at 12 000 x g for 60 seconds and the supernatant was discarded. The pellets were re-suspended in 200 µl of Instagene Matrix, vortexed briefly and incubated at 56°C for 30 minutes. The tubes were then incubated at 100°C for eight minutes, centrifuged at 12 000 x g for two minutes and the supernatants were removed to a fresh tube and stored at -20°C for future use.

Detection of *C. difficile* toxins

PCR to detect the toxin A gene (*tcdA)*, the toxin B gene (*tcdB)*, and the binary toxin genes (*cdtA* and *cdtB)* was performed as previously described [17]. Amplification reactions were performed using a Mastercycler® pro S Thermal Cycler (Eppendorf, Mississauga, Ontario) and the following cycling parameters: 10 minutes at 94°C, 35 cycles of 50 seconds at 94°C, 40 seconds at 54°C, 50 seconds at 72°C, and a final extension of three minutes at 72°C. The 25 µl reaction contained 2 µl DNA, 1.0 µl of 25 mM MgCl2, 12.5 µl KAPA2G™ Fast HotStart Ready Mix (Kapa Biosystems, Boston, MA), and primers as previously described [17]. PCR products were resolved on a 1.5% agarose gel and visualized using GelRed DNA stain (Biotium, Hayward, CA).

Capillary ribotyping

Briefly, 200 ng of purified DNA is used with 0.2 µM of the 16S (5'-GTGCGGCTGGATCACCTCCT-3') and 23S (5'-CCCTGCACCCTTAATAACTTGACC-3') primers.

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The 16S primer was labelled at the 5′ end with a fluorescent label. Amplification reactions were performed using a Mastercycler® pro S Thermal Cycler (Eppendorf, Missisauga, Ontario) with the following cycling parameters: 15 minutes at 95°C, 24 cycles of 60 seconds at 95°C, 60 seconds at 57°C, 60 seconds at 72°C, and a final extension of 30 minutes at 72°C. The 25 µl reaction contained 2 µl DNA, 0.5 µl of 10 µM primers, 12.5 µl KAPA2G™ Fast HotStart Ready Mix (Kapa Biosystems, Boston, MA).

PCR products were analyzed using the Webribo server (*https://webribo.ages.at*). Ribotypes identified as international ribotypes based on comparison to reference strains were assigned the appropriate numerical designation and an internal laboratory number was assigned for all other isolates.

Analysis

The patients who tested positive for *C. difficile* during their admission were mapped in the hospital by physical location (unit) from the day of admission until discharge. The patients were mapped to three medicine units, two surgical units, an intensive care unit, a step-down unit, a family birthing unit and the emergency department. An epidemiological link that would support the possibility that transmission had occurred was defined as one patient who goes on to develop CDI after spending a minimum of 12 hours on the same unit as another patient who had tested positive for *C. difficile* within the previous eight weeks, with both patients infected with the same ribotype. Basic patient demographic data, reason for hospital visit/admission and recent antibiotic usage were recorded.

RESULTS

During the 25-month study period, 125 specimens were isolated from 119 patients diagnosed with CDI and *C. difficile* was isolated from all samples. The classification of infections and summary of toxin profiles are summarized in Table 1.

All 125 isolates were successfully ribotyped and classified into 47 distinct ribotypes, with two subtypes of ribotype 002 being identified (002 and 002/2) and three subtypes of ribotype 014 being identified (014/0, 014/4 and 014/5). Twenty-two isolates belonged to 19 newly identified ribotypes. The most common ribotypes are summarized in Table 2. The 41 HAIs belonged to 18 distinct ribotypes.

Eight of the 14 cases classified as a relapse had the initial infection diagnosed at another facility therefore the specimens from the initial cases were unobtainable and the ribotype is unknown. Of the remaining six relapse cases, only 4/6 (67%) had the same ribotype identified as the initial infection. Two cases had an initial isolate classified as a different ribotype compared to the relapse episode (Table 3).

TABLE 1: Summary of the classification and toxin profiles of *C. difficile* isolates.

Classification				Total	Percent (%)
	HAI			41/125	32.8
	Other HAI			17/125	13.6
	CAI			53/125	42.4
	Relapse			14/125	11.2
Toxin Profile	Toxin A (tcdA)	Toxin B (tcdB)	Binary toxin (cdtA/cdtB)		
	+	+	-	85/125	68.0
	+	+	+	34/125	27.2
	-	+	-	5/125	4.0
	-	-	-	1/125	0.8

+: indicates the toxin gene was detected by PCR
-: indicates the toxin gene was not detected by PCR

TABLE 2: Summary of the most common *C. difficile* ribotypes for each classification of infection.

Ribotype	Total No. of isolates (%)	Total No. of HAIs	Total No. of CA-CDIs	Total No. of other-HAIs	Total No. of Relapses
027 (NAP1)	25 (20.0)	9	9	3	4
020	7 (5.6)	5	2	0	0
014/0	7 (5.6)	0	3	2	2
014/5	7 (5.6)	2	2	2	1
002/2	5 (4.0)	3	0	1	1
012	4 (3.2)	3	1	0	0

TABLE 3: Relapse cases that differ in ribotype between the initial and relapse episode of CDI.

Initial Case Ribotype	Relapse Case Ribotype	Time between positive test
075	014/0	55 days
027 (NAP1)	GGH13[1]	48 days

[1] Internal laboratory designation

Demographic and clinical characteristics, including the indication for previous antibiotic use and the admitting diagnosis, are summarized in Table 4.

For the 41 cases identified as hospital-associated, an epidemiological link to another patient known to have, or have had a recent CDI, was investigated. Only 4/41 (9.8%) of the HAIs could be epidemiologically linked to another patient with CDI when ribotype was considered (Table 5). The remaining 37/41 (90%) cases either shared no time on the same unit as another patient with CDI, or was found to have a different ribotype than a patient on the same unit at the same time.

DISCUSSION

In this study, only 9.8% (4/41) of infections classified as hospital-associated had an epidemiological link to another known case of CDI suggesting transmission from known cases is rare. On the onset of diarrhea, a series of infection prevention precautions were initiated. In accordance with best practice [7], contact precautions were initiated, which included the accommodation of patients in private rooms with dedicated toileting facilities and all staff and visitors were required to don gloves and a gown prior to any contact with the patient or the patient environment. A sporicidal disinfectant was used for twice-daily environmental cleaning of the patient room and bathroom until the patient was symptom-free for a specified period of time or discharged. In this study, very few cases developed as a result of onward transmission from known cases and therefore the additional precautions initiated for suspect and confirmed cases of CDI were presumably effective in preventing transmission.

Antimicrobial stewardship may be more effective, compared to additional precautions, in reducing CDIs as this strategy would address patients already colonized, or those becoming colonized by an unidentified source as opposed to strictly relying on targeting prevention strategies to recognized exogenous sources.

Recent antibiotic exposure is a well-known risk factor for CDI [18]. Not surprisingly, the majority of patients (70%) had recognized recent exposure to antibiotics prior to the onset

TABLE 4: Demographics and clinical characteristics of patients

Characteristics	Range	Mean (years of age)
Age (years of age)	15 – 98	66

	Total	Percentage (%)
Female	75/125	60.0
Admitted from		
Home	100/125	80.0
Long term care home	22/125	17.6
Another hospital	2/125	1.6
Unknown	1/125	0.8
Recent Antibiotic use[1]	90/125	72.0
Cephalosporin	53/90	58.9
Fluoroquinolone	32/90	35.6
Penicillin	26/90	28.9
>1 antibiotic	55/90	61.1
No antibiotics	30/125	24.0
Proton pump inhibitors	75/125	60.0
Antibiotic Indication[2]		
Pneumonia	23/125	18.4
Urinary tract infection	18/125	14.4
Sepsis	10/125	8.0
Surgical prophylaxis	10/125	8.0
Cellulitis	7/125	5.6
Admitting diagnosis		
Diarrhea	58/125	46.4
Cardiac concerns[3]	7/125	5.6
Pneumonia	6/125	4.8
Urinary tract infection	5/125	4.0

[1] Antibiotic use within the previous four weeks prior to CDI diagnosis

[2] Indication for antibiotic prescribed within four weeks prior to CDI diagnosis

[3] Cardiac concerns including congestive heart failure, rapid atrial fibrillation, myocardial infarction

TABLE 5: Summary of the CDI cases that had an epidemiological link to another known CDI case.

Case No.	Date	Ribotype	Epidemiological Link
39	Feb. 2015	027	Patient spent seven days on the same unit as another case of ribotype 027
40	Feb. 2015	002/2	Patient spent 16 days on the same unit as another case of ribotype 002/2
70	Aug. 2015	020	Patient spent nine days on the same unit as another case of ribotype 020
78	Sep. 2015	020	Patient spent nine days on the same unit as another case of ribotype 020

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of symptoms of CDI. The two most frequent indications for antibiotic therapy were pneumonia and urinary tract infections (UTIs). CDI following pneumonia and UTIs are common and have been shown to have a higher in-hospital mortality rate and to result in a longer length of stay [19]. Antimicrobial stewardship practices targeting pneumonia and UTI cases may reduce overall CDI rates [20, 21].

The sources of *C. difficile* in the majority of the infections classified as hospital-associated in this study are unknown. They may include other asymptomatically colonized patients or staff, an environmental source, or the patients who develop infections may be colonized prior to admission. Patients may also have had contact with other parts of the hospital not identified in this study, highlighting a potential limitation. The possibility of acquisition of *C. difficile* from an unrecognized location outside of the units the patients were admitted to (e.g., operating rooms, diagnostic imaging rooms) cannot be ruled out. *C. difficile* positive patients may have contaminated those locations creating an unrecognized opportunity for transmission.

The role of asymptomatically colonized patients in transmission remains unclear. Eyre et al (2013a) [4] demonstrated that onward transmission from asymptomatically colonized patients to cases of CDI was likely very rare and Kong et al. 2019 [22] confirmed this, finding only 6% of new CDIs could be linked solely to colonized patients. Curry et al (2013) [23] reported a higher rate finding 29% of new CDI cases in their study could be linked to asymptomatically colonized patients. Differences in molecular techniques used and baseline CDI rates in the respective patient populations may account for these differences. Overall, neither infected patients nor asymptomatically colonized patients may be the most common source of incident CDIs in hospitals.

The most common ribotype identified in this study was ribotype 027 (NAP 1) (Table 2) which has previously been reported to be a common type identified in healthcare settings, although it is becoming less frequent [24, 25]. This study found a broader variety of ribotypes than previously reported in similar studies. The 125 isolates were classified into 47 distinct ribotypes while Aptekorz et al. (2017) [24] classified 108 isolates from 15 different hospitals into only eight ribotypes and found 7/108 (6.5%) to be non-typable. Furuya-Kanamori et al. (2016) [26] found greater variety, classifying 324 isolates into over 90 ribotypes, but also included isolates from colonized patients. These studies were conducted in different countries in varying patient populations and used different ribotyping techniques compared to this study, which may contribute to the varying results. In Canada, in a non-outbreak setting, 46 isolates from a hospital were classified into 10 different ribotypes by Labbé et al. (2008) [27] and Martin et al., (2008) [28] classified over 1,000 isolates provided by 21 diagnostic laboratories into only 39 distinct ribotypes. The reason why such a heterogeneous population of *C. difficile* was identified in this study isn't clear, but may indicate that the exposures to *C. difficile* may be from a broad range of sources in this patient population.

Another limitation of this study is that only one molecular typing technique (ribotyping) was performed to differentiate strains. All of the cases with epidemiological links to other cases were among the top five most common ribotypes identified in this study. A more discriminatory typing technique, such as whole genome sequencing, may have further differentiated these strains. If anything, typing using higher resolution methods would reduce the number of likely HAIs even further, if isolates of the same ribotype were identified as distinct.

The identification of patients colonized on admission or throughout the duration of stay was not investigated during this study, but is an opportunity for future research. In the future, as suggested by O'Hagan and McDonald (2018) [29], sampling of healthcare workers' hands and the collection of environmental samples could provide estimates of transmissions, which may be prevented by a focus on hand hygiene or improved environmental cleaning practices.

Two cases identified as relapses had different ribotypes isolated from the specimen compared to the initial isolates. The patients may have been infected with more than one ribotype of *C. difficile* highlighting another limitation of this study. Only one colony was characterized per specimen and additional strains may have been present and were not identified. Alternatively, the patients may have become infected with a new strain of *C. difficile* within the timeframe to classify the case as a relapse. Given that none of these patients had an epidemiological link to another patient with CDI with the same strain during the time period between the initial and relapse infections, if infection with a new strain had occurred, the source is unknown. Further investigation into the sources of *C. difficile* in cases classified as relapses is warranted.

Without the ribotyping data, 75% (31/41) of the hospital-associated cases of CDI would have an epidemiological link based only on time and location within the hospital. This could result in efforts to improve or enhance the IPAC practices focusing on those symptomatic patients potentially wasting IPAC resources better directed at other potential sources of transmission.

This study identified a heterogeneous population of *C. difficile* in this patient population with ribotype 027 (NAP1) identified as the most common ribotype. The majority of new CDIs in these patients could not be epidemiologically linked to other patients with active CDIs. Other sources of *C. difficile* should be investigated and identified to ensure that the IPAC practices being implemented are the most strategic and effective.

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ORIGINAL ARTICLE

Assessment of the infection prevention and control learning needs of Ottawa community-based healthcare providers

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ABSTRACT

Background: Under the *Health Protection and Promotion Act* and Infection Prevention and Control (IPAC) Complaint Protocol, Ontario public health units are mandated to respond to IPAC complaints about community-based clinical offices. From 2015 to 2018, Ottawa Public Health noted a seven-fold increase in IPAC complaints involving medical and dental settings. In response, we sought to assess the IPAC learning needs of our community-based healthcare providers. Specifically, our objectives were to assess: 1) clinical practice characteristics, 2) current IPAC practices, 3) IPAC knowledge, 4) barriers/facilitators to adherence to IPAC best practices, and 5) preferred IPAC professional development activities.

Methods: An anonymous online survey targeting Ottawa community-based healthcare providers was disseminated through multiple methods including through Ottawa Public Health's (OPH) subscription-based e-bulletin to physicians. The short survey questionnaire included Likert-scale, multiple choice, and open-ended questions. Data collection began in August 2018; a descriptive analysis was conducted using data extracted on January 19, 2019.

Results: Our findings suggest that medical respondents may not be as aware of IPAC practices in their clinic as dental respondents were. Familiarity with IPAC best practice documents was also higher among dental respondents, as compared to medical respondents. IPAC knowledge-testing questions revealed that more medical than dental respondents knew the appropriate use of multi-dose vials, and that few medical respondents knew the IPAC best practices for point-of-care glucose monitoring equipment. Respondents recognized the importance of adhering to IPAC best practices to prevent healthcare-associated infections; however, lack of evidence and cost were self-reported barriers to adherence to IPAC best practices. Over half of all medical and dental respondents surveyed were interested in a voluntary audit of their IPAC practices to help meet their IPAC professional development needs.

Conclusions: Findings from this needs assessment helped describe current IPAC practices and knowledge, identify barriers and facilitators to adherence to IPAC best practices, and understand the learning preferences of Ottawa community-based healthcare providers. This information will be instrumental in planning future IPAC capacity-building activities and tailoring these activities to specific professional groups in Ottawa and potentially beyond.

KEYWORDS

Infection prevention and control; Community healthcare settings; Knowledge translation; Family medicine; Dentistry

INTRODUCTION

In 2015, the Ontario Ministry of Health and Long-Term Care amended the Infection Prevention and Control (IPAC) Practices Complaints Protocol [1] under the Health Protection and Promotion Act [2], and released the Infection Prevention and Control (IPAC) Lapse Disclosure [3] guidance document. These changes introduced a new requirement for local public health units to actively investigate public complaints related to IPAC practices in regulated healthcare professional settings and to publicly disclose lapses identified. Since 2015, Ontario public health units have noted a nearly six-fold increase in IPAC complaints [4].

From 2015 to 2018, the number of IPAC complaints to Ottawa Public Health (OPH) involving medical settings increased from four to 28 (a seven-fold increase) and those related to dental settings increased from zero to seven (a seven-fold increase); there were four times more complaints involving medical as compared to dental settings.

In response to this increase in IPAC complaints, OPH sought to better understand the IPAC learning needs of Ottawa community-based healthcare providers, with the goal of ensuring effective knowledge translation to them and preventing IPAC complaints and lapses in the future.

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Conflicts of interest: None.

Funding: None.

OBJECTIVES

The objectives of this needs assessment were to evaluate: 1) clinical practice characteristics, 2) current IPAC practices, 3) IPAC knowledge, 4) barriers/facilitators to adherence to IPAC best practices, and 5) preferred IPAC professional development activities of Ottawa community-based healthcare providers.

METHODS

An anonymous online survey targeting Ottawa community-based healthcare providers was disseminated through multiple methods including through OPH's website (*www.OttawaPublicHealth.ca/IPACsurvey*) and subscription-based e-bulletins to physicians, emails from the Ontario Medical Association District 8 Representative and the Ottawa Dental Society to their members, and a postcard mail-out to all Ottawa family physicians. Data collection began in August 2018 and the last survey dissemination attempt took place in October 2018. The online survey was hosted by CheckMarket® and was available in both French and English.

The survey collected information on respondents' clinical practice characteristics, current IPAC practices, IPAC knowledge, barriers/facilitators to adherence to IPAC best practices, and preferred IPAC professional development activities. Survey development was informed by existing literature on barriers/facilitators to adherence to practice guidelines in relation to behaviour change [5], and included Likert-scale, multiple choice, and open-ended questions. Descriptive statistical analyses were performed using Microsoft Excel and StataSE Release 14, 2015 on survey data extracted on January 19, 2019. Results from medical respondents (physicians, midwifes, nurses, and medical clinic owners/managers) and dental respondents (dentists, dental hygienists, dental assistants, and dental clinic owners/managers) were compared using two-sided adjusted Wald tests (α=0.05). A thematic analysis was performed on the answers to the open-ended question: 'What else would help increase adherence to IPAC best practices in your clinic?'

RESULTS

As of January 19, 2019, 361 individuals attempted the survey and 319 were included in the analysis. A total of 38 respondents were excluded because their main practice location was outside Ottawa or missing, three due to incomplete surveys and one because the respondent selected the wrong set of questions (medical vs dental) for his/her profession.

Given that survey dissemination to potential participants was completed primarily through third parties (regulated professional associations), estimation of a response rate is

TABLE 1: Clinical practice characteristics of survey participants

	Medical N=199)		Dental (N=120)		P value
	N	%	N	%	
Professional designation[1]					
Physician/dentist	117	58.8	71	59.2	0.84
Nurse (RN or RPN)/dental hygienist or assistant	40	20.1	14	11.7	0.03
Midwife	16	8.0	N/A	N/A	N/A
Clinic owner/manager	49	24.6	65	54.2	<0.001
Type of practice setting					
Group	174	87.4	47	39.2	<0.001
Solo	15	7.5	72	60.0	<0.001
Missing	10	5.0	1	0.8	0.02
Location of clinic[2]					
Central Ottawa	83	41.7	45	37.5	0.46
Western Ottawa	49	24.6	32	26.7	0.70
Eastern Ottawa	67	33.7	43	35.8	0.69
Years in practice					
<5 years	22	11.1	3	2.5	0.001
5-9 years	24	12.1	6	5.0	0.02
10-14 years	19	9.5	9	7.5	0.52
15-19 years	17	8.5	7	5.8	0.35
≥20 years	68	34.2	30	25.0	0.08
Missing	49	24.6	65	54.2	<0.001

[1] Respondents were instructed to select all that apply; several respondents who selected physician or dentist also selected clinic owner/manager.
[2] Based on Champlain Local Health Integration Network (LHIN) boundaries.

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difficult. However, a response rate can be estimated for the subset physicians who selected 'family physician' as their professional designation. Of the 1,213 family physicians identified from the College of Physicians and Surgeons of Ontario registry that were mailed a postcard by Ottawa Public Health inviting them to take the survey, 95 participated (7.8% response rate). Characteristics of respondents are presented in Table 1.

Table 2 summarizes current IPAC practices in participants' clinics. The majority of medical respondents reported having some reusable medical equipment and tabletop sterilizers in their clinic, yet 13.3% did not know who performed the reprocessing and 31% reported that reprocessing was performed by someone without any certification. A greater proportion of dental respondents than medical respondents reported that reprocessing was performed by a person with some form of certification (43.2% vs 29.2%, p=0.02) (Table 2).

With respect to respondents' familiarity with key IPAC guidance documents (Table 3), dental respondents generally reported higher familiarity with their profession-specific IPAC guidance documents than medical respondents (58.9% vs 97.9%, p<0.001). Furthermore, dental respondents were more likely to be familiar with Ontario best practices for reprocessing medical equipment [7] than medical respondents (95.6% vs 68.1%, p<0.001).

Respondents were asked three IPAC knowledge-testing multiple-choice questions. Nearly all respondents (156/166 or 94.0% of medical respondents and 86/91 or 94.5% of dental respondents) correctly identified that none of the following: a one-way dirty-to-clean flow, a clean area for medication preparation, a soiled area for specimen testing or a designated hand-washing sink were present on the provided photo

TABLE 2: Current IPAC practices

	Medical		Dental		P value
	N	%	N	%	
Which of the following are used at the clinic where you work most of the time? (Select all that apply.)	(N=195)		(N=111)		
Reusable medical equipment (e.g. scissors, forceps/pickups, needle-drivers, vaginal specula, carpule syringes, dental burs)	145	74.4	92	82.9	0.07
Tabletop sterilizer (e.g., autoclave)	127	65.1	107	96.4	<0.001
Liquid sterilants (e.g., high-level disinfectants such as 2% glutaraldehyde, 6% hydrogen peroxide, OPA)	77	39.5	67	60.4	<0.001
Ultrasonic cleaner	13	6.7	96	86.5	<0.001
Multi-dose vials (e.g., local anaesthetic, vitamin B12)	133	68.2	28	25.2	<0.001
Non-safety engineered needles (please refer to picture provided in the survey)	31	15.9	50	40.0	<0.001
None of the above	25	12.8	2	1.8	<0.001
Who performs equipment reprocessing (i.e., cleaning, disinfection, sterilization) at the clinic? (Select all that apply.)[1]	(N=152)		(N=99)		
Designated individual(s) with an up-to-date Canadian Standards Association (CSA) certification as a 'Certified Medical Device Reprocessing Technician'	15	7.7	9	8.1	0.84
Designated individual(s) who completed the Public Health Ontario certificate for 'Reprocessing in Community Health Care Settings'	42	21.5	39	35.1	0.06
Designated individual(s) without certification	61	31.3	21	18.9	0.001
Each healthcare provider is responsible for reprocessing the equipment that they use	8	4.1	35	31.5	<0.001
No specific individual is designated to perform reprocessing	5	2.6	7	6.3	0.20
I do not know	26	13.3	5	4.5	0.002
Other	9	4.6	11	9.9	0.16

[1] This question was only asked of respondents who selected at least one of the following answers to the question 'Which of the following are used at the clinic where you work most of the time? (Select all that apply.)':
- Reusable medical equipment (e.g. scissors, forceps/pickups, needle-drivers, vaginal specula, carpule syringes, dental burs),
- Tabletop sterilizer (e.g., autoclave),
- Liquid sterilants (e.g., high-level disinfectants such as 2% glutaraldehyde 6% hydrogen peroxide, OPA), and/or
- Ultrasonic cleaner (dental offices).

TABLE 3: Familiarity with IPAC guidance documents[1]

	Medical		Dental		P Value
	N	%	N	%	
Familiarity with the Provincial Infectious Diseases Advisory Committee (PIDAC)'s Infection Prevention and Control for Clinical Office Practice [6]	83/141	58.9	57/94	60.6	0.79
Familiarity with PIDACs Best Practices for Cleaning, Disinfection and Sterilization of Medical Equipment/Devices [7]	79/116	68.1	86/90	95.6	<0.001
Familiarity (among dental respondents) with the Royal College of Dental Surgeons of Ontario (RCDSO)'s Standard of Practice: Infection and Prevention and Control in the Dental Office [8]	N/A	N/A	93/95	97.9	<0.001[2]
Familiarity (among nurses) with the College of Nurses of Ontario (CNO)'s Infection Prevention and Control Practice Standard (replaced by the PIDAC best practices in December 2018)	28/34	82.4	N/A	N/A	N/A

[1] Defined as strongly agree or agree with the statement: I am familiar with _.
[2] Compared to medical respondents' familiarity with the Provincial Infectious Diseases Advisory Committee (PIDAC)'s Infection Prevention and Control for Clinical Office Practice.

(see Appendix I). A higher proportion of medical respondents (84.2% or 139/165) correctly answered the question about the appropriate use of multi-dose vials compared to dental respondents (50.6% or 46/91) (p<0.001). Only 8.5% (14/164) of medical respondents answered the question about IPAC best practices for point-of-care glucose monitoring equipment correctly; this question was not asked of dental respondents. Seventy-eight percent (71/91) of dental respondents answered the question about the proper placement of dental instruments into a sterilization pouch/cassette correctly; this question was not asked of medical respondents.

Results in Table 4 suggest that both medical and dental respondents recognize the importance of IPAC best practices in preventing healthcare-associated infections. The two most frequently self-reported barriers to adherence to IPAC best practices were lack of evidence and cost. This finding was similar for both medical and dental respondents.

Respondents' preferred continuing professional development activities related to IPAC were those that are completed independently (i.e., review of published materials and online course) (Table 5). Although the least popular option, as many as half of medical and dental respondents were interested in a voluntary audit of their IPAC practices by an IPAC expert.

Respondents were asked an open-ended question about what else would help increase adherence to IPAC best practices in their clinical office. Of the 68 responses received, 43 (63.2%) were from medical respondents and 25 (36.8%) were from dental respondents. The most common answer themes among medical respondents were financial assistance or funding (30.2%), training (18.6%), regular communication (e.g., IPAC updates, common mistakes) (14.0%), audits (14.0%), expert IPAC consultation as needed (11.6%), and modification of existing IPAC best practices (11.6%) (e.g., more applicable to their practice, more evidence-based). Among dental respondents, the most common answer themes were: modification of existing IPAC best practices (28.0%) (e.g., more applicable to their practice, more evidence-based, clearer), training (24.0%), regular communication (16.0%) (e.g., IPAC updates, common mistakes), audits (16.0%), and expert IPAC consultation as needed (16.0%).

DISCUSSION

We completed an assessment of the IPAC learning needs of Ottawa community-based healthcare providers. Our findings suggest that medical respondents may not be as aware of IPAC practices in their clinic as are dental respondents. Familiarity with IPAC best practice documents was also higher among dental respondents, as compared to medical respondents. IPAC knowledge-testing questions revealed that more medical than dental respondents knew the appropriate use of multi-dose vials, which may be partially explained by the fact that more medical than dental respondents reported using multi-dose vials. IPAC knowledge-testing questions also revealed that few medical respondents knew the IPAC best practices for point-of-care glucose monitoring equipment. Respondents recognized the importance of adhering to IPAC best practices to prevent healthcare-associated infections. However, lack of evidence and cost were self-reported barriers to adherence to IPAC best practices. Independent review of resources was the preferred IPAC professional development activity; although the least popular option, as many as half of all medical and dental respondents surveyed were interested in a voluntary audit of their IPAC practices to help meet their professional development needs. The most common answer themes to an open-ended question about 'what else would help increase adherence to IPAC best practices in your clinic' were financial assistance or funding for medical respondents (30.2%) and modifications to existing IPAC best practices for dental respondents (28.0%) (e.g., more applicable to their practice, more evidence-based, clearer); these themes are consistent with the self-reported barriers of cost and lack of evidence.

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The differences in IPAC self-reported practices, knowledge, barriers/facilitators, and preferred professional development activities observed between medical and dental respondents may be related to a variety of factors; future research may seek to identify these factors. One such factor may be the level of awareness about IPAC among medical and dental healthcare providers. IPAC awareness may increase following heavily mediatized IPAC lapses, such as the one that occurred in Ottawa in July 2018 (*www.OttawaPublicHealth.ca/Lapse*). Another factor is likely to be knowledge translation (KT) efforts to date; for example, the Royal College of Dental Surgeons of Ontario conducted a large-scale promotion and KT of its new IPAC Standard throughout Ontario in 2018.

To our knowledge, this is the first published assessment of the IPAC learning needs of community-based healthcare providers. A strength of this needs assessment was grounding the development of the questionnaire on existing literature about physician adherence to practice guidelines in relation to behaviour change. Unfortunately, the response rate to this survey was low and selection bias may be present as a result; a future needs assessment may consider compensating participants for their time to increase the response rate. The survey did not assess if respondents had previously been investigated by Ottawa Public Health following an IPAC complaint against their clinic; if previously-investigated respondents were more or less likely to participate in the survey than those who have not been previously investigated, our results could over- or under-represent previously investigated respondents. A majority of respondents were either physicians or dentists; therefore, our findings likely reflect primarily those perspectives. Respondent characteristics suggest that respondents practiced in a variety of settings and locations and had a range of practice experience. The ability to analyse and contrast responses from medical respondents to those of dental respondents is another strength of this needs assessment, as the needs of these two groups may differ.

TABLE 4: Barriers/facilitators to adherence to IPAC best practices.[1]

	Medical (N=169)		Dental (N=93)		P value
	N	%	N	%	
Adherence to IPAC best practices reduces the risk of infection for my patients, myself, and clinic staff.	147	87.0	86	92.5	0.15
Failure to adhere to IPAC best practices increases the risk of a complaint being submitted to public health or to my regulatory college.	142	84.0	81	87.1	0.49
It is my responsibility to ensure that IPAC best practices are implemented in my practice.	140	82.8	83	89.2	0.14
I apply infection prevention and control (IPAC) best practices in my day-to-day work.	144	85.2	89	95.7	0.003
IPAC best practices are applicable to my practice.	135	79.9	79	84.9	0.30
The benefits of adhering to IPAC best practices outweigh the costs.	121	71.6	59	63.4	0.18
IPAC best practices are evidence-based.	111	65.7	56	60.2	0.38

[1] Defined as strongly agree or agree with the statement

TABLE 5: Preferred[1] IPAC professional development activities

	Medical (N=155)		Dental (N=91)		P value
	N	%	N	%	
Independent review of resources available online (e.g., PIDAC's Infection Prevention and Control for Clinical Office Practice)	115	74.2	77	84.6	0.045
Independent completion of an online course (e.g., Public Health Ontario (PHO)'s IPAC Core Competencies Course) [9]	98	63.2	74	81.3	0.002
Telephone consultation with an expert about a specific IPAC question or issue, on an as-needed basis	102	65.8	59	64.8	0.88
In-service training on IPAC-related job-specific tasks (e.g., reprocessing)	101	65.2	59	64.8	0.96
Self-audit or voluntary peer-audit of my IPAC practices	96	61.9	63	69.2	0.24
Voluntary audit of my IPAC practices by an IPAC expert	80	51.6	46	50.5	0.87

[1] Defined as likely or very likely to take part in the following activity to help meet your IPAC professional development needs

Findings from this needs assessment have helped describe current IPAC practices and knowledge, identify barriers and facilitators to adherence to IPAC best practices, and understand the learning preferences of Ottawa community-based healthcare providers. This information will be instrumental in planning future IPAC capacity-building activities and tailoring these activities to specific professional groups in Ottawa, and potentially beyond. In particular, the willingness of our survey participants to undergo voluntary IPAC audits of their practice suggests that IPAC audits or inspections of community-based healthcare settings may be an acceptable means of addressing gaps in IPAC practices in these settings.

These gaps in adherence to IPAC best practices are likely not unique to Ottawa; they are thought to exist in a majority of Ontario community-based healthcare settings that are not routinely inspected. A nearly six-fold increase in IPAC complaints has been observed in Ontario over the past four years; this is likely a reflection of increased public and health professional awareness and reporting of existing IPAC deficiencies, rather than worsening of IPAC practices over time. Ontario's current complaint-based approach is unlikely to lead to significant wide-scale improvement in IPAC practices in community-based healthcare settings. An upstream preventive approach combining additional formal training during school/residency and CPD as well as greater oversight and accountability for health professionals' IPAC practices (e.g., through routine IPAC inspections) will likely be required to effect this change.

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CONCISE REPORT

Gym Routine Infection Prevention program – An Innovative, Collaborative Approach towards Excellence

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ABSTRACT

Gym Routine Infection Prevention program's (G.R.I.P.) purpose was to establish a monitoring program for hand hygiene and equipment disinfection in six rehabilitation/complex continuing care gymnasiums. Our goal was to create a safe environment by preventing acquisition of healthcare associated infections (HAIs) by promotion of infection prevention and control (IPAC) best practices with a focus on hand hygiene compliance and the cleaning and disinfection of shared equipment.
A customized tool was created that revealed hand hygiene compliance was 76% before patient contact and 96% after patient contact and cleaning shared equipment before patient use was 79% and after use was 90%.

KEYWORDS

Gym; infection; hand hygiene; equipment cleaning; audit; education; result

INTRODUCTION

Hospitalized patients are vulnerable to infections due to their clinical conditions and possible immunocompromised state. The Canadian Patient Safety Institute reports that 8,000 Canadians die from hospital-acquired infections each year and a further 200,000 patients become infected with hospital-acquired infections each year [1]. Gymnasiums in rehabilitation centres are settings that pose a potential risk for spread of infections like *Staphylococcus* sp. and *Giardia* sp. [2-5]. A study done in a US metropolitan Public Fitness Centre (Mukherjee et al, 2014) showed that the surface swab samples collected from the exercise equipment (stationary bike, hand rails, toilet handles) identified the most prevalent bacterial species as *Staphylococcus* sp [5]. The possible contributing factors for this include the use of shared equipment such as parallel bars, treadmills, and small sets of stairs with hand railings, which could be reservoirs for microorganisms, a patient's vulnerable health status, the need for more frequent hands-on care for this specific population undergoing rehabilitation from rehab assistants and a fast-paced working environment.

There has been no baseline data of compliance of either hand hygiene or equipment disinfection in the gym of our facility. An innovative approach was adopted to use a customized audit tool. The results of the audits were intended to identify any barriers and improve these practices.

METHODS

The rehabilitation/complex continuing care (rehab/CCC) facility is located in Toronto, Ontario, Canada with 276 inpatient beds, as well as outpatients who come to the facility for rehab. The patient population consisted of individuals requiring rehab due to the loss of a limb, stroke, spinal cord injury, chronic obstructive pulmonary disease (COPD), or other physical injuries. Each of the six gyms audited had unique patient groups that accessed them. The largest gym at this rehab/CCC, the amputee gym, had a mix of inpatients and outpatients the majority of which were young adults to middle aged, and they used recombinant bikes, parallel bars, treadmills and beds for practicing movement in bed and standing and sitting. The neurological gym is the second largest gym at the facility. It contains less workout equipment compared to the amputee gym, but is still larger than the other gyms attached to the various units. The gym included parallel bars, some cardio equipment, but also many puzzles, small items for fine motor manipulation, open space for patients to re-master ambulation, and beds for patients to practice skills.

As there was no available standardized tool to perform audits in a gym setting, a customized tool was created to monitor compliance of hand hygiene and equipment disinfection by gymnasium staff. This staff was comprised of physiotherapists, occupational therapists, rehabilitation assistants, environmental services, nurses and other staff. Cleaning and disinfection of equipment includes wiping high-touched areas and drying time.

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Conflicts of interest: None.

The process of developing the tool involved gathering ideas from 20 gymnasium staff through in-person interviews and input through e-mails, which included current perception of hand hygiene practices and the idea of using a customized tool to monitor hand hygiene and equipment disinfection in gyms. The tool was developed to capture data related to staff hand hygiene and equipment cleaning compliance rate. The tool was then sent out to staff to gather their opinions.

Feedback from potential users of the tool was gathered and the tool modified to better suit this healthcare setting. A fourth-year Bachelor of Science in Nursing student and IPAC attended meetings to get direct feedback on the tool and began auditing the first week of February 2019. Staff were asked whether they felt they were performing hand hygiene using alcohol-based hand sanitizer (ABHS) and cleaning equipment often enough to reduce the risk of infection. Staff were also asked if they believed patients were performing hand hygiene often enough to reduce the spread of infectious organisms. The student carried out direct observations of patients and gym staff in six gyms over a four-week period. The audits, which were conducted during the standard hours of operation during the day, involved repeated observation of staff by the student with the support of IPAC staff. Over the same time period, staff meetings were held to share real-time compliance data and gather feedback about the tool, which was used to modify it.

The audit tool was initially based on the Just Clean Your Hands (JCYH) program developed by Public Health Ontario as a trial for observations[6]. After observations were carried out and feedback was gathered from staff, this tool was modified to better suit the gym environment (Figure 1). The JCYH tool has the first moment involving contact with patient or patient's environment. The modified tool identified moments to suit the gym activity and separated the first moment into contact with patient and patient's environment meaning equipment. Further, this tool was classified into two sections: required and recommended. Recommended moments were monitored but not taken into consideration when adherence rates were tallied as they may not always be feasible e.g. limited mobility of the hands of a patient. Since we do not have baseline data, our target was to achieve 80% of overall compliance.

Required moments include:

- Staff performing hand hygiene before patient contact
- Staff performing hand hygiene after patient contact
- Staff disinfecting equipment before patient use
- Staff disinfecting equipment after patient use

Recommended moments include:

- Staff performing hand hygiene when they enter and exit a gym
- Staff encouraging patients to perform hand hygiene before entering and upon exiting the gym
- Staff encouraging patients to perform hand hygiene before and after activities.

The Education tool (Appendix A)[6,7,8] was developed as an important element of this improvement program. The Infection Control Practitioner, assisted by the student of this project, imparted education sessions to staff and the tool was also posted in the gyms as a visual reminder. The tool included background information on hospital-acquired infections and why hand hygiene and equipment decontamination are important. While handing out this resource IPAC/student answered staff questions, gathered feedback on the hand-out and provided on-the-spot education on hand hygiene and equipment decontamination. A power point presentation on G.R.I.P. was also created that detailed the project, specifically mentioning the project's goal, background, hand hygiene and equipment decontamination, adherence rates and conclusions. A project overview was sent to the team leads of each gym that was audited.

RESULTS

Patient hand hygiene compliance was monitored, but has not been included in the results. A total of 259 observations were made across six gyms between the beginning of February 2019 and the first week of April 2019. In the 2-East Functional Enhancement gym, 25 observations of rehab assistants were carried out, and two physiotherapist observations for a total of 27 observations. Staff observations in the 3-East Musculoskeletal gym consisted of 40 observations of rehab assistants and one observation of a physiotherapist totaling 41 observations. Fourteen observations of rehab assistants in the 2-West Respiratory gym were conducted and 30 observations of physiotherapists totaling 44 observations. In the 3-West Adult Disability/Multiple Sclerosis (MS) gym 52 observations of rehab assistants were conducted and 14 observations of physiotherapist for a total of 66 observations.

For the Neurological gym, 17 observations of rehab assistants were conducted, 13 observations of physiotherapists, two observations of occupational therapists, and two observations of two other staff members for a total of 34 observations. The patients in the Neurological gym have a higher acuity of care, therefore, the length of time spent on a patient was longer which explains the number of audits to the observations made. For the Amputee gym, 27 observations of rehab assistants were carried out, and 20 observations of physiotherapists for a total of 47 observations. Average hand hygiene and all the gyms and healthcare staff before patient contact was 76%; after-patient contact was 96%; equipment disinfection before patient use was 79%; and 90% after patient use (Table 1).

DISCUSSION

In the gym environment, some barriers to infection control practices were identified by staff such as working in a fast-paced environment, varied staff to patient ratios, and the kind of equipment that patients use. Furthermore, staff members were concerned that G.R.I.P. could interfere with their ability to carry out their duties within their scheduled work shift. Despite the development of the tool, limitations to compliance to best practices exist. Staff-to-patient ratios vary across the hospital and as such, depending on the gym staff are working in, it can

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TABLE 1: Audit moments observed divided by gym in which observation occurred.

Gym audited	Hand hygiene before patient contact	Hand hygiene after patient contact	Cleaning equipment before patient use	Cleaning equipment after patient use
2-East (Functional Enhancement)	9/11(82%)	10/10(100%)	1/1(100%)	10/10(100%)
3-East (Musculoskeletal)	17/23(74%)	8/8(100%)	7/7(100%)	11/13(85%)
3-East (Amputee)	14/15(93%)	18/20(90%)	4/8(50%)	13/15(87%)
3-East (Neurological)	9/11(82%)	14/15(93%)	2/2(100%)	14/16(88%)
2-West (Respiratory)	13/15(87%)	25/25(100%)	No observations made	7/8(88%)
3-West (Adult disability/MS)	21/34(62%)	28/29(97%)	1/1(100%)	17/18(94%)
Hospital average	83/109(76%)	93/97(96%)	15/19(79%)	72/80(90%)

be difficult for them to work with multiple patients while still performing equipment disinfection.

The staff-to-patient ratio in the 3-West gym varied from one to seven patients (Hand Hygiene before contact 62%) whereas staff in the amputee gym may work with one to two patients at a time (hand hygiene before contact 93%). This suggests higher staff-to-patient ratios are associated with better hand hygiene compliance before contact with patient. The 3W gym handles MS patients, which entails more care due to greater mobility issues compared to other patients, which possibly adds more work volume to staff. Some equipment have uneven surfaces and may require additional time to disinfect. Wall-mounted wipes are not always positioned in convenient locations and as such may be contributing to less than perfect equipment disinfection. Patients do not always follow staff directions when asked to perform hand hygiene. Due to muscle weakness, patients are not always capable of using the wall-mounted, alcohol-based hand rub (ABHR) dispensers as they require a certain amount of strength and coordination to operate, which in turn may skew audits and therefore patient audits have not been included in the results. Possible solutions to these barriers could include procurement of ABHR dispensers that are activated by a sensor making it easier for patients to use. Emphasis on routine IPAC practices during staff orientation to encourage adherence to appropriate hand hygiene and equipment disinfection practices and the availability of disinfectant wipes at convenient locations may also improve compliance[9]. Moving forward, auditing by Hand Hygiene Champions will enable monitoring of compliance and identify the necessary resources needed for improvements, or additional resources such has staffing, supplies of ABHR and disinfectant wipes.

The purpose of the project was to develop an audit tool that is specific to the rehab gym environment. Our healthcare centre already has a hand-hygiene-monitoring program in place in the patient environment; G.R.I.P. does not replace this program, its purpose is to augment it. On average, hand hygiene and shared equipment cleaning and disinfection adherence rates are above 80%, which is comparable to other areas in the facility. There is room for improvement when staff perform hand hygiene before patient contact. The compliance rates G.R.I.P. captures is for internal reporting only, and only applies specifically to the gym environment. Data is not shared with the Ministry of Health and Long-term Care.

CONCLUSION

This initiative enabled our facility to identify room for improvement and a plan to sustain higher compliance. Our plan moving forward is to train auditors to perform 30-50 observations per gym every three to four months and then evaluate the data collected. From there the project may be expanded so gyms are audited each quarter and the results sent to leadership and routinely posted in the gyms audited.

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FIGURE 1: Customized audit tool

G.R.I.P: Gym Routine Infection Prevention Program

Form #:
Gym: Date:
Start Time: End Time:

West Park FOUNDATION get your life back

Required Best Practice

HCP category #		HCP category #	
BEF PAT	Yes ☐ No ☐	BEF PAT	Yes ☐ No ☐
AFT PAT	Yes ☐ No ☐	AFT PAT	Yes ☐ No ☐
WIPE BEF PAT USE	Yes ☐ No ☐	WIPE BEF PAT USE	Yes ☐ No ☐
WIPE AFT PAT USE	Yes ☐ No ☐	WIPE AFT PAT USE	Yes ☐ No ☐

Recommended Hygiene

PAT CLN hands BEF/AFT activities	Yes ☐ No ☐	PAT CLN hands BEF/AFT activities	Yes ☐ No ☐
PAT CLN BEF ENT/EXT gym	Yes ☐ No ☐	PAT CLN BEF ENT/EXT gym	Yes ☐ No ☐
HCP CLN BEF ENT/EXT gym	Yes ☐ No ☐	HCP CLN BEF ENT/EXT gym	Yes ☐ No ☐

Required Best Practice

HCP category #		HCP category #	
BEF PAT	Yes ☐ No ☐	BEF PAT	Yes ☐ No ☐
AFT PAT	Yes ☐ No ☐	AFT PAT	Yes ☐ No ☐
WIPE BEF PAT USE	Yes ☐ No ☐	WIPE BEF PAT USE	Yes ☐ No ☐
WIPE AFT PAT USE	Yes ☐ No ☐	WIPE AFT PAT USE	Yes ☐ No ☐

Recommended Hygiene

PAT CLN hands BEF/AFT activities	Yes ☐ No ☐	PAT CLN hands BEF/AFT activities	Yes ☐ No ☐
PAT CLN BEF ENT/EXT gym	Yes ☐ No ☐	PAT CLN BEF ENT/EXT gym	Yes ☐ No ☐
HCP CLN BEF ENT/EXT gym	Yes ☐ No ☐	HCP CLN BEF ENT/EXT gym	Yes ☐ No ☐

Required Best Practice

HCP category #		HCP category #	
BEF PAT	Yes ☐ No ☐	BEF PAT	Yes ☐ No ☐
AFT PAT	Yes ☐ No ☐	AFT PAT	Yes ☐ No ☐
WIPE BEF PAT USE	Yes ☐ No ☐	WIPE BEF PAT USE	Yes ☐ No ☐
WIPE AFT PAT USE	Yes ☐ No ☐	WIPE AFT PAT USE	Yes ☐ No ☐

Recommended Hygiene

PAT CLN hands BEF/AFT activities	Yes ☐ No ☐	PAT CLN hands BEF/AFT activities	Yes ☐ No ☐
PAT CLN BEF ENT/EXT gym	Yes ☐ No ☐	PAT CLN BEF ENT/EXT gym	Yes ☐ No ☐
HCP CLN BEF ENT/EXT gym	Yes ☐ No ☐	HCP CLN BEF ENT/EXT gym	Yes ☐ No ☐

FIGURE 1a: Instructions to the auditor

- If using the paper copy of this tool, write the HCP category number into the box next to 'HCP category #'.
- Check the Yes box if the HCP being audited is observed performing the moment, if the moment is missed tick the No box.
- Auditors should choose one HCP, approach them and determine their HCP category and then observe them with one patient and observe the HCP as they move onto the next patient to get a complete observation.
- The auditor should not interfere with the HCP's work and must leave if asked to do so.

Healthcare Providers (HCP) categories

1 = Rehabilitation Assistant, 2 = Physiotherapist
3 = Occupational Therapist, 4 = Nurse
5 = Environmental Services, 6 = Other Staff

Moments for Hand Hygiene and Equipment Decontamination

- BEF PAT refers to the HCP performing hand hygiene before coming into physical contact with the patient.
- AFT PAT refers to the HCP performing hand hygiene after coming into physical contact with the patient.
- WIPE BEF PAT USE refers to the HCP performing decontamination of frequent touch points with a disinfecting wipe before the patient uses the equipment.
- WIPE T PAT USE refers to the HCP performing decontamination of frequent touch points with a disinfecting wipe after the patient uses the equipment.
- PAT CLN hands BEF/AFT activities refer to whether the HCP encouraged the patient to perform hand hygiene before and after activities in the gym.
- PAT CLN BEF ENT/EXT gym refers to whether the HCP encouraged the patient to perform hand hygiene before entering and upon exiting the gym.
- HCP CLN BEF ENT/EXT gym refers to whether the HCP performed hand hygiene before entering and upon exiting the gym.

LETTER TO THE EDITOR

A case for integrating substance use harm reduction into IPAC practice in acute care settings

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KEYWORDS:
Harm Reduction, Injection Drug Use, Infection Prevention & Control, Acute Care, Health Equity

Harm reduction interventions for people who inject drugs (PWID) based in acute care hospitals have yet to be widely adopted or evaluated despite robust evidence from community settings supporting their impact on reducing injection drug-related harms, such as infections. [1,2] It is well known that injection drug use can lead to many infectious complications such as skin and soft tissue infections, bacteremia, infectious endocarditis, and transmission of various blood-borne pathogens such as HIV and hepatitis C. [3,4] Once admitted to hospitals, PWID may not have access to harm reduction services offered in the community, which could increase their risk of infection. I argue that Infection Control Practitioners (ICPs) are well positioned and have the ethical imperative to advocate for and support the implementation and evaluation of harm reduction programs such as needle-syringe programs (NSPs), supervised consumption services, and harm reduction education within acute care hospital settings.

Once admitted to acute care settings, many PWID continue to inject drugs throughout their hospitalization and the commonly enacted abstinence-based models, which prohibit drug use and syringe possession lack effectiveness. [5,6] Without the integration of harm reduction services like NSPs into the acute care setting, the infectious risks associated with intravenous drug use persist in our institutions, and are left unmitigated by evidence-based interventions.

When PWID use substances in the hospital setting, it is often the result of inadequate pain control or management of withdrawal. [7] Without access to supportive, culturally safe environments and sterile supplies, individuals may take efforts to hide their use to avoid penalization. [7,8] These efforts, such as rushed injection, injecting alone in locked washrooms, and using non-sterile syringes and supplies, could lead to various infections, overdose and death. [6,7] It is through a complex interplay of structural vulnerability and normalization of suffering that these risks may be framed as natural consequences of substance use. [7] When this suffering is seen as unavoidable and expected, healthcare providers and hospital leadership may be less likely to recognize opportunities where they can intervene.

To help mitigate these risks, ICPs can support the creation of comprehensive in-hospital harm reduction programs in line with their respective local context and epidemiology. This can be done through collaboration with key stakeholders such as PWID, nurses, infectious disease and addictions medicine specialists, psychiatrists, social workers, hospital leadership and local public health bodies. Common harm reduction interventions used in the community setting to curb the incidence of these infectious complications include: NSPs, supervised consumption services, distribution of biohazard sharps containers; distribution of safer injection kits, which may include alcohol swabs and sterile injection equipment; and educational materials.

While Infection Prevention and Control departments are comfortable working within the focused lens of their respective organizations, we need to also think broadly with a health equity lens to reduce systemic and socially constructed (and therefore modifiable) risks faced by PWID in the hospital setting. Turning a blind eye to the risk environment that is our hospitals perpetuates health disparities and is not an option. We need to think outside the box and leverage our knowledge of infectious processes and our skills in education and policy development to help reduce the harm experienced by PWID.

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PCS Apply and Dry results demonstrated significantly better removal of pathogens and prevention of transfer of pathogens to adjacent surfaces . Previous QCT-3 studies demonstrated wiping high touch surfaces with pre moistened wipes or cloths transferred Murine norovirus and C.difficile spores to clean surfaces , this occurred with all major classes of disinfectants.

QCT-3 Field relevant laboratory testing data needed to be confirmed under actual use conditions in the patient care environment.PCS contracted NSF International to do microbial audits pre and post cleaning in three separate health care facilities. A large teaching facility in Michigan, a new teaching hospital and a community hospital in Montreal Quebec .

Microbial auditing of the environment pre and post cleaning provides a very accurate measurement of the effectiveness of hospital cleaning practices.

Previous studies have recommended that cleaning should reduce aerobic plate counts to below 2.5 Colony forming units (CFU) per square centimetre for cleaned surfaces.

However many professionals currently recommend that cleaned surfaces should have less than 1 colony forming unit per square centimetre after cleaning.

In all three facilities surfaces where sampled pre and post cleaning and two of the three hospitals in addition to aerobic plate counts samples were also analysed for presence of C.difficile spores.

Samples were taken in multiple rooms for multiple days with hospitals current cleaning process. Staff where then trained on how to clean using PCS Apply and Dry process. Testing pre and post cleaning were again taken in multiple rooms and days.

PCS Apply and Dry Process

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Vegetative Bacteria (S. aureus and S. marcescens)
Average CFU per square centimetre

	CFU/cm2			Percent		Average Percent	
Product	Control	After Wiping	Transfer	Reduction	Transfer	Reduction	Transfer
Apply & Dry Test 1	**27,000**	**0**	**0**	**100**	**0**	**100**	**0**
Apply & Dry Test 2	**35,000**	**0**	**0**	**100**	**0**		

C. difficile spores
Average CFU per square centimetre

	CFU/cm2			Percent		Average Percent	
Product	Control	After Wiping	Transfer	Reduction	Transfer	Reduction	Transfer
Apply & Dry Test 1	**27,000**	**3.57**	**0**	**99.99**	**0**	**99.95**	**0**
Apply & Dry Test 2	**9,240**	**8.15**	**0**	**99.91**	**0**		

Murine Norovirus
Average PFU per square centimetre

	PFU/cm2			Percent		Average Percent	
Product	Control	After Wiping	Transfer	Reduction	Transfer	Reduction	Transfer
Apply & Dry Test 1	**4,333**	**0**	**0**	**100**	**0**	**100**	**0**
Apply & Dry Test 2	**18,386**	**0**	**0**	**100**	**0**		

Results
Average hospital colony forming units (CFU) Pre and Post cleaning existing processes

	Pre CFU	Post CFU
1. Community Hospital medical ward 60% isolation patients Daily cleaning with hydrogen peroxide disinfectant cleaner	**6.33**	**3.18**
2. Michigan Teaching Hospital daily sporicidal cleaning	**10.9**	**4.61**
3. New teaching hospital daily cleaning with Quaternary disinfectant cleaner	**4.12**	**0.601**

Results
Average hospital colony forming units (CFU) Pre and Post cleaning
PCS Apply and Wipe Dry Process

	Pre CFU	Post CFU
1. Montreal Community Hospital	**3.91**	**0.60**
2. Michigan Teaching Hospital	**10.9**	**1.53**
3. New Teaching Hospital Montreal	**7.84**	**0.263**

	Pre CFU	Post CFU
AVERAGE OF THE THREE HOSPITALS CURRENT CLEANING PROCESESS	**5.01**	**2.797**
AVERAGE OF THE THREE HOSPITALS PCS Apply and Dry Process	**7.55**	**0.798**

No C. difficile spores where detected in any of the samples tested.

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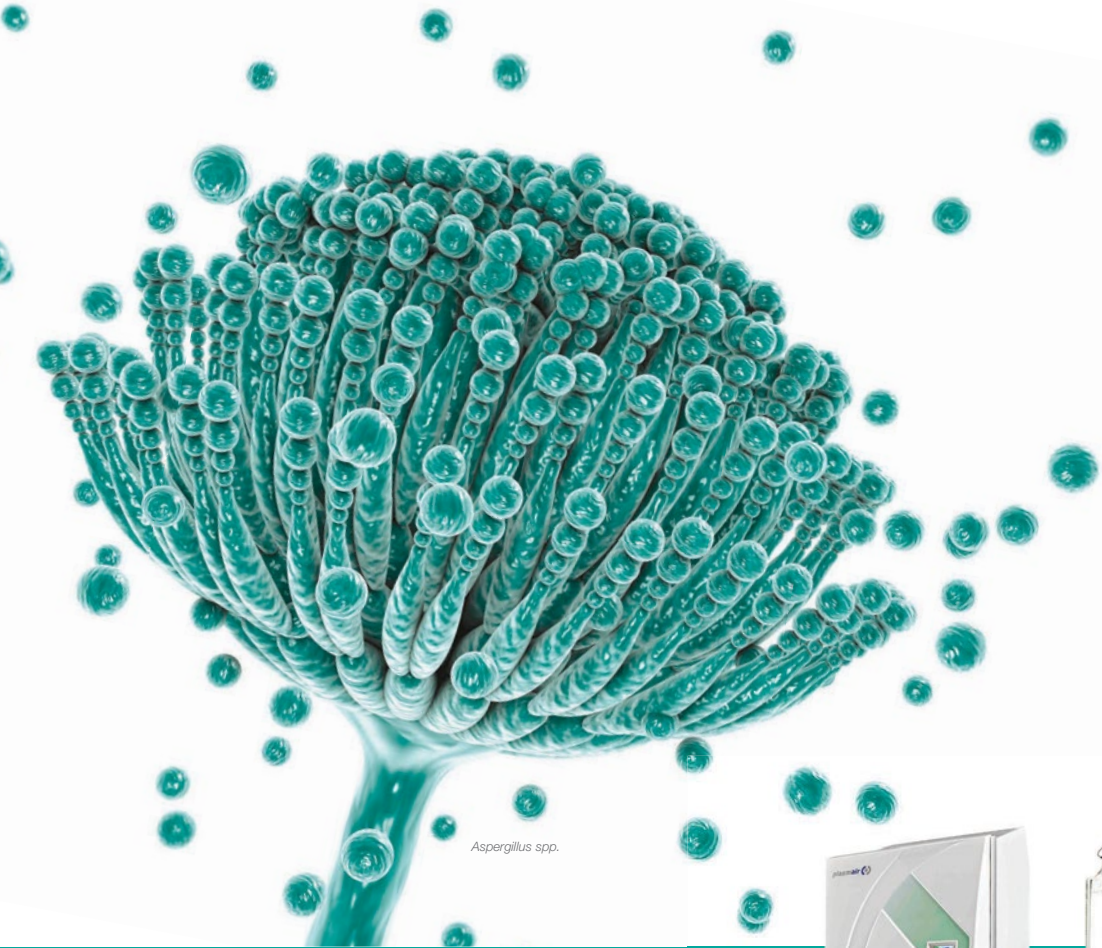

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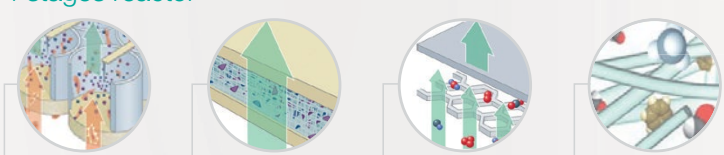

STAGE 1
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STAGE 2
HEPA filtration.

STAGE 3
Elimination of oxidant chemical molecules.

STAGE 4
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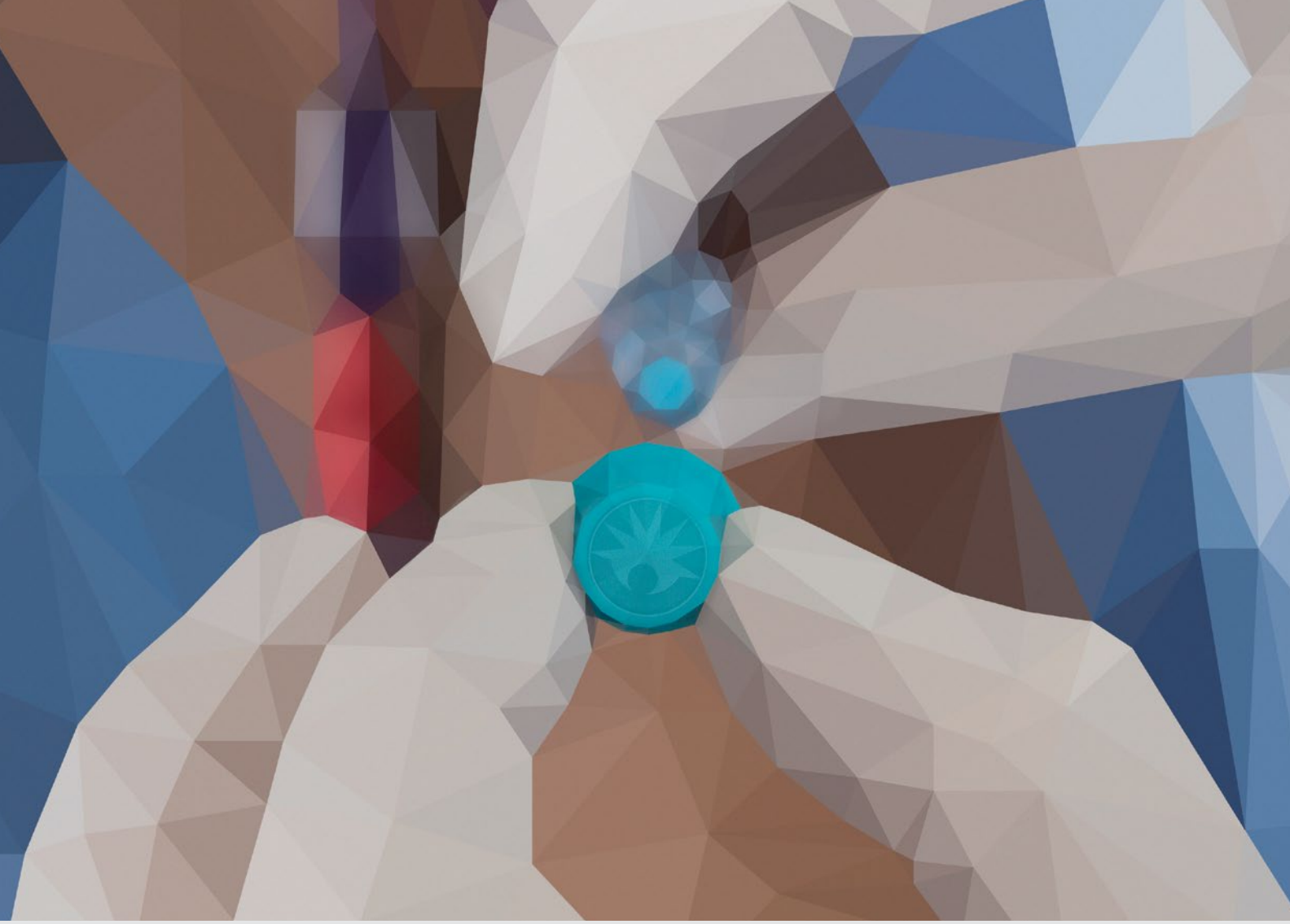

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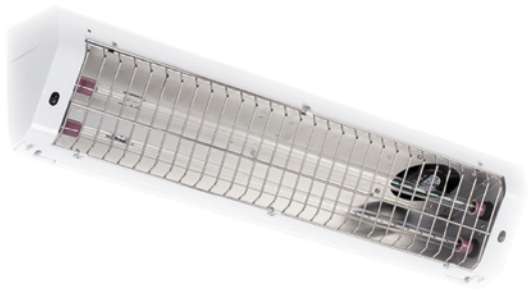

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- Reduces risk of HAI by reducing C.Diff, VRE & other pathogens.
- Automated 5 minute disinfection cycle following each bathroom use.

SMARTFLO$_3$
Hand Hygiene Sink

The world's first self-disinfecting sink uses ozonated water to reduce bacteria on hands, on the sink and in the drain trap. No splash, no faucet, no problems!

- ☑ Motion activated and self-flushing.
- ☑ Exceeds CSA Z317.1-16 requirements.
- ☑ UV compatible coating.
- Prevents bacterial growth and biofilm.

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Together, we do amazing things every day

We're leaders in our work. We support patients, their families, staff, physicians and volunteers across the continuum of care.

Our Infection Prevention and Control program is one of a kind. With province-wide surveillance, hand hygiene initiatives, medical device reprocessing quality reviews, and various education and best practice resources, we work collaboratively to integrate IPC principles into all aspects of patient care.

Learn more at ahs.ca/ipc.

Alberta Health Services

Infection Prevention & Control

Healthy Albertans.
Healthy Communities.
Together.

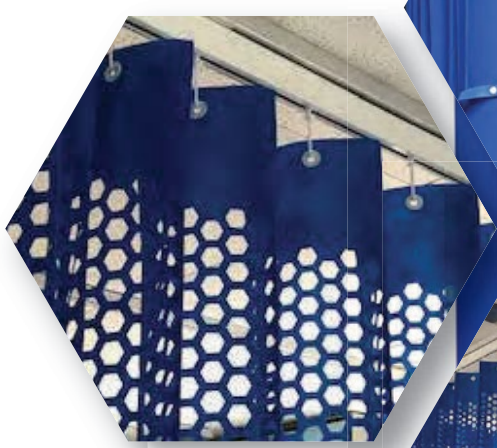
Canada's Top 100 Employers 2018

Alberta's Top 70 Employers 2017

Canada's Top Employers for Young People 2018

STAFF-FRIENDLY ANTIMICROBIAL CURTAINS

Privacy curtains – two words that make ICPs shudder. Curtains are a challenge - they define the patient's environment providing shelter, privacy and comfort... and they are touched continuously, potentially undermining hand hygiene and your cleaning and disinfection protocols.



Our easy to install, antimicrobial curtains have been tested in Canadian and European hospitals.

- ☑ *Reduce staff injury by 80%*
- ☑ *Preferred by staff*
- ☑ *3 log reduction of pathogens such as MRSA*

*Contact us and let us show you how we can help you **reduce costs**, **protect staff** and **patients.***

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PREVENA™
INCISION MANAGEMENT SYSTEM

INFECTION?

PREVENA™ Incision Management System is the only medical device intended to manage the environment of surgical incisions and surrounding intact skin in patients at risk for developing post-operative complication, such as infection, by maintaining a closed environment via the application of negative pressure wound therapy system to the incision.

The PREVENA™ Dressing skin interface layer with silver reduces microbial colonization in the fabric., PREVENA™ Therapy can help protect your high risk patients.

PREVENA™ Therapy can help:

- Hold incision edges together
- Remove fluids and infectious materials
- Act as a barrier to external contamination
- Deliver continuous negative pressure at -125mmHg up to 7 days

For more information, please visit **prevenatherapy.com** or call **1-800-668-5403** to schedule a meeting with your local KCI Representative

NOTE: Specific indications, contraindications, warnings, precautions, and safety information exist for PREVENA™ Therapy. Please consult the applicable PREVENA™ System Clinician Guide instructions for use prior to application. This material is intended for healthcare professionals.

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