This Alberta Health Services (AHS) annual report of Infection Prevention and Control (IPC) activities is submitted as required by the Alberta Health (2011) Standards for IPC Accountability and Reporting.

In AHS, provincial IPC services are provided by IPC staff members located in healthcare facilities and clinical service programs across the five zones. Physician leadership to the program is provided through IPC-trained physicians with backgrounds in Infectious Diseases or Medical Microbiology in Calgary and Edmonton and by Medical Officers of Health in the South, Central and North zones. The zone-level IPC teams are supported by a provincial team, IPC Surveillance and Standards.

The Senior Program Officer and the Senior Medical Director for IPC report to the Vice President of Quality and Chief Medical Officer. The Senior Medical Director for IPC serves as the AHS IPC Executive, a position set out in the Alberta Health (2011) Standards for IPC Accountability and Reporting.

The IPC program was created within AHS in June 2009 and continues to establish a strong IPC foundation across the continuum of care. The provincial model of health service delivery in Alberta facilitates close collaboration in the prevention of healthcare-associated infections between AHS IPC, Population, Public and Indigenous Health, Workplace Health and Safety, Linen and Environmental Services, Capital Management, Facilities Maintenance and Engineering, and other clinical and non-clinical programs.

Covenant Health is a full partner in the AHS IPC surveillance program and AHS IPC works closely with Covenant Health IPC and with representatives from agencies that provide clinical services on contract to AHS. Strong linkages continue between AHS IPC and infection control designates or IPC staff employed by continuing care organizations across Alberta.

The Alberta Health (2015) IPC Strategy defines accountabilities that key partners have for implementing identified actions. Alberta Health provides IPC policy direction, oversight, and public assurance that care is safe and effective. AHS is responsible for assessing, promoting and protecting the health of Albertans, promoting IPC, and delivering safe, quality healthcare IPC services. The Health Profession Regulatory Colleges also partner in IPC by governing practices within their respective professions.

In this annual report, outcomes achieved by IPC in partnership with programs throughout the province are organized according to the directions within the Alberta Health (2015) IPC Strategy. Those are accountability and monitoring, provincial surveillance, human resource capacity, physical environment and infrastructure, and public awareness and education.

Hand hygiene strategies are integrated throughout the Alberta Health (2015) IPC Strategy. To highlight the significant work towards improving hand hygiene practices, this content is designated its own section within this annual report. Key outcomes and initiatives for each strategic direction are summarized below with details found in the subsequent sections of this report.
Key Outcomes and Initiatives in 2016/17

Accountability and Monitoring

As a provincial health authority, AHS complies with the Alberta Health (2015) IPC Standards and aligns its policies and practices accordingly.

During 2016, the Office of the Auditor General of Alberta conducted site visits to six acute care facilities to assess IPC progress on the recommendations tabled in the 2013 Office of the Auditor General of Alberta Review of IPC at Alberta Hospitals. The areas of focus included accountability and monitoring of medical device reprocessing, management of antibiotic-resistant organisms, and accountability for improving hand hygiene in AHS.

The Provincial IPC Committee and the five Zone IPC Committees met regularly through 2016/17 providing a forum by which IPC challenges and opportunities could be addressed.

Key outcomes and initiatives in 2016/17 included:

- Review and dissemination of IPC surveillance reports;
- Analysis and discussion of outbreaks and site trends;
- Support and advancement of hand hygiene improvement initiatives;
- Guidance towards design and construction activities within clinical areas;
- Collaboration with Cardiac Surgery, Biomedical Engineering and others to identify patients who had cardiovascular procedures involving open chest surgery using equipment impacted by the LivaNova heater-cooler safety alert and to develop safe practices for use of the device pending a global solution.

Provincial Surveillance

Surveillance is foundational to evidence-based practice and an essential component of IPC. The AHS surveillance program is unique nationally with its level of provincial integration, standard data management, and use of data to improve patient outcomes. The downward trend of Methicillin-resistant *Staphylococcus aureus* and *Clostridium difficile* infection rates are illustrative of actions made possible by integrated provincial surveillance.

Since the start of provincial surveillance in 2011/12, the rate for hospital-acquired Methicillin-resistant *Staphylococcus aureus* has decreased from 3.0 per 10,000 patient-days to 2.07 per 10,000 patient-days. This rate decrease is also seen for *Clostridium difficile* infection, with a decrease from 4.2 per 10,000 patient-days to 3.3 per 10,000 patient-days in 2016/17.

Improvements in practices, including consistent patient management, improvements in environmental cleaning and hand hygiene compliance, and appropriate antibiotic utilization all contribute to these hospital-acquired infection rate improvements.

Key outcomes and initiatives in 2016/17 included:

- Launch of Methicillin-resistant *Staphylococcus aureus* and *Clostridium difficile* infection incident data using online reporting workbooks to communicate up-to-date information to AHS and Covenant Health staff on cases identified by the IPC program;
- Alignment and revision of provincial surveillance protocols;
- Development of a case example library for education and training purposes.
Human Resource Capacity

Through the provision of a number of educational initiatives developed to support AHS staff and physicians, the IPC program has enhanced IPC-related capacity and effectiveness.

Key outcomes and initiatives in 2016/17 included:

• IPC support and response to the Fort McMurray fire;

• Work to update learning modules: “Hand Hygiene Interactive Module” and “IPC is Everyone’s Business”;

• Development of an internal IPC Preceptorship Program and the IPC Education Community of Practice;

• IPC collaboration with partners to support an evidence-based practice environment through development of guidelines, policies, and procedures.

Physical Environment and Infrastructure

Managing physical environments is a key to breaking the chain of infection transmission. IPC collaborates with partners to create environments that support IPC principles.

Key outcomes and initiatives in 2016/17 included:

• Trial of new environmental disinfection technology and the introduction of an automated quality audit program in collaboration with Linen and Environmental Services;

• Education and update of design, construction, and renovation guidelines in collaboration with Alberta Infrastructure, Capital Management, and Workplace Health and Safety;

• Response to Fort McMurray wildfire with establishment of an urgent care centre and remediation and support towards re-opening of the hospital.

Public Awareness and Education

In 2016/17, appropriate antibiotic use was a focus within AHS. The Antimicrobial Stewardship program is guided by the vision, mission and objectives set out in the AHS Antimicrobial Stewardship 2015/16 Annual Report and Future Directions document.

The Antimicrobial Stewardship Committee works in collaboration with the five zone Antimicrobial Stewardship Working Groups and reports directly to the provincial Drugs and Therapeutics Committee which is accountable to AHS Executive Leadership.

Public awareness about IPC is also supported through development of education materials on a range of topics.

Key outcomes and initiatives in 2016/17 included:

• Establishment of acute care Antimicrobial Stewardship Working Groups in all zones and many sites;

• Provision of additional education to develop knowledge of antimicrobial stewardship in Pharmacy staff;

• Implementation of standardized order sets and algorithms guiding management of Clostridium difficile infection in acute care;

• Enhancement of reporting of antibiotic use in continuing care;

Hand Hygiene

Hand hygiene is the most effective measure to reduce organism transmission. The IPC Hand Hygiene program collaborates with healthcare workers to collect data and create initiatives to increase hand hygiene compliance across the continuum of care. Hand hygiene compliance has increased steadily from the 2011 rate of 50% to the 2016/17 rate of 82.2%.

The five zone-based IPC hand hygiene teams focus on engagement of frontline staff in hand hygiene at the unit and site level. Resources for hand hygiene reviewers include standardized training modules for direct observations, real-time data reports, and a provincial forum to discuss hand hygiene reviews. Work continued this year to provide new learning modules, an updated AHS Hand Hygiene Policy and Procedure, and improved support for placement of alcohol-based hand rub in clinical areas.

Key outcomes and initiatives in 2016/17 included:

- Revision of the Hand Hygiene Policy and Procedure;
- Transition of the Hand Hygiene Reviewer Training to an online, self-directed module with mandatory completion of a self-assessment and competency check;
- Increased number of site-based hand hygiene reviewers resulting in more site engagement and ownership;
- Completion of department-specific sections of the Hand Hygiene Reviewers Guide.

IPC in Action

This is an example of how IPC principles are applied “on the ground” in Alberta’s healthcare system in a complex situation.

In 2016/17, South zone IPC was engaged in investigation and follow-up of a cluster of Group A Streptococcal infections involving persons receiving outpatient services. The two serotypes identified were strains known to lead to severe disease but uncommon in that area of Alberta.

IPC best practices in wound care and environmental cleaning were reinforced and enhanced surveillance was established. Investigation revealed that the physical infrastructure of the clinic was suboptimal in terms of air exchanges and access to hand hygiene facilities was limited.

Through the collaborative efforts of IPC, Public Health, Seniors Health and site leadership, the clinic was relocated in September 2016. Following these actions, no further cases were identified.
A close collaboration with Population, Public and Indigenous Health is found within the integrated and comprehensive provincial IPC program that provides service to the continuum of care in Alberta. Physician leaders are well represented on the various committees and initiatives within the IPC program. Monthly teleconferences are held involving IPC physicians and Medical Officers of Health, where together, with senior IPC operational leaders, program strategy and decisions are established. Physician leadership is provided by Dr. Gerry Predy, Senior Medical Officer of Health and Dr. Mark Joffe, Senior Medical Director IPC. The following highlighted areas were addressed in 2016/17.

**Antibiotic-resistant Organisms**

Ongoing review of strategies for screening and managing antibiotic-resistant organisms continued, with reference to the Alberta Health-sponsored, Institute for Health Economics/AHS-organized, Canadian Consensus Development Conference on Surveillance and Screening for Antibiotic-Resistant Organisms that was convened in Calgary, Alberta in June 2014. Detailed reviews and implementation strategies have been undertaken for all antibiotic-resistant organisms with a particular focus on updated approaches to screening for Vancomycin-resistant enterococci, admission screening protocols including carbapenemase-producing organisms, and management of individuals with previously known colonization. The goal of these reviews was to consistently apply a contemporary evidence-based approach throughout the province. Revised screening strategies have been implemented with incorporation of quality assurance reviews.

A comprehensive review of antibiotic-resistant organism patient management in ambulatory care has been completed, beginning in Cancer Control Alberta. Changes in isolation strategies focused on meticulous attention to Routine Practices are being implemented in appropriate ambulatory settings. Implications for the Emergency Department will be considered next. A detailed review of strategies for IPC management of carbapenemase-producing organisms is currently underway.

**Hand Hygiene**

Improving hand hygiene compliance remains an organizational priority. Enhanced resources and software platform implemented provincially in AHS in 2014/15 have facilitated ongoing review and feedback with quarterly reporting to frontline staff, units, programs and sites. Hand hygiene compliance rates continue to demonstrate incremental, steady improvement.

**Clostridium difficile**

Overall provincial rates of hospital-acquired *Clostridium difficile* infection are stable and below the national comparator rate. Prevention and management of *Clostridium difficile* infection remains a priority within IPC. Preprinted care orders have been implemented provincially to facilitate a standardized approach to recognition and management of *Clostridium difficile* infection in acute care hospitals across Alberta. Antimicrobial stewardship continues to evolve within AHS and will be key to successfully reducing *Clostridium difficile* infection rates.
Emerging Technologies

New technologies for environmental disinfection have become available over the last several years and include systems that use ultraviolet light, hydrogen peroxide vapour, and hydrogen peroxide/ozone vapour. Though there is considerable interest, the number of systems available, the potentially significant expense, and the relative lack of outcome data complicate decision-making.

In collaboration with Linen and Environmental Services a year-long pilot project utilizing a hydrogen peroxide vapour system is underway in Calgary and Edmonton. While there is great interest in the potential for novel environmental disinfection strategies to prevent hospital-acquired infections, confirming efficacy would require a large scale cluster randomized controlled trial. The pilot project is focused on time-motion analyses to carefully explore the implementation and operational characteristics of new technologies. Specifically, better understanding is needed for the additional time requirements for terminal disinfection of patient care rooms, practicality of implementing such devices in facilities with large numbers of two and four bed rooms, the impact on patient flow throughout the system, and the impact on clinical care for frontline healthcare workers. *Clostridium difficile* infection rates are also being tracked as an outcome measure of the pilot project.

Review of the Provincial Infection Prevention and Control Committee

Together with the Clinical Quality Metrics group within AHS Quality and Healthcare Improvement, a review of the Provincial IPC Committee has been completed. The committee’s mandate and membership requirements are outlined in Alberta Health (2011) Standards for Infection Prevention and Control Accountability and Reporting. The review has focused on whether engagement of stakeholders is sufficient and whether the current committee structure and function facilitate improved patient safety within AHS. Feedback received and options for improving engagement are being considered. A full report on this review is available to Alberta Health upon request.

Emerging Respiratory Pathogens

Novel emerging pathogens will always remain a potential threat. Known and ongoing emerging pathogens include Middle East Respiratory Syndrome Coronavirus, emerging from Saudi Arabia and surrounding countries and responsible for significant hospital outbreaks in the Middle East and South Korea. Novel influenza viruses such as H7N9 remain potential threats. Considerable effort has been devoted to triage strategies for management of patients presenting to Emergency Departments with respiratory symptoms, particularly with a history of travel. These issues require ongoing attention and frequent reminders.
Carbapenemase-producing Organisms

This group of multi-resistant gram negative pathogens are known by a variety of acronyms such as CPOs, CREs, KPCs, NDMs, etc. and represent a significant current and future threat as antibiotic treatment options are limited or non-existent. The frequency is known to be increasing year-over-year in Canada. In Alberta, most have been imported with overseas travel, but community spread and increasing prevalence are inevitable. We have seen limited spread within Alberta healthcare facilities to date but events in spring 2016 at the University of Alberta Hospital represent a harbinger of things to come. After identifying colonization of a long-term University of Alberta Hospital patient with a New Delhi metallo-beta-lactamase-producing Klebsiella pneumoniae, about 500 potential contacts were identified, including patients transferred or readmitted to other acute care and continuing care facilities. Contact follow-up was complicated and prolonged but notification and screening were undertaken and secondary transmission to approximately ten individuals was identified. This outbreak was reported as required to the Chief Medical Officer of Health by the IPC Executive.

Heater-cooler Units and Mycobacterium chimaera Infections Following Cardiovascular Surgery

A slowly evolving global outbreak of infections with Mycobacterium chimaera in patients undergoing cardiovascular procedures involving open chest surgery and linked to heater-cooler units that are an essential component of the surgery resulted in a Health Canada Alert on October 21, 2016 and prompted an extensive response from many stakeholders within AHS. A multi-disciplinary working group comprised of operational leaders, cardiovascular surgeons, cardiologists, IPC, AHS Legal, Clinical Engineering, perfusionists, and others was quickly struck and met regularly to guide the AHS response to this issue. Review of heater-cooler cleaning, disinfection, placement within the Operating Room, and exhaust venting was undertaken. AHS Senior Leadership rapidly deemed that disclosure and patient notification were required and letters were distributed to nearly 11,500 individuals who had cardiovascular procedures involving open chest surgery in Calgary since January 2013 or in Edmonton since January 2012. Specific information about this issue with an individual risk of less than 1:1000 surgeries was added as part of the informed consent for surgery.

To detect potential infections in Alberta, a retrospective data link was conducted to match all patients in the province having had these procedures with the provincial laboratory Mycobacterial database. Fourteen potential links were detected and isolates were forwarded to the National Microbiology Laboratory for further analysis to determine whether patients had Mycobacterium chimaera, since identification to the species level is not routine or generally necessary. Of these, two isolates, both from sputum specimens, were identified as Mycobacterium chimaera. One of the individuals has multiple medical issues and remains under investigation, though is not thought to have infection with cardiovascular procedure-derived Mycobacterium chimaera, while the second individual had no evidence of infection. Confirmation results from whole genome sequencing showed conclusively that these two isolates are not related to the global outbreak.
A system for prospective monitoring has also been established to determine whether any individual undergoing cardiovascular procedures involving open chest surgery subsequently develops infection with *Mycobacterium chimaera*. All physicians and nurse practitioners in the province were notified about this issue and were asked to monitor and refer symptomatic patients for assessment. A number of calls have been fielded from patients and healthcare providers and a small number of patients have been seen by specialists in Infectious Diseases with further work-up and culture, as appropriate. To the end of March 2017, there have been no confirmed infections with *Mycobacterium chimaera* following these procedures in Alberta.

Ongoing mitigation strategies are in place, including a loaner program recently initiated by the manufacturer so that Alberta heater-cooler units can be returned for dismantling, deep cleaning, and disinfection. Ultimately, we await a definitive engineering solution to be approved by Health Canada to fully address this issue and completely eradicate the risk of *Mycobacterium chimaera* aerosolization and infection during surgery.

**Special Pathogens Unit**

As previously identified in the 2014/15 IPC Annual Report, the threat of Ebola led to establishment of a Special Pathogens Unit at the University of Alberta Hospital. Maintaining such a unit requires ongoing vigilance, training, dedicated laboratory equipment and repeated simulation. Long-term disaster planning and emergency preparedness require Federal/Provincial/Territorial input and decisions to clarify optimal strategies, roles and responsibilities across Canada. AHS would be pleased to partner with Alberta Health in ongoing discussions with the Public Health Agency of Canada to enhance preparedness.
Future Direction and Priorities

During 2017/18, AHS IPC will remain focused on strengthening the foundation of quality IPC practices that occur daily in the provision of patient care within AHS facilities and services. Future plans and priority actions are aligned with the AHS IPC Strategic plan. Specific goals for 2017/18 are:

**Accountability and Monitoring**

- Completing Cycle 3 medical device reprocessing reviews to support quality medical device reprocessing practices with Covenant Health, Calgary and Edmonton zones done at the time of this report. A business case for a new platform for recording and reporting has been approved and the process will be in place for Cycle 4 medical device reprocessing reviews.
- Implementing the recommendations arising from the Provincial IPC Committee evaluation.
- Completing the revision of the Acute Care Resource Manual.
- Following up on recommendations from the final report of the Office of the Auditor General of Alberta.

**Provincial Surveillance**

- Integrating IPC patient management into the IPC surveillance system by facilitating communication between sites and jurisdictions. The surveillance platform will continue to play a central role in recording and harmonizing antibiotic-resistant organism management across the province.
- Increasing focus on automated reports and increasing availability of surveillance information to all members of the healthcare team.
- Evaluating antibiotic-resistant organism Additional Precautions protocol compliance and process.
- Evaluating the epidemiology of the healthcare-associated infections in Alberta’s acute care facilities.

**Point Prevalence Infection Survey**

In March 2017, AHS member acute care facilities of the national IPC surveillance initiative, through the Public Health Agency of Canada’s Canadian Nosocomial Infection Surveillance Program, participated in a national point prevalence study to review the burden of illness related to healthcare-associated infections in acute care facilities across Canada. Participating facilities were Foothills Medical Centre, Peter Lougheed Hospital, Rockyview General Hospital, South Health Campus and Alberta Children’s Hospital in Calgary zone and the University of Alberta Hospital, Mazankowski Alberta Heart Institute, and Stollery Children’s Hospital in Edmonton zone. Healthcare-associated infections are responsible for significant morbidity and mortality, and utilize considerable health care resources. This study was previously conducted in 2002 and in 2009.

This year the Royal Alexandra Hospital, Grey Nun’s Community Hospital, Sturgeon Community Hospital, and Cross Cancer Institute also participated using this national surveillance protocol, increasing the Alberta dataset and contributing to the knowledge base of the epidemiology of these infections locally, provincially, and nationally. Further, the Canadian Antimicrobial Resistance Surveillance System provided funding for a similar national point prevalence study to the Queen Elizabeth II Hospital, Westlock Healthcare Centre, Red Deer Regional Hospital, and Chinook Regional Hospital. A provincial working group will develop a project plan to analyze the Alberta data in 2017/18.
Physical Environment and Infrastructure

- Completing, with Linen and Environmental Services, the pilot of a room disinfection technology.
- Participating in the review to select surface disinfectants and to select products based on Health Canada efficacy standards, safety, user acceptability, and cost.
- Collaborating on identification of upgrades for medical device reprocessing infrastructure needs.

Public Awareness and Education

- Continuing the Calgary zone acute care facilities use of probiotics as a strategy to prevent *Clostridium difficile* infections.
- Developing additional patient education materials.
- Expanding the number and scope of best practice guidelines to support quality patient care.

Hand Hygiene

- Continuing to work towards achieving the 2017/18 target of 90.0% through stakeholder engagement and education on hand hygiene.
- Evaluating hand hygiene reviewer education modules and inter-rater hand hygiene reliability.
- Reviewing hand hygiene compliance reports created for frontline interventions and for formal reporting.

Human Resource Capacity

- Demonstrating commitment to the education of staff members by supporting IPC staff to attain Certification in Infection Control and by refreshing the content of the orientation manual used in training new IPC staff members. IPC will continue to support presentations at meetings and publication of innovative practice and research initiatives.
- Continuing the development of resource manuals for specific care delivery areas including Ambulatory Care and Cancer Control Alberta.
- Initiating work with the Northern and Southern Alberta renal programs to address gaps identified in a practice review. Revision of hemodialysis practices will build on the work already done with Ambulatory Care.
- Completing online education modules for Routine Practices and Additional Precautions to support all frontline healthcare providers to apply IPC principles in daily practice. Other IPC online resources for staff will be reviewed and have content updated where required.

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