PICNet
Provincial Infection Control Network – BC

An Assessment

Of

Infection Control Activities

Across the

Province of British Columbia

2006

Corrected v 1.0 - 2007

No matter how hard one tries to
'do it right the first time'…
it's not always possible.
The 2007 corrected version of
"An Assessment of Infection Control Activities
Across the Province of British Columbia"
reflects the feedback provided to PICNet following
presentation of the original survey results
to the Health Authorities in the Fall of 2006.
Although the Health Authorities found
the original report informative and its recommendations useful,
they noted a few minor inaccuracies in the data. None of the inaccuracies
changed the overall key findings and recommendations of the report
but prior to posting this document on the web
the Needs Assessment Working Group
voted to make the necessary changes.

To the best of our knowledge
the information reported in this corrected document now reflects
the true state of affairs within the infection control community
of BC during the period of
November 2005 – March 2006

PICNet Management Office, 2007

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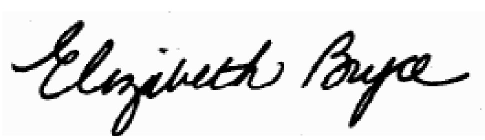

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Executive Summary

This assessment of infection prevention and control activities within health care facilities across the province of British Columbia was an ambitious undertaking for the newly formed Provincial Infection Control Network (PICNet). It is due to the dedicated work of health professionals from across all the Health Authorities that PICNet is tabling this report. For the first time, British Columbia has a picture of infection prevention and control activities across the province and recommendations for moving ahead.

The Provincial Infection Control Network (PICNet) was established in 2005 by the British Columbia (BC) Ministry of Health Services. PICNet's community of practice consists of all Health Authority staff involved in infection control activities across the province. A principle aim of PICNet is to guide and advise health care professionals across the continuum of care on the prevention and control of healthcare associated infections using a collaborative and evidence-centered approach. PICNet is accountable to the Provincial Medical Services Committee which reports to BC's Leadership Council.

During the first stakeholder meeting, in May 2005, knowledge gaps were identified with relation to surveillance, resources and standards/best practice development. In July of 2005, a Needs Assessment Working Group (NAWG) was created with the goal of determining the current status of infection prevention and control activities across the continuum of health care within British Columbia.

The specific objectives of the Needs Assessment Working Group were:

- To develop an inventory of the state of infection prevention and control across the continuum of health care to facilitate best practice.
- To identify needs and/or gaps from the results of the inventory and prioritize these for intervention.

The NAWG divided the assessment into 3 distinct areas:

i. **Infection Control Human Resource Information**
(Includes infection control, occupational health and safety, and public health)

ii. **Infection Control Surveillance Information**
(Within directly funded healthcare facilities)

iii. **Infection Control Practices**
(The standards, policies and guidelines related to healthcare associated infection from each of the three practice domains)

Information for the Needs Assessment was collected from all six health authorities within British Columbia between November 2005 and March 2006 and was analyzed by a consultant epidemiologist. The intent of the Needs Assessment was to provide a **'snap shot'** of infection control activities in the province and although the information gathered was not always comprehensive, it was sufficient enough to do just that. The NAWG subsequently identified key priority areas for intervention using current national and international standards for infection control to support recommendations.

Infection control practice is multidisciplinary and encompasses the disciplines of infection control, medical microbiology, public health, occupational health in the acute, long-term care and community sectors. The full report focuses on five key areas: Infection Control Resources; Occupational Health Resources; and Public Health Resources; as well as Surveillance; and Practice.

The review of these areas identified three overarching themes:

1. Insufficient number of skilled staff to provide infection control services
2. Inconsistent standards for education/training to develop the skill set for provision of infection control services
3. Inconsistent standards in surveillance and best practices to guide those who deliver infection control services

INSUFFICIENT NUMBER OF SKILLED STAFF

Key findings in this area include that in the majority of health care facilities surveyed the published recommended staffing ratio of one infection control practitioner (ICP) to 100 to 120 beds was not met. As well, nearly eighteen (17.6%) of the existing fulltime ICP positions were unfilled at the time of the survey. There is also an apparent shortage of physicians and/or doctoral level staff, epidemiologists, support staff, and public health and occupational health personnel with specialized training in infection prevention and control.

INCONSISTENT STANDARDS FOR EDUCATION/TRAINING

There is a lack of clearly articulated education and/or training requirements for practitioners, physicians and other professionals working in infection prevention and control in facilities, public health and occupational health. For example, 22 (59.5%) of the ICPs surveyed who qualify are certified in infection control (Certification Board of Infection Control (CBIC)). Various educational programs exist across the country and internationally relating to infection control (e.g. University of British Columbia, University of Calgary); however, the programs vary in content and often have long waiting lists. The reason for this is beyond the scope of this assessment, however, it was noted that in most facilities surveyed, dedicated funds for continuing education in infection control are not available.

INCONSISTENT STANDARDS IN SURVEILLANCE AND BEST PRACTICES

The review of surveillance activities in health care facilities surveyed identified that the surveillance definitions for Methicillin Resistant *Staphylococcus aureus* (MRSA) and vancomycin resistant *Enterococci* (VRE) are fairly consistent with all of the facilities performing this activity routinely. The majority of facilities screen patients for these organisms on admission, screen contacts of known carriers and approximately half use the Health Canada definitions for facility acquired versus community acquired MRSA or VRE. However, inconsistencies were identified in how contacts were screened and in the intensity of surveillance performed. In the area of *Clostridium difficile* associated diarrhea (CDAD) surveillance there is a greater variety of definitions and laboratory diagnostic methods used. The rate of surgical site infection surveillance ranged from 5 -71% depending on the procedure and variation exists in how this surveillance is performed. It should be noted that only a few sites perform surveillance for blood stream infections and ventilator associated pneumonias, despite the significant morbidity and mortality associated with these healthcare associated infections.

Similar to what was identified in the review of surveillance activities, the review of infection prevention and control practice documentation (e.g. standards, guidelines, policies/procedures) identified that variations exist within the facilities surveyed with relation to the terminology used in infection prevention and control. As well, there is a lack of consistent and up-to-date standards and guidelines for infection prevention and control practices. This is noteworthy as it speaks to either a lack of capacity, a variance in expectation relating to different infection control programs across the province, or both.

All the results from the Needs Assessment were reviewed by PICNet's community of practice at the Third Stakeholder Summit held on June 21, 2006. The participants identified priority areas within each of the above themes and proposed approaches for addressing these priorities. The summation of their recommendations - which are outlined in this document under "Next Steps" - is that PICNet develop two working groups; one to address Surveillance issues, and the other to address Education/Training and Practice issues.

Introduction

Healthcare associated infections (HAI), which include nosocomial or hospital-acquired infections, are defined as any disease or pathology related to the presence of an infectious agent or its products as a result of exposure to health care facilities or health care procedures.[1] Historically, HAI have been acquired during stays in hospital; however, this profile is changing with more invasive outpatient procedures, and shortened length of stay contributing to acquisition and detection outside the facility walls.

HAI directly affect the patient, their families, their care-givers, and the health system as a whole. In the United States, *Staphylococcus aureus* (SA) infections resulted in three times the length of stay (14.3 vs. 4.5 days) and five times the risk of in-hospital death (11.2 percent vs. 2.3 percent)[2]. Alone, SA infections resulted in an estimated 2.7 million days in excess length of stay, $9.5 billion in excess charges, and close to 12, 000 inpatient deaths per year.[2]. *Clostridium difficile* infections have been estimated to cost the U.S. healthcare system in excess of $1.1 billion per year.[3]

The Public Health Agency of Canada (PHAC) estimates that the annual burden of illness in Canada related to surgical wound infections, pneumonias, bacteremias, urinary tract infections and other sites exceeds $453 million with emerging antibiotic resistant organisms (i.e. MRSA, VRE) adding an additional cost of $24-35 million.[4] In the last five years alone, a number of national and local studies have taken place examining infection control in both the public health and hospital settings [6, 7, 8, 9, 10]

Each of these reports emphasised the need for coordination and resources within the world of infection control practice. Consequently, in January 2005, the Ministry of Health Services authorized the development of the Provincial Infection Control Network (PICNet) in British Columbia. The purpose of the PICNet is to guide and advise health care professionals across the continuum of care on the prevention and control of healthcare associated infections in British Columbia using an evidence-centered approach.

PICNet's core membership or community of practice consists of experts in the field of infection control, medical microbiology, epidemiology, infectious diseases, public health, occupational and environmental health. PICNet is a true network where all work is done in a collaborative, horizontal, and non-hierarchical fashion. The Network is accountable to the Provincial Medical Services Committee (PMSC).

During the first meeting of PICNet's stakeholders, in May 2005, knowledge gaps were identified with relation to surveillance, resources and standards/best practice development. In British Columbia there has never been a systematic province- wide review of these areas. In July of 2005, a Needs Assessment Working Group was created with the goal of determining the current status of infection prevention, surveillance and control practice across the continuum of health care within the Province of British Columbia for evidence- based decision making.

The specific objectives of the PICNet Needs Assessment Working Group were:

- To develop an inventory of the state of infection prevention and control across the continuum of health care to facilitate best practice.
- To identify needs and/or gaps from the results of the inventory and prioritize these for intervention.

BACKGROUND

As the Working Group began preparations for the Needs Assessment, two key issues were identified as requiring consideration during implementation of the assessment.

1) COMPETING DEMANDS ON INFECTION CONTROL HUMAN RESOURCES

Infection control professionals in each health authority are very busy. Establishing time to meet or receive timely feedback on a document or collecting data can be a difficult challenge to their already tight schedules. However, in this case, the timing of the Needs Assessment coincided with the data collection and interview schedule of the Provincial Office of the Auditor General who is carrying out an independent review of the provincial infection control system. This led to the occasional conflict for the ICPs time. It should be noted that PICNet has agreed to share all material collected with the office of the Auditor General. Once PICNet learned of the Auditor General's investigation it requested clarification from the Provincial Medical Services Committee as to whether PICNet should proceed with its Needs Assessment. The PMSC encouraged PICNet to proceed as planned.

2) HEALTH AUTHORITY PARTICIPATION

While infection control representatives of the different health authorities had been participating in meetings and discussions regarding the development of the PICNet since May 2005, there was little time directed towards the issues of preparing the stakeholder/health authorities for the PICNet needs assessment data collection and analysis process. The following outlines the steps that were required to ensure a clear understanding of PICNet and PICNet's Needs Assessment:

- The need to formally engage the executive of each health authority /stakeholder
- The need to clarify the purpose and intent of PICNet and its formal relationship to each stakeholder through communication of its governance model and decision making models.
- The need to offer confidentiality and stakeholder control of their data
- The need to clarify the acceptable use and handling of data
- The need to confirm necessary management approvals as requested by individual ICPs to ensure they were supported by their organizations

These steps were very important for PICNet and while they were time consuming they aided in the establishment of essential trust among the stakeholders and therefore the capability of the needs assessment project moving forward.

PROCESS

The Needs Assessment Working group divided the assessment into three distinct areas:

I. Infection Control Human Resource Information
(Includes infection control, occupational health and safety, and public health)

II. Infection Control Surveillance Information
(Within directly funded healthcare facilities)

III. Infection Control Practices
(The standards, policies and guidelines as they relate to the provision of infection control service from the three practice domains)

The information was to be collected from all six health authorities within British Columbia. Five health authorities divide the province into unique, non-overlapping geographic regions. The sixth health authority, the Provincial Health Services Authority (PHSA) is responsible for the coordination of a number of specialized health organizations (for example the BC Cancer Agency) and their services throughout the province. These six health authorities are:

1. Interior Health Authority (IHA) – regional scope
2. Fraser Health Authority (FHA) - regional scope
3. Vancouver Coastal Health Authority (VCHA) - regional scope
4. Vancouver Island Health Authority (VIHA) - regional scope
5. Northern Health Authority (NHA) - regional scope
6. Provincial Health Services Authority (PHSA) – provincial scope

Each participating regional scope health authority (HA) is composed of formal sub-units known as health service delivery areas (HSDA). There are also affiliated facilities (for example faith-based hospitals) in some health authorities. Although as much information as possible was collected at the HSDA and affiliate levels, to maintain confidentiality, the Needs Assessment Working Group agreed to analyze the information in this report at the health authority level.

At the outset of the project, an introductory letter was signed and emailed to each Health Authority executive, followed by on-site visits by PICNet representatives to meet with key stakeholders. In addition to health authority visits, visits were made to practice leaders and experts in infection control, occupational health and safety and public health across the province.

The first letter was followed by a communiqué outlining how all the information was to be managed. The Co-Chairs, PICNet Management Office and assigned Leads for each of the (sub) sections would oversee the collection of all the regional information. All the personal/organizational identifiers on the data would be removed prior to viewing by the Needs Assessment Working Group. The Needs Assessment Working Group (NAWG) would review the analysed data and assist in the development of the final provincial report. The final provincial report would be tabled with the PICNet Steering Committee and the Provincial Medical Services Committee (PMSC) prior to wider dissemination in the spring of 2006. As well, presentations would be made for each Health Authority with their specific regional data. As of March 31st, 2006, all of the infection control materials collected on behalf of PICNet for the Needs Assessment was returned to the appropriate region.

The original timeline for the project was Sept-December 2005, but because of the issues identified in the background section above, the Needs Assessment Working Group (NAWG) sought and received an extension from the PICNet Steering Committee to March 2006. As a result, the following report is based on information gathered between November 2005 and March 2006 and as such represents a snapshot of infection prevention and control activities in BC at the time.

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Prior to presenting the findings from the review of resources, it is worth reminding the reader that in the business of infection control one professional group never truly works in isolation. The practice of infection control requires a multidisciplinary team that includes not only nurses, but physicians, epidemiologists, laboratory technicians, occupational health and safety experts, etc., all interacting on a daily basis. The intention of this report was never to measure how these teams work together within individual Health Authorities, nor could it capture all practice areas (given fiscal restraints). Rather this report focuses on the three groups individually (facility infection control, public health, and occupational health).

The goal of the surveys done for each of these areas was to provide a "snap shot" of the infection prevention control activities occurring within the Health Authorities at the time of the survey. Collecting data from every health care facility in the province in order to derive a complete picture of these activities would be an overwhelming task. Instead a representative sample was surveyed.

The data presented in this report is based on the data provided from the Health Authorities at the time of the survey. Since the time interval in which this data was collected some of the HAs have been successful in enhancing their infection control services through increased financial and human resources.

SECTION 1 - RESOURCES

Facility Infection Control

INTRODUCTION

This section of the Needs Assessment Working Group Resource Analysis focuses on the infection control resources needed to run an effective infection control program within facilities. The purpose of the infection control resources survey was to provide a picture of the financial and human IC resources available in the province during the review period (November 2005 to March 2006), identify differences in resource availability between health authorities as well as to highlight areas where there are opportunities or barriers to implementation of a successful IC program.

METHODS

The facility infection control resources questionnaire was developed by a consultant on behalf of the PICNet Needs Assessment Working Group (NAWG). In November 2005, acute care facilities, their associates and directly-funded long term care facilities from the six health authorities in British Columbia were directed by the consultant to an on-line password protected website to complete the form. In February 2006, as a result of the low completion rate, the NAWG further refined the forms and determined a minimal data set required for completion. Follow up e-mails and phone calls were made to clarify and/or request the information required in this minimal dataset. All data were submitted centrally to the PICNet Management Office for analysis.

The questionnaire incorporated data in the following areas: Facility capacity; Utilization of facility resources; ICP and other medical resources; and IC budget allocation. A copy of the data collection tool is available on request.

Data received from the online website were provided and analyzed in Microsoft Excel.

For the purposes of data analysis the HAs were designated as either urban or rural. As the data was aggregated by HA, it is not possible to give specific details by HSDA. HAs were designated urban based on a population density of >100 people per square kilometre. HAs designated as rural had a population density of <100 people per square kilometre. It is recognized that in all health authorities the population density exceeds this level within cities, but not when the large geographic area served by the health authorities designated as rural is taken into account.

RESULTS

1. RESPONSE RATE TO QUESTIONNAIRES

There were 80 acute care hospitals and 169 affiliated long term care/rehabilitation facilities (LTCF) in British Columbia at the time of the survey. Surveys were sent to the Infection Control Professionals who work in these facilities. Twenty one responses were received. In some cases, respondents filled out the questionnaire on behalf of their entire HA. As a result, the total number of responses represented 54 acute care facilities (67.5%) and 55 LTCF (32.5%). The low response rate for LTCFs is misleading as the majority do not have ICPs and therefore were not surveyed. Also, the LTCF facilities represented in this survey are limited to those facilities directly funded by the health authorities. Facilities that are privately owned and operated were not included in this survey and the infection control resources in the facilities were not measured.

Finally, to ensure confidentiality, the data presented below is aggregated at the HA level. The process of aggregating the data eliminates the variability seen between facilities within the HA and it may thus appear as if the resources are evenly spread across the HA, where in most instances this was not the case.

2. STAFF RESOURCES

a. ICP Staff

Data on infection control professionals (ICPs), by health authority, is presented in Table 1. The proportion of ICPs with two years of experience or less ranged from 0% in one health authority to 80% in another health authority. Comparison between rural and urban designated health authorities showed that the proportion of ICPs with less than or equal to two years experience was significantly higher in rural health authorities than urban health authorities (68.2% vs. 16.7%; $p<0.001$). Of those ICPs with greater than two years experience, 22 (59.5%) were CBIC (Certification Board of Infection Control) certified.

The number of vacant FTE (full time equivalent) positions for infection control varied between health authorities and ranged from 0 to 3.5 FTEs. In two health authorities, at least one of the positions has been vacant for one year. Primary reasons given for not filling these positions were the inability to find a suitable candidate to fill the role. This is important in that over 17.6% of ICP FTEs for all HAs were unfilled at the time of the survey. The shortage of ICPs is also reflected in that 76.3% (ranging from 20-90.9%) of ICPs from all HAs reported working overtime (greater that 36 hours per week).

Table 1: Regional infection control resources (excludes management)

HA	**Number of ICPs**	**N (%) Nurses**	**Median (range) years of experience**	**N (%) CBIC certified**	**N(%) working more than 36hrs/week**	**Actual Number of FTE ICPs**	**Vacant FTE positions**	**Total # of FTE ICPs**
A	10	10 (100)	10 (0.5-19)	3 (30.0)	10 (90.9)	9.6	2	11.6
B	16	16 (100)	1 (0-20)	5 (31.3)	14 (82.4)	14.5	2.4	16.9
C	5	5 (100)	0 (0-7)	1 (20.0)	1 (20.0)	2.1	1	3.1
D	8	6 (100)	10 (0-20)	2 (25.0)	4 (66.7)	6.9	2.14	9.04
E	14	13 (92.9)	10 (0.08-25)	8 (57.1)	11(78.6)	12.7	0	12.7
F	6	6 (100)	6 (0.5-20)	3 (50.0)	5 (83.3)	5.8	3.5	9.3

b. Infection Control Physician/Doctoral Staff

Five out of six HAs (83.3%) reported having either a physician or doctoral level person who provided service to the facility's IC program, however, the number and medical specialty of these physicians varied by health authority. In the two rural designated health authorities, one HA did not have physician support for their IC program while the other HA reported access to one infectious disease physician for the entire HA as well as access to an additional physician leader for infection control if needed. In the regions designated as urban, the number of physicians ranged from one to seven with specialties in infectious diseases, internal medicine, medical microbiology and pathology. The number of medical hours provided to the IC program by all physician or PhD resources ranged from no hours per week in one HA to 57.5 hours per week in another HA.

c. Support Staff

Support provided to infection control programs surveyed was minimal. The median number of administrative support hours per week provided to the IC program surveyed was three hours (mean 4.7 hours; range: 0-12 hours). Only one respondent, representing one HSDA, reported one dedicated human resource (HR) hour per week spent on infection control. All remaining respondents reported that no dedicated human resource support was provided to their IC program. Support for information systems (IS) was varied across health authorities with 0-1 hour/week dedicated to facilities in four HAs to 10 and 75 hours/week provided in the two remaining HAs. HR and IS support services may be available on a consulting basis, but not dedicated to the IC programs.

d. ICP Distribution of Work

The distribution of ICP work hours among infection control (IC) activities is presented in Table 2. The intensity of activity reported by the various IC programs varied by how the questions were interpreted by the respondents. In some cases the respondents were reporting activity for their entire HA and in others they were reported by individual hospital. No apparent association between the size of facility and IC activity was noted. In the facilities surveyed the majority of ICP time was dedicated to teaching, surveillance activities (collecting analysing and interpreting data), policy revision and review, consultation, outbreak management and meetings. These activities varied within and across HA, but universally there was very little time spent on infection control research.

The Delphi project for IC staffing requirements suggests 27% of ICP time should be spent on surveillance activities, 16% on education, 14% on prevention of transmission and 8% on outbreak management. The results in Table 2 show the proportion of ICP work hours reported in each of these areas which vary - in some cases - dramatically from the Delphi numbers as well as show variation between HAs [4].

Of note, in two of the HAs designated as rural, is the large portion of time is used for traveling between facilities (mean 9.7%), reflected by limited personnel covering various facilities spread out over large geographic areas. As compared with the HA designated urban (mean 4.9) ICPs in rural areas spend almost twice as much time in travel. Though not statistically significant (p=0.55), the difference is notable.

In two health authorities, ICPs reported 20% of their work time spent on 'other' activities. In one health authority, this included 20% of time spent on Workplace Health and Safety duties while in another HA, 75% of one ICPs work time was spent dealing directly with construction and housekeeping issues. Also of note, ICPs are sometimes asked to provide consultation when outbreaks occur in the community. Even though this activity falls outside of their job description, there is an expectation among the HAs that facility based ICPs provide this service.

Table 2: Distribution of total proportion of ICP work hours by IC activity

Activity		% (or % range) of ICP hours					
	Delphi %	A	B	C*	D*	E*	F*
Teaching	16	10	30	8-13	5-10	5-30	5-30
Surveillance: collect/analyze /interpret data	27	55	10	21-29	1-20	10-40	15-40
Write/review IC policy	14 (total)	2	10	7-17	3-10	2-20	1-10
Product evaluation		1	5	1-2	1-5	1-5	1-6
Consultation		1	2	13-15	5	2-10	2-20
Regional IC activities		5	5	20-31	1-5	3-16.5	1-10
Meetings		8	5	8-9	5-25	4-20	5-20
Outbreak management (Delphi = 8%)	8	10	10	2	1-5	4-15	2-20
Research		4	3	0	0-5	0-5	0-5
Travel		4	10	7-12	2-5	2.5-10	0.5-10
Other		0	10	5-20	10-75	2.5-20	0-2

**% range provided for HAs where regional values were not provided*

e. ICP: Beds Ratios

The reported ratios of ICPs per acute care beds by health authority are presented in Table 3 based on the number of ICP FTEs allocated and based on the number of filled positions. Current staff to acute care bed ratios varied between health authorities from one ICP per 67 acute care beds to one ICP per 175 acute care beds. As it was determined that most infection control professionals had dual responsibilities for both acute care and long-term care beds, the number of acute and long-term care beds was combined to provide a more accurate ratio of ICP service provision. The ratio of ICPs for both acute and long-term care beds ranged from one per 270 beds to one per 525 beds.

Table 3: ICP: bed ratio in acute and long-term care

Health Authority	Total # of FTE ICPs	Theoretical ICP: Acute care beds*	Theoretical ICP: Acute +LTC beds**	Actual # of FTE ICPs	Actual ICP: Acute care beds*	Actual ICP: Acute + LTC beds**
A	12.6	1:147	1:302	9.6	1:193	1:332
B	17.9	1:67	1:304	15.5	1:77	1:351
C	3.1	1:175	1:525	3.1	1:175	1:525
D	9.04	1:164	1:371	6.9	1:215	1:486
E	12.7	1:102	1:270	12.7	1:102	1:270
F	9.3	1:108	N/A	5.8	1:173	N/A

*assumes all ICPs are dedicated to acute care

**assumes even distribution of ICPs across both acute and long-term care

3. BUDGETARY RESOURCES

Key contacts from each Health Service Delivery Area (HSDA) were asked about their 2005 infection control program budget for staff, office resources, materials as well as continuing ICP education. The majority of respondents from three health authorities were unable to provide budget data as infection control programs are funded out of the global hospital budget and do not have dedicated cost centres or control over program funds. Three health authorities were able to provide budget information. Of these, the office resources budget varied from $0 and $5,501 to $40,000. The budget for educational materials, database development and policy/procedure development was $0 in all three health authorities. The staff budget varied based on the number of FTEs allocated to the IC program.

4. TEACHING RESOURCES

Respondents from five health authorities reported on the number of teaching events held in the past year. The number of sessions held varied by facility and ranged from 11 to 300 teaching events. More than 90% of facilities from these regions reported keeping attendance records at these events.

All respondents from two regional HAs reported conducting some degree of effectiveness monitoring of teaching activities in their health care facilities. In the remaining HAs, there was variation among facilities with regards to how/if evaluations of teaching activities were completed.

Fifteen (71.4%) respondents reported access at their facilities to a computer projector, laptop and overhead projector. Approximately half (52.3%) of all respondents reported access to a slide projector and 76.2% had access to teleconference facilities.

DISCUSSION

The basis of a good infection control program includes both adequate financial and human resources. This includes an effective working team of Infection Control Professionals (ICPs) and physicians trained in infection control; the human resources needed to collect, enter and analyze data on the surveillance of healthcare-acquired infections (HAI); the ability of qualified staff to set and recommend policies and procedures based on synthesis of surveillance data, clinical practice guidelines and literature review and the resources to directly intervene to interrupt the transmission of infectious diseases; and resources needed to educate and train healthcare workers and providers in basic infection control procedures.[1]

1. INFECTION CONTROL STAFF RESOURCES

With the increased focus on infection control following the SARS outbreak and increasing rates of antimicrobial resistant organisms, the roles of ICPs have expanded as have the requirements for depth of knowledge. The demands for IC services have substantially increased the need for resources to provide educational programs and surveillance activities. Multiple responsibilities and lack of resources may hinder essential infection control activities such as assessing health care workers' educational needs or incorporating infection prevention strategies based on best practices.

Staffing recommendations must take into account not only the number of occupied beds within a facility, but also the type of care provided, characteristics of the patient population, the specific needs of the facility and geographic distances between sites.

The ratio of infection control professionals to acute care beds has changed over time. In 1985, the CDC recommended there be a minimum of one ICP per every 250 acute care beds. In 2001 the Canadian Infection Prevention can Control Alliance recommended ratios of 1 ICP per 150-175 acute care beds and 1 ICP per 150-250 LTC beds. [4] In 2002, *APIC (Association for Professionals in Infection Control and Epidemiology)* recommended that for an IC program to be effective, it should have a ratio 1 ICP per 100 to 120 beds regardless of setting. [5]

In 1985, the SENIC (Study on the Efficacy of Nosocomial Infection Control) project identified three essential elements of infection surveillance and control programs. [6] These included: epidemiological surveillance for infection occurring while patients were in hospital, developing policies and procedures to control these infections based on surveillance data and training specific personnel to do surveillance and coordinate the control activities. The SENIC project found that hospitals that established infection control programs including infection surveillance, one ICP per 250 occupied beds, an Infection Control physician and a program for reporting wound infection rates to surgeons were able to reduce their nosocomial infection rate by approximately 32%.

In 2002, Zoutman et al., conducted a comprehensive survey of the content, surveillance, control measures and resources of infection control programs in Canadian hospitals with over 80 beds. [7] The results indicated the following deficits in these programs: 42% of hospitals had less than one ICP per 250 beds and 80% had less than one ICP per 175 beds. Only 60% of programs had physicians with infection control training. The report recommended that resources for IC programs in hospitals need to be improved.

a. *Infection Control Professional Staff*

ICPs are most often nurses with at least a bachelor's degree or medical technologists. Often ICPs have master's degrees, as well as specialized training in infection control surveillance and in epidemiology. Newly recruited ICPs do not have this specialized training and a minimum of two years is the estimated time needed for an ICP to become proficient at their job. Certification in infection control through the Certification Board of Infection Control (CBIC) is available after two years of work experience. Also available are courses in both basic and advanced infection control practice through the Community and Hospital Infection Control Association of Canada, the University of Calgary, Queens University and the University of BC. In our study, 22 (59.5%) of ICPs with more than two years of experience were not CBIC certified. Completion of other courses in IC was not measured. Currently, there is no minimum standard for the core competencies of health care professionals trained in infection control.

As noted in the results, the proportion of experienced ICPs working in those HAs designated as urban was significantly higher than those designated as rural. As with other health care professions, it is difficult to recruit experienced practitioners to work in these areas. In all HAs vacancies posted for ICP positions often remain unfilled for prolonged periods and most ICPs report working overtime. A 2003 Canadian Institute for Health Information study of loss of nurses due to retirement projected a 13% shortfall of nurses by 2006. [8] As with all health sectors, the number of experienced ICP available to fill vacancies is becoming limited due to a high proportion of nurses reaching retirement age. Succession planning is needed to utilize existing expertise and to prevent shortages.

With a lack of human resources, especially in rural HAs, ICPs must spread their services thinly over wide geographic areas. This is reflected in the amount of time spent travelling between facilities and the amount of time spent on regional, as opposed to facility based activities.

Recently, two of the rural HAs received funding to hire additional ICPs, but there is a lack of experienced ICPs available to fill those positions. Other than recruiting ICP from out of province, the only option is to hire novice practitioners into those positions and provide education and mentorship. As noted in the budgetary resources results, dedicated funds for this education are limited.. It must also be noted that with a lack of experienced ICPs available to act as mentors, the time required for inexperienced ICP working in facilities to receive adequate training and perform their duties independently is prolonged.

Another disparity in IC staff resources noted in the results was the availability of a physician or doctoral level person who provided service to the facility's IC program. One HA designated as rural had no access to physician support and the other HA had one infectious disease physician covering the entire HA. Clearly this disparity in resources needs to be addressed.

Among all provincial health authorities, the majority of health care facilities surveyed do not meet the recommended standards for staffing and IC resources in order to function as an effective program. Even the theoretical number of allocated FTE staff (if all vacant positions were filled) does not meet the recommended ratio of 1 ICP per 100 to 120 beds set by APIC(5). This ratio is recommended for all health facilities regardless of setting. The most current Canadian standard calls for 1 ICP per 150 to175 acute care beds. This standard is met in all of the six HAs, but does not take into account the fact that most ICPs carry dual responsibilities for both acute care and LTC beds. With the majority of IC resources focused in acute care facilities, there is little support for LTC facilities. Also, as noted in the results sections, facility based ICPs are expected to provide consultation to the community. These programs are not resourced for this. Currently the shortage of infection control resources in the province is being addressed through the development of business cases that support more resources being directed towards these programs. Given the ongoing climate of limited resources and a lack of trained practitioners with IC experience, an emphasis needs to be placed on providing the resources to recruit and train new persons into the profession.

Key Findings:

Of those facilities surveyed:

- **The majority do not meet the published standards for IC staffing.**
- **There is a shortage of certified ICPs**
- **There is a lack of experienced practitioners, particularly in remote areas.**
- **Posted vacancies remain unfilled (17.6 % at the time of the survey)**
- **Seventy-six percent of ICPs reported working greater than 36 hours per week.**
- **There is a shortage of physicians and/or doctoral level staff with specialized training in infection prevention and control to provide services in many areas of the province.**
- **There are no minimum standards (i.e. core competencies) for health care professionals trained in infection prevention and control.**
- **Newly recruited ICPs often have limited opportunities for training or mentorship to build their competency in a reasonable time. The current education programs available are unable to meet the demand and dedicated funds for continuing education of ICPs are not always available.**

Recommendations:

1. **Establish recommendations for infection control staffing levels in all health care facilities (includes infection control professionals, physicians and/or doctoral level staff with specialized training in infection control).**
    a. **These recommendations should take into account the complexity of care provided in the facility; and**
    b. **Staffing ratios should consider the scope of service provision and the geographic separation between worksites within each HA.**
2. **Develop a strategy for the active recruitment of infection control staff:**
    a. **Succession planning is needed to utilize existing expertise and to prevent shortages.**
3. **Identify core competencies for all health care professionals involved in infection prevention and control.**
4. **Establish minimum education/training requirements for infection prevention and control to meet core competencies:**

a. **Infection control education requirements should be included as part of strategic planning activities and quality management initiatives;**
b. **Professional development plans must reflect the needs of the individual and the practice setting and/or background individuals bring to the role;**
c. **Establish funding for infection control education/training;**
d. **Minimum education standards for education/training must be flexible enough to address recruitment challenges; and.**
e. **Ensure that opportunities for specialized education/training in infection control are available.**

5. **Explore strategies to provide greater access of physicians with specialized training in infection control and experienced ICPs through sharing of resources and greater collaboration among Health Authorities ; and**
   a. **Encourage greater collaboration among all professionals dealing with infectious diseases (e.g., ICPs, OH, public health) including in-service training opportunities, to increase awareness of each others' roles.**

b. ***Administration, Human Resources (HR), Information Technology (IT) And Equipment***

Administrative support is essential for an IC program. Tasks such as data entry, typing minutes, policies and other documentation and correspondence need to be done. Also telephone inquiries need to be addressed and meetings arranged. Without this support, ICP work time is taken away from other essential activities. Non-personnel resources such as office space, computers, software, support etc. are also necessary for these activities to take place.

Key Findings:

- **IC programs report limited access to resources in the area of administrative, IT and HR. Up to 20% of ICP time was reported spent on these activities.**

Recommendations:

1. **Determine scope of responsibilities (i.e. roles and responsibilities) of infection control staff and then assess adequacy of administrative support, HR, IT and equipment within this scope.**

2. BUDGET

As indicated by responses from the various facilities surveyed, in most cases funding for infection control programs is not under a separate cost centre. While budget allocations vary by health authority and by HSDA, resources for infection control programs as a whole are included in global budgets under Patient Services, Laboratory Services or Quality Management/Improvement. Targeted funding is needed that is dedicated to infection control programs to facilitate hiring and retention of appropriate staff, provision of educational opportunities and to ensure that adequate support staff is available.

Key Findings:

- **Budget allocations for infection control programs vary by health authority and by HSDA.**
- **Infection control programs often do not have their own budgetary control.**
- **In most cases specific funding is not allocated for education of novice ICP or continuing education of experienced ICP.**

Recommendations:

1. **Review the budgetary requirements for IC programs.**
2. **Enable IC programs to have direct control of resources through a dedicated infection control budget (i.e. move from nursing/labs to safety and quality).**

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Occupational Health and Safety Resources

INTRODUCTION

In 2002, the Public Health Agency of Canada's Division of Nosocomial and Occupational Infections developed guidelines for the "Prevention and Control of Occupational Infections in Health Care" to assist occupational health and safety (OHS) professionals, medical directors and others responsible in the prevention and management of health care workers' (HCWs) exposures to, and infections with, infectious diseases. This guideline reinforced the necessity for collaboration between OHS departments and infection control programs in order to reduce occupational health hazards [1].

Within health authorities (HAs) in British Columbia (B.C.), OHS professionals are responsible for the prevention and control of occupational infections in the employee population (e.g., in the HCW). By contrast, infection control professionals (ICPs) are responsible for infection prevention and control in the patient population. Very often, measures to protect patients are also important for protecting staff, for example, immunizations, outbreak investigations and education on safe practices. In most jurisdictions world-wide, measures directed to employees are managed by the OHS departments, as that is where employee records (e.g., training, fit-testing, immunizations, etc.) are kept. Clearly, however, decisions regarding policies in this area, and the content of specific training programs, are best developed in a collaborative manner.

Roles and responsibilities of the OHS professional specific to the control of occupational infections can be divided into the four categories of risk assessment, risk control, education, and evaluation. Risk assessment activities include new employee health assessments and workplace surveillance. HCW immunizations, outbreak investigations, personal fit testing, and investigations for blood and body fluid (BBF) or communicable disease exposures fall under the category of risk control. Educational activities include new employee orientations and ongoing training. Finally, product and program evaluation and activities related to data collection and analysis comprise evaluation activities.

This section of the Needs Assessment Working Group (NAWG) Resource Analysis focuses on OHS department resources, procedures and policies related to the control of occupational infections. The purpose of this survey was to provide a picture of the OHS resources available in the province during the review period (March 2006), identify differences in resource availability between HAs, and highlight areas where improvements to current OHS programs could be made specific to the prevention and control of occupational infections.

METHODS

The OHS questionnaire was drafted for the PICNet NAWG by the Occupational Health and Safety Agency for Healthcare (OHSAH). After review and input from the NAWG and from the OHS directors from the six HAs, OHSAH made appropriate revisions to the questionnaire prior to finalizing it. In March 2006, the questionnaire was sent by e-mail from OHSAH to the OHS directors to oversee its completion by each of the six OHS departments. All data were submitted to the PICNet Management Office for analysis.

The questionnaire was designed in accordance with the Public Health Agency of Canada's 2002 Infection Control Guidelines: "Prevention and Control of Occupational Infections in Health Care" and focused on the following four areas: Risk assessment, Risk control, Education, and Evaluation. Examples of the data collected include: number of professional OHS staff and employees served by the department, the number of HCW immunizations, fit tests, and outbreak investigations completed in 2005, as well as descriptive data about the number and type of orientation and educational sessions done. Data were also collected for contract workers and medical staff working in the organization.

Data were entered in EpiData and analyzed in EpiInfo v.3.3.

RESULTS

1. *FACILITY EMPLOYEES AND OHS PROFESSIONAL STAFF*

Completed questionnaires were received from all six HAs. OHS employee data are presented in Table 1.

Table 1: Facility Employees in British Columbia

	N_{HA}	Median (Range) staff
Employees	5	18000 (9821-23500)
FTEs	3	10930 (6796-12000)
New hires	4	1041 (1041-3175)
Direct pt care employees	3	11500 (11500-12000)
Direct pt care FTEs	3	6655 (6600-10000)
Direct pt care new hires (2005)	2	2706.5 (2413-3000)

N_{HA}=the number of HAs that provided data
N_{total}=5, as one HA could not provide regional data

Data on OHS professional staff are presented in Table 2.

Table 2: OHS Staff by Profession

	N_{HA}	Median # of FTEs (Range)	Total # vacant FTEs
OH Nurse	6	5.5 (1.0-9.6)	3.5
OH Hygienist	6	0 (0-2.1)	0
OH Physician*	6	0 (0-0.1)	0
Director/Manager	6	3.0 (1.0-4.2)	1
Admin/Clerical Staff	6	3.3 (0-9.6)	0
Safety Consultant	6	5.8 (3.0-12.0)	0
MSIP (Musculoskeletal Injury Prevention) Teams	5	N/A	0
Disability/Claims Staff	4	3.5 (1.0-15.0)	0
Early Intervention Staff	3	3.6 (1.0-6.0)	0.4
Health and Wellness Staff	3	5.0 (1.0-9.0)	1.0
OHS Advisors	2	4.5 (4.0-5.0)	0
Other	3	1.0 (1.0-6.0)	2.0

OH=Occupational Health
*For 3/6 HAs, the OH physician works on a contract, on-call or sessional basis

Credentials of professional staff included: diplomas, bachelors degrees and/or certificates in OH nursing for OH nurses; masters in hygiene for OH hygienists; certificates, diplomas, bachelors, masters and doctoral degrees for OHS consultants.

A ratio of OH nurses to employees was calculated based on available data from all 6 HAs. Per one OH nurse FTE, there was a range of 1964 to 7000 employees (median = 2862).

Of the five HAs reporting the total job time dealing with issues related to the prevention and control of occupational infections for each OHS professional group (OH Nurse, hygienist, physician, manager, administrative staff and safety consultants), three HAs reported that for each position, less than 25% of work time was spent in this area. One HA reported that the OH nurse and physician spent 50-75% of total work time dealing with the control of occupational infections and that the OH manager and safety consultants spent 25-49% of work time on these issues. Another HA reported that the OH nurse and administrative staff spent 25-49% on these issues.

None of the HAs had OHS professionals that were dedicated solely to the control of occupational infections. Reasons cited for this included insufficient numbers of OHS professionals to dedicate individual staff solely to activities around occupational infections, as well as the generalist nature of the OHS professional. The OHS departments reported that infection control professionals were primarily responsible for issues related to infection control. OHS professionals, on the other hand, had a more generalist role in performing a wide range of tasks including the prevention and management of occupational infections, in addition to other responsibilities such as injury prevention and disability case management.

Three regions had professionals from other areas conducting OHS duties related to occupational infections. In all three HAs, these other professionals included ICPs. HAs also reported OHS access to clinical educators, public health resources, communicable disease nurses and fit-testers to fill roles pertinent to occupational infections within the OHS capacity.

Four HAs reported OHS vacancies. A total of 3.5 vacancies existed for OHS nurses. Other vacancies include 0.4 FTE for a physiotherapist for an early intervention program and 1.0 FTE for a health promotion coordinator. Reasons for these vacancies included a shortage of qualified professionals. It is noteworthy that although very little OH physician time is devoted to this area, none of the HAs reported active recruitment. The reason cited for this is the perception that qualified occupational medical specialists are not available or at least not easily accessible.

2. *RISK ASSESSMENT*

The objectives of the risk assessment are to evaluate the workplace to identify potential infectious hazards related to occupation and to assess and analyze the occupational risk associated with exposure to infectious disease.

OHS departments in all HAs conducted new employee health assessments (Table 3). This task was undertaken by OH nurses in all HAs, and involved administrative and clerical staff in four of the HAs. Two HAs indicated that 25-49% of total OHS department time was dedicated to new employee health assessments; four HAs reported that less than 25% of OHS time was spent on these assessments. The time spent during each employee health assessment on issues related to occupational infections varied greatly between the HAs with two HAs spending greater than 75%, two HA spending 50-75%, one HA with less than 25% and another HA with no time dedicated to issues around occupational infections.

The procedures for conducting new employee health assessments were similar across all HAs and included a baseline health assessment of all new employees with follow-up by OHS staff. Occupational infection control issues covered included general health screening, TB skin testing, immunization review (e.g., MMR, tetanus/diphtheria, hepatitis B) and laboratory/immune status screening. Other counselling reported by some HAs included review of safe needle utilization and BBF exposure protocols.

Three OHS departments conducted workplace surveillance visits to identify infectious disease hazards including examination of work setting, working conditions of staff, supplies, equipment and standards of practice. This was conducted by an OHS consultant in two of the three HAs as well as by the OH nurse (N_{HA}=1) and OH hygienist (N_{HA}=1). Visits included ward, outpatient clinics, laboratory, operating room and other clinical as well as non-clinical areas in acute, residential and community settings. One HA reported that each visit required two hours to complete. All HAs reported that less than 25% of OHS time was dedicated to workplace surveillance activities. Two HAs indicated lack of time and resources as well as overlapping roles with ICPs as reasons for not conducting workplace surveillance visits in 2005.

None of the HAs conducted employee health assessments for medical staff (non-employees of the hospital/HA) due to lack of resources, no tracking system, and no request for OHS to handle these staff.

Table 3: OHS Risk Assessment Activities

Activity	
Number (%) HAs conducting new employee assessments	6 (100)
Median (range) of new assessments conducted in 2005	1700 (>100-2096)
Mean (range) hours required for one new assessment	1.3 (0.66-2)
Median percentage (range) of new employees receiving health assessments (N=3)	63% (31%-100%)
Number (%) HAs conducting workplace surveillance visits*	3 (60.0)
Number (%) HAs collecting data on risk assessment tasks	4 (66.6)

*N_{total} HA=5 as one HA did not respond to this question

3. RISK CONTROL

The objectives of risk control measures are to implement appropriate OHS policies, procedures and programs to prevent and/or manage exposures or infections in health care workers (HCWs), including outbreak management. Data on risk control activities undertaken by OHS departments are presented in Table 4.

OHS departments in all HAs conducted HCW immunizations; these were undertaken by the OH nurse in all HAs, administrative staff (N_{HA}=4), OHS consultant (N_{HA}=1) and director (N_{HA}=1). Two HAs also reported hiring contract nurses to conduct influenza immunizations. The percent of total OHS time dedicated to HCW immunization was less than 25% in two HAs, between 25-49% in two HAs and 50-75% in one HA.

Outbreak investigations included OHS involvement at all six HAs with involvement by the OH nurse in all HAs, administrative staff (N_{HA}=4), director (N_{HA}=1) and OH physician (N_{HA}=1). Of the four HAs reporting the percent of OHS time dedicated to outbreak investigation and follow-up, three (75.0%) HAs spent less than 25% of time on these activities and one HA reported 50-75%.

Fit tests were conducted in all HAs by the OHS consultant (N_{HA}=5), by the OH nurse (N_{HA}=3) or by hired trained professionals (N_{HA}=1). There was also administrative involvement in two HAs. The percent of OHS time dedicated to fit testing was less than 25% in four HAs, between 25-49% in one HA and 50-75% in one HA. A relatively low number of HCWs received immunizations in 2005 (median = 14%). However, these data were only available for two HAs, and did not include uptake of the annual influenza immunization. While it would be expected that the majority of HCWs would already have adequate immunization coverage with the possible exception of new recruits, this cannot be verified.

OHS departments in all HAs conducted incident or exposure investigations for BBF and communicable diseases. These were conducted by the OH nurse in all HAs, with additional involvement by the OH physician (N_{HA}=1), OH hygienist (N_{HA}=1), OHS consultant (N_{HA}=2), director (N_{HA}=1) and administrative staff (N_{HA}=4). Of the BBF exposures that were reported to OHS departments in 2005, five HAs investigated 100% of reports and one HA investigated 66.5% of BBF reports made.

Data collection for risk control measures was undertaken by OHS staff in all HAs. The timeframe of collection varied by task with data on outbreak investigations and BBF and Communicable Disease (CD) exposures collected either immediately or daily by all OHS departments. Timing of data collection on HCW immunizations and personal fit testing ranged from immediately and daily to monthly.

Table 4: OHS Risk Control Activities

Risk Control	
Number (%) of HAs with OHS conducting HCW immunization	6 (100%)
Median (range) of HCW immunized in 2005	4097 (750-12000)
Median percentage (range) of all HCWs receiving immunizations, excluding influenza, in 2005 (N=2)	14% (9%-19%)
% HAs with OHS conducting immunization for Medical Staff	5 (83.3%)
Number (%) of HAs with OHS doing outbreak investigations	6 (100%)
Median (range) of OB investigations	15.0 (4-26)
Mean (range) of hours required for OB investigations	31.6 (8-60)
Number (%) HAs with OHS including medical staff on OB investigations	6 (100%)
Number (%) of HAs with OHS involved with fit testing	6 (100%)
Median (range) of fit tests in 2005	2045 (600-2875)
Mean (range) staff hours to conduct one fit test	0.43 (0.3-0.5)
Median percentage (range) of all employees receiving fit testing in 2005 (N=5)	11.2% (9.2%-13.9%)
Number (%) HAs with OHS conducting fit testing for Medical Staff	5 (83.3%)
Number (%) of HAs with OHS involved with exposure investigation	6 (100%)
Median (range) reported BBF exposures to OHS (2005)	219 (42-382)
Mean (range) staff hrs per BBF investigation	4.5 (2-10)
Median (range) reported CD exposures to OHS (2005)	23 (4-1500)
Mean (range) staff hrs per CD investigation	10 (3-16)
Number (%) HAs with OHS inclusion of Med Staff in exposure investigation	6 (100%)
Number (%) HAs collecting data on risk control measures	6 (100%)

4. EDUCATION

The objectives of educational activities are to provide HCWs with information regarding the importance of personal hygiene habits and compliance with recommended occupational infection precautions, and to highlight the responsibility of the individual during the delivery of care in the prevention of infectious disease transmission. Data on education activities conducted by OHS are presented in Table 5.

There was one HA where OHS staff did not conduct orientations in 2005 for new employees because there were too few OHS resources to do so. In this case, this role was undertaken by ICPs. Of the other HAs, new employee orientations involved the OH nurse and OHS consultant in four HAs, the OH hygienist and administrative staff in two HAs, as well as the director (N_{HA}=1) and OH physician (N_{HA}=1). Employee orientations were offered on a group basis; in all HAs, less than 25% of the orientation time was spent on the control of occupational infections. Relevant topics covered included: hand washing, immunizations (hepatitis B), BBF exposures, and personal protective equipment.

Three HAs had ongoing education programs for existing employees on occupational prevention and control. OHS staff involved included nurses (N_{HA}=3), hygienists (N_{HA}=2) and safety consultants (N_{HA}=2). Education sessions were offered on a group basis only in one HA and on both individual and group basis in two additional HAs. In all HAs, less than 25% of time spent on ongoing education was dedicated to the prevention and control of occupational infections. Topics relevant to occupational infections that were covered in education sessions were as previously described for new employee orientations. The three HAs where OHS did not conduct ongoing education stated that there were either no OHS resources to do so or that this role was handled by ICPs.

Only one HAs OHS department provided medical staff (non-employees including physicians, residents and medical students) with an orientation and ongoing education on occupational infectious disease prevention and control. OHS departments in all the other HAs stated lack of procedures and employment relationships with these groups as reasons for not providing these services.

OHS departments in two HAs collected data for educational tasks such as orientation to new employees or ongoing education. Reasons cited for not collecting these data included lack of a system or difficulty in doing so, or that this task was managed by the ICPs.

TABLE 5: OHS Education Activities

Education	
Number (%) of HAs with OHS conducting new employee orientation	5 (83.3%)
Median (range) of group orientations in 2005	64 (4-144)
Median (range) of new staff participating in group orientation	2400 (300-5000)
Median percentage (range) of all new staff participating in group orientation	95% (93%-97%)
Mean (range) hours to conduct group orientation	6.2 (1-20)
Number(%) of HAs providing Medical Staff with orientation	1 (16.7%)
Number (%) of HAs with ongoing education of existing staff	3 (50.0%)
Median (range) of staff participating in ongoing education	425 (250-600)
Mean (range) hours to conduct group education	5 (2-8)
Mean (range) of hours to conduct individual education	2.3 (0.5-5)
Number (%) of HAs providing medical Staff with ongoing education	1 (16.7%)
Number (%) of HAs collecting data on education	2 (33.3)

5. EVALUATION

The objectives of evaluation activities are to ensure that policies, procedures and programs relevant to occupational infection control are consistent with current recommendations and achieve their stated objectives. Data on evaluation activities conducted by OHS departments are presented in Table 6.

Of the five HAs where OHS staff conducted product evaluations related to occupational infections, two HAs conducted evaluations on a regular basis while three HAs conducted product evaluations on an ad hoc basis. Less than 25% of total OHS staff time was spent on product evaluations. Involved staff included OH nurses and safety consultants in four HAs, hygienist in three HAs, OH physician and director in two HAs, as well as administrative staff and an ergonomist in one HA.

OHS staff in five HAs participated in policy and procedure development related to control of occupational infections; this was done on a regular basis in four HAs and accounted for less than 25% of total OHS staff time. Staff involved included the OH nurse (N_{HA}=5), safety consultant (N_{HA}=4), the OH physician and director (N_{HA}=2), as well as the hygienist and administrative staff (N_{HA}=1).

In all six HAs, OHS staff were involved in data analysis related to control of occupational infections. Data analyzed by OHS in all HAs included: employee health assessments, HCW immunizations, outbreak investigations, fit testing, BBF exposures, CD exposures and data from new employee orientations. Staff involved in data collection and data analysis included the OH nurse and safety consultant in all six HAs, and the hygienist, director and administrative staff in four (66.7%) HAs. Data collection and data analysis accounted for less than 25% of total OHS staff time in five (83.3%) HAs, and 25-49% in one HA. Software and/or databases used included WHITE[tm], VAX (for human resources data), a Parklane incident tracking system as well as Excel spreadsheets.

Three HAs describing their process of evaluating occupational infection policies and programs within OHS stated that this included a review and update with stakeholders (e.g., ICPs) as measured against current standards such as Centre for Disease Control guidelines.

Table 6: OHS Evaluation Activities

Evaluation	
Number (%) of HAs with OHS conducting product evaluation Mean (range) staff hrs/yr on product evaluation	5 (83.3%) 60 (24-96)
Number (%) of HAs with occupational infection policy involvement	5 (83.3%)
Number (%) HAs conducting occupational infection data analysis	6 (100%)
Number (%) HAs conducting occupational infection data collection	6 (100%)

6. OTHER

OHS staff in five HAs were responsible for more than one site and were required to travel between sites. Travel time applied to all OHS staff within a given HA. While travel time accounted for less than 25% of total OHS staff time in three HAs, one HA reported that 850-1000 hours per year were spent travelling between work sites and that this accounted for 25-49% of total OHS department time.

Five HAs had contracted workers. In two HAs, occupational infection policies and procedures utilized for contract workers were similar to those for non-contract workers; three HAs did not know whether policies and procedures were the same. HAs differed regarding occupational health services offered to contract workers with three HAs providing occupational infection-related services to contract workers on a routine basis. This included influenza vaccinations, outbreak response activities and follow-up for BBF exposures. In the HA where OHS services were not offered to contract workers, while OHS did conduct follow-up on infectious disease issues, other services (e.g., immunizations) were left to the employer of the contracted workers.

None of the HAs felt that OHS departments had adequate time or resources to perform all necessary tasks related to the control of occupational infections. All cited limited staffing resources to be a challenge in areas ranging from outbreak management and performance of fit testing to implementation of baseline health assessments, surveillance, and exposure management. In one HA, this was compounded by the large geographic area covered. HAs reported the need for determining an appropriate ratio of the number of OHS professionals to staff taking into consideration such issues as geographical distance.

DISCUSSION

The objectives of the OHS portion of the NAWG Resource Analysis were to determine the current level of OHS department resources and involvement in occupational infections across the six HAs, to identify gaps in resources, and to make recommendations for improvements in the provision of services related to occupational infections within OHS departments.

Findings from these data indicate that OHS departments are under-resourced and understaffed in terms of resources related to occupational infections, with 2/3 of HAs reporting OHS position vacancies. However, there is variation across the HA in the allocation of number of OHS professionals to number of employees, indicating a need for guidelines to delineate an appropriate ratio of OHS professionals to employees. Recommendations from the U.S. suggest that one occupational health nurse is usually needed for more than 300 employees with an additional nurse for every 750 employees thereafter [2]. These targets are currently not being achieved across B.C.

Data from the current survey also demonstrate that OHS professionals have an extensive range of job duties that may prevent them from finding enough time to fulfill all of their job responsibilities. Five of six HAs reported the necessity of travel time between sites, reporting that all staff were required to travel; one HA reported 25-49% of total OHS time dedicated to travel. An increase in the number of OHS professionals along with a greater distribution of these staff across a HA would allow for more job time to be dedicated to OHS tasks, including control of occupational infections.

None of the HAs reported dedicated OHS staff for occupational infections, while 50% of HAs reported that they must utilize professionals outside of their OHS department in order to complete tasks related to occupational infections that fall within their job responsibilities. These findings indicate inadequate OHS resources. Total time spent on issues relevant to occupational infections was reported as < 25% in three HAs. Additionally, two HAs reported the need to hire contract nurses to fulfill annual immunization commitments. HAs cited a skills shortage as one reason for being unable to fill vacant positions, and in one HA where there is a demand for two additional OH nurse positions to cover a large geographic area, the status of these positions is currently "under review" by the HA.

Key Findings:

- **All six HAs report OHS professional involvement in the prevention and management of occupational infections.**
- **There are no reports of OHS professionals dedicated solely to activities related to occupational infections within B.C.**
- **The availability of occupational medical expertise in BC healthcare is extremely limited.**

- **Occupational health departments are under-resourced and understaffed in terms of resources related to the control of occupational infections with 2/3 of HAs reporting OHS position vacancies.**
- **OHS professionals have an extensive range of tasks that they are expected to perform and this may prevent them from fulfilling all of their job responsibilities, including tasks specific to the prevention and management of occupational infections.**
- **Five of six HAs reported the necessity of travel time between sites, reporting that all staff were required to travel. One HA reported travel accounted for 25-49% of total OHS department time.**
- **Infection Control Professionals are frequently asked to perform occupational health duties due to lack of OHS staff.**

There are no reports of OHS staff dedicated solely to the control of occupational infections due to lack of staffing resources and the nature of the role of OHS professional. As stated by one HA, OHS professionals have a "generalist role in performing infection control and disability case management functions".

Given the diverse and varied responsibilities of the OHS professional in addition to the current situation of understaffing within OHS departments, changes are essential to ongoing and successful functioning of the OHS departments, including the prevention and management of occupational infections. While it may not be feasible at this time to hire OHS professionals solely for the purpose of occupational infection control, more OHS professionals need to be trained and hired in the HAs. Once there are adequate numbers of OHS professionals, the prevention and management of occupational infections within the overall picture of infection control will serve to benefit, including: integration of up to date OHS polices and procedures into the organization's overall infection control program, consistent and timely coverage for all employees including contracted workers and medical staff, dedicated OHS professionals to liaise with ICPs, and in the event of an emergent situation, OHS professionals to take the lead in organizing and coordinating a response plan for employees.

All six HAs reported involvement in data collection and analysis, although there was a lack of consistency across the HAs in terms of software used. Standardization of software programs would enable HAs to more easily compare data for policy and research purposes. The Workplace Health Indicator Tracking and Evaluation (WHITE^{tm}) database, developed by OHSAH, is in use in four of the six HAs, and one additional HA has indicated interest in implementing WHITE^{tm} shortly.

Three HAs reported that they did not know if policies and procedures related to occupational infections were the same for contracted workers as for hospital employees. This response emphasizes the importance of ensuring that consistent occupational infection standards be implemented for all groups of HCWs, including hospital employees, contracted workers and medical staff.

The involvement of a trained OH physician is essential in certain circumstances to the implementation of effective procedures and policies related to the control of occupational infections. These data demonstrate that there is a need for increased involvement by OH physicians within the OHS departments of B.C. Other countries, including the US and the UK, have highlighted the important role of the OH physician. While the director of an OHS department may not be a physician, there should be adequate support for this role from a trained medical consultant in occupational medicine. One proposed staffing ratio for OH physicians suggests that an OHS department should have an on-site OH physician on at least a part-time basis for every 1000 employees, and on a full-time basis for an employee population greater than 2000 employees [2]. While this ratio may not be applicable to HAs in B.C., it does emphasize the need for the development of appropriate guidelines on OHS professional ratios, which would take into consideration individual factors of the OHS department as well as the geographic distribution of the HA. Regardless, both Public Health and Infection Control departments have access to physician specialists, and OHS departments should be no exception. OHS departments in B.C. require improved access to OH physicians, through both better linkages with existing occupational medical expertise in the province, and via recruitment and retention of more OH physicians.

Recommendations:

1. **Determine what occupation health involvement (i.e. roles and responsibilities) should be in the area of infection control activities related to healthcare associated infections:**
    a. **Establish provincial standards for the number of OHS professionals (including OH physicians) required to ensure adequate coverage of all OHS responsibilities;**
    b. **Develop strategies and dedicate resources to encourage the recruitment and training of new OHS professionals to meet those standards; and**
    c. **Develop OHS professional staffing ratios with consideration to the scope of service provision and the geographic separation between worksites within each HA.**
2. **Provide OHS professionals with ongoing training in the prevention and management of occupational infections, recognizing the specific educational needs of OHS staff working in healthcare.**
3. **Encourage greater collaboration among all professionals dealing with infectious diseases (e.g., ICPs, OH, public health) including in-service training opportunities, to increase awareness of each others' roles**

Limitations:

While there are limitations inherent to any observational survey design, each of the OHS departments was given the opportunity to provide feedback on a draft version of the questionnaire, which was developed based on current OHS standards for the control of occupational infections [1]. One limitation of the questionnaire was the range of percentages allocated (25% increments) which may have been too wide to collect precise measurements of actual time spent conducting certain job tasks.

Data were collected on name and job title of respondent for each of the questionnaires, demonstrating that in some HAs one member of the OHS department completed the questionnaire independently, while other HAs took a collaborative approach to completion. We are unable to comment on how each approach might influence the validity of the data.

The questionnaires were completed independently by each of the OHS departments and thus interpretation of the questions may have varied by HA. This method of completion could influence the accuracy of the data collected. However, the HAs were encouraged to contact OHSAH during questionnaire completion for clarification of any portion of the questionnaire on an as needed basis.

Summary:

OHS professionals in B.C. are engaged in an extensive range of job responsibilities, including the prevention and management of occupational infections. OHS professionals are integral and necessary in the handling of both routine and unexpected issues related to occupational infections and as such, must be properly funded and staffed to maintain this expertise.

In 2003, the National Advisory Committee on SARS and Public Health reported that OHS issues were a source of recurrent tension within healthcare institutions during the SARS outbreak in Toronto. This report highlighted the importance of creating a process or mechanism to include front-line HCWs in advance planning to prepare for health emergencies, including infectious disease outbreaks. It was recommended that OHS issues be given prominence in this process [3].

While each of the six HAs identified that they are under-resourced in terms of their responsibilities related to the control of occupational infections, it is not possible from these data to outline the exact nature of these deficits. It is apparent, however, that OHS professional staffing ratios need to be developed within B.C. As well, greater resource allocation directed towards recruitment and training of OHS professionals is needed for OHS departments to ensure that procedures and policies related to the prevention and management of occupational infections are being adequately addressed.

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1. Health Canada. Infection control guidelines: Prevention and control of occupational infections in health care. CCDR: 28S1; March 2002.

2. Clinics in Occupational and Environmental Medicine: Occupational Health in the Healthcare Industry, R Orford (ed). W.A. Saunders, Philadelphia, PA. May, 2001.

3. Health Canada. Learning from SARS: Public Health Renewal in Canada.

Public Health Resources

INTRODUCTION

To further compliment the work of PICNet and the goals of the Needs Assessment Working Group (NAWG), the public health needs assessment questionnaire was developed to gather information on the human and fiscal resources dedicated to health care associated infections (HAI) in the area of public health.

METHODS

Individuals with varied public health backgrounds were selected from the NAWG to lead the public health component of the project. The public health questionnaire was designed by this group of individuals and all revisions of the questionnaire were vetted through the NAWG and the PICNet Management Office prior to dissemination. The final questionnaire was approved in February 2006.

The Provincial Health Officer identified the Chief Medical Health Officers (CMHOs) for each health authority as the key stakeholders for public health. A letter was sent from the Provincial Health Officer to the Chief MHOs updating them on the progress of PICNet, the purpose of the public health needs assessment project and requesting their cooperation in completing the questionnaire. The Chief MHOs were then emailed a copy of the questionnaire by the public health nurse hired to carry out the interviews and were contacted to arrange a telephone interview to complete the questionnaire.

All of the telephone interviews took place in February 2006. The interviews took between 30 and 45 minutes to complete. If one of the Chief MHOs were unable to answer all the questions - or as in the case of the sixth HA which does not have a Chief MHO - the interviewer spoke with other key public health personnel. A total of 10 interviews were performed and all questionnaires were forwarded to the PICNet Management Office for analysis. The original questionnaires were returned to the key stakeholders on March 31st 2006.

The questionnaire focused on determining:

- If any health authorities have public health staff dedicated to infection control activities related to healthcare associated infections (HAI);
- Who of the public health staff within the HA provides routine advice/support for infection control activities related to HAI;
- What percentage of their time is being spent in this area and to which health care settings is this advice/support being given (including non-directly funded organizations); and
- Who of the public health staff within the HA provides outbreak advice/support for infection control activities related to HAI.

Data were entered into EpiData and analyzed in SPSS v.10.1.

A definition of the terminology used is included at the end of this report.

1. *DEDICATED INFECTION CONTROL RESOURCES*

Health Authority respondents were asked about the number of FTEs that are dedicated (i.e. 1.0 FTE) to infection control activities related to healthcare associated infections. Throughout the province only two health authorities with a total of three Public Health staff are identified as working full-time on infection control related activities.

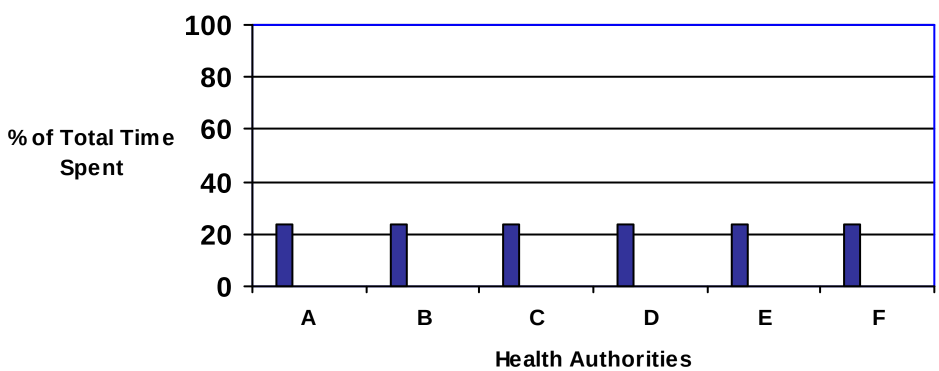
2. *ROUTINE INFECTION CONTROL ACTIVITIES/SUPPORT*

All six (100%) provincial health authorities reported providing routine infection control (IC) advice/support related to health care associated infections (HAI). Routine advice/support was defined as anything associated with non-outbreak situations. For simplicity sake the following section will first discuss the findings from the five health authorities that service specific geographical areas and then follow with a discussion on the one health authority which provides province-wide service.

One of the five regional health authorities identified that an infection control team had been recently organized to provide infection control (IC) advice and support to regional facilities and centres that require assistance. This team is comprised of members of all health care programs: acute care, long-term care and community/public health. This infection control team has been in place for approximately one year. While this region has indicated that support on IC issues is a collaborative effort of this team, for the purposes of this analysis, efforts has been made to quantify the participation of public health staff in this collaboration.

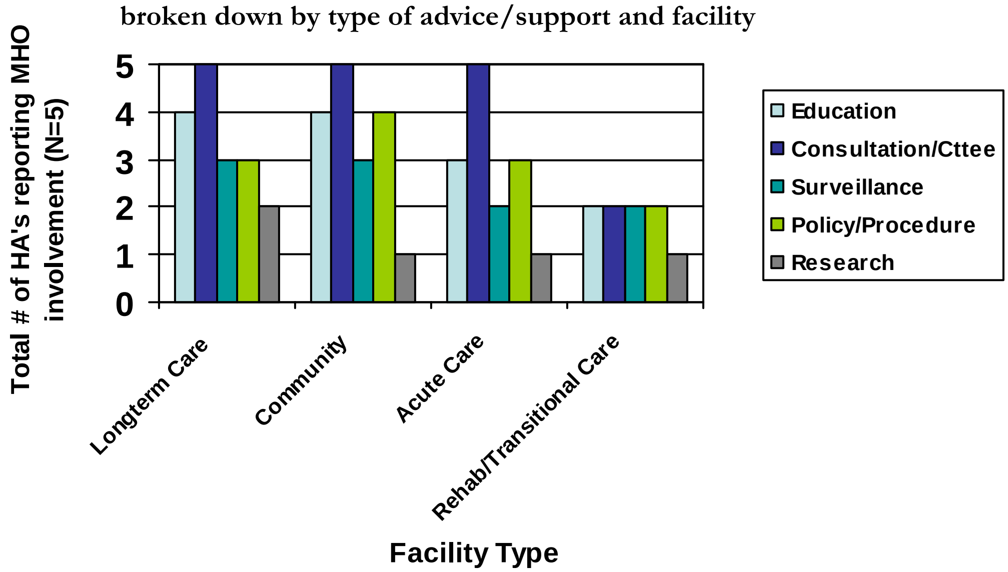
To measure the amount of work time spent providing routine advice, five discrete categories were used on the questionnaire: >75%; 50-75%; 25-49%; <25% and 0. In the five regional health authorities, all respondents indicated that the Medical Health Officers (MHO) spent < 25% of their time providing routine advice to acute care facilities, long-term care facilities (LTC), and community health settings. However, during the interview process, respondents indicated that the actual number was closer to 10%. Only two HAs reported that their MHO provides routine advice/support to rehabilitation/transitional care settings.

Figure 1
MHO Time Spent Providing Routine Advice/Support on Infection Control Related Activities



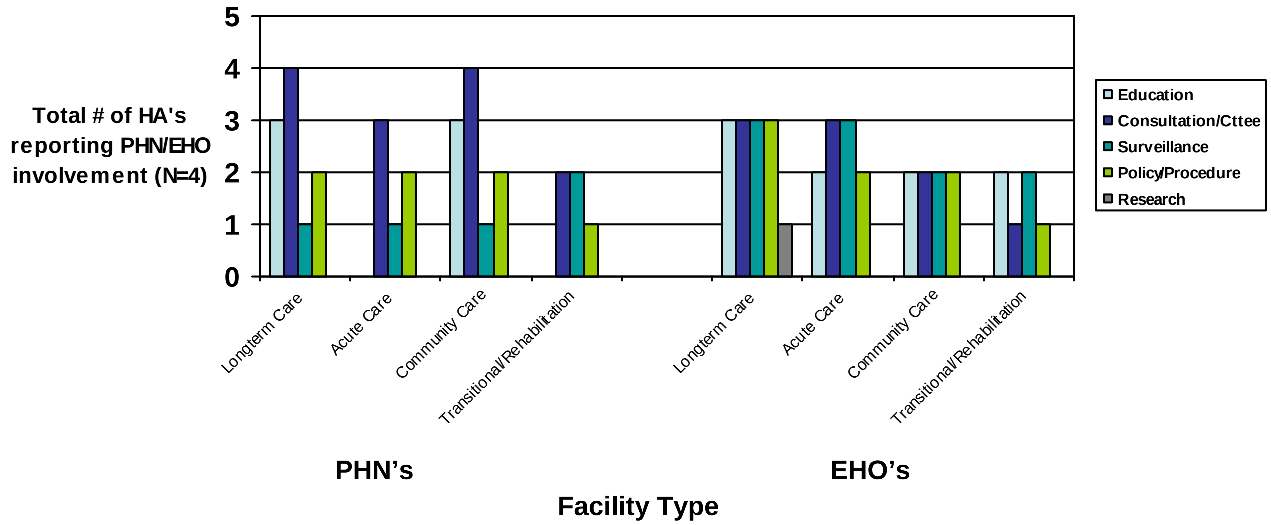
The MHO's report that the form of this routine advice consists of consultation and participation on committees (100%) followed closely by education specifically to long-term care and community health settings (80%) and the development of policies and procedures in community health settings (80%).

Figure 2
Number of HAs reporting MHO involvement in providing routine infection control advice/support - broken down by type of advice/support and facility



In one HA, there was no public health nurse (PHN) time spent providing routine IC advice/support. However, four other authorities indicated that their PHNs spend <25% of their time on this area. Of that time, the majority of time spent focused primarily on providing consultation and/or participating on committees within long-term care and the community health setting, followed by education to the same groups. Similarly, one HA reports that no environmental health officer (EHO) time is spent providing routine advice support while the four other authorities indicate that their EHO's spend < 25% of their time on this area As with the MHOs respondents indicated that the actual amount of time was closer to 10%.. Table 3 provides a more detailed breakdown of the areas of involvement by facility setting.

Figure 3
Number of HAs reporting PHN/EHO involvement in providing routine infection control advice/support - broken down by type of advice/support and facility



Administrative support related to provision of routine infection control advice to health care settings was reported by three health authorities. Except for the one health authority with a 0.5 dedicated FTE, administrative support was provided on an as-needed basis and comprised <25% of total administrative staff work time.

Three HAs indicated other staff responsible for providing routine advice/support to their regional healthcare facilities. In one HA, this included a research officer who provided surveillance support. Another HA reported having an infection control physician lead whose commitment to provision of routine IC advice to long-term care and acute care facilities was less than 10% of work time. Advice/support provided included the areas of education, consultations/committees and policy/procedure in both facility types as well as education and surveillance in acute care facilities.

An important final note for this area, of the time spent by each of the five HAs on routine infection control activities, all five regions reported spending less than 25% of staff hours providing this advice to business/contract/privately funded settings[a]. However, one region reported that 50-75% of the time spent on infection control activities was provided to such business partnerships.

As we mentioned, for the sake of simplicity during analysis we separated the health authority which provides province wide support from the other five health authorities. This health authority has a dedicated infection control practitioner who spends 50-75% of his/her work time providing IC advice on HAI directly to long-term care and community health settings in the areas of education, consultations/committees, policy/procedure and research; 25-49% of his/her time providing advice/support to acute care facilities in the area of consultations/committees across the province; and < 25% of his/her time providing routine advice to rehabilitation/transitional care. To quote the infection control practitioner:

"I provide services directly to LTC - providing teaching or direct consultation. In many LTC there is no dedicated IC person so the direct contact is usually the director of care. I also provide consultation to EHOs who are dealing with outbreaks in LTC or the community. I also get direct calls from the public. I usually try to refer those to the local public health unit - but sometimes they have already been referred to me by public health. In acute care facilities I usually communicate directly with the IC staff on hand. If other staff from acute care call me directly I will refer them to the IC department."

This HA has 0.5 FTE physician assigned to the HAI portfolio and PHN staff who spend <25% of their time providing IC advice to the healthcare field in the province. Their areas of involvement include education, consultations/committees, policy/procedure and research.

Finally, of the time spent providing this routine advice/support, the amount of time this health authority's staff dedicates towards non-directly funded organizations can be broken down as follows:

- The infection control nurse spends <25% of their time providing advice support to business/contract/private long-term care and community health settings;
- The percentage of time the physician epidemiologist spends providing routine advice to non-directly funded organizations is broken down as follows:
    - 50-75% long-term care and community health settings
    - 25-49% acute-care settings
    - <25% rehabilitation/transitional care

[a] Not directly funded through the Health Authority

3. ***OUTBREAK INFECTION CONTROL ACTIVITIES/SUPPORT***

As expected, public health is actively involved in outbreak situations related to healthcare associated infections. Whether an enteric or respiratory outbreak, all regional medical health officers (MHO) provide consultation and participate on the necessary committees. Similarly, all MHOs participate in the development of policies and procedures. To a lesser extent, MHOs are directly involved in education and surveillance. As in the above section the discussion first focuses on the five geographically oriented health authorities, followed by a discussion on the one province wide health authority.

Figure 4
Number of HAs reporting staff involvement in enteric outbreaks - broken down by type of advice/support

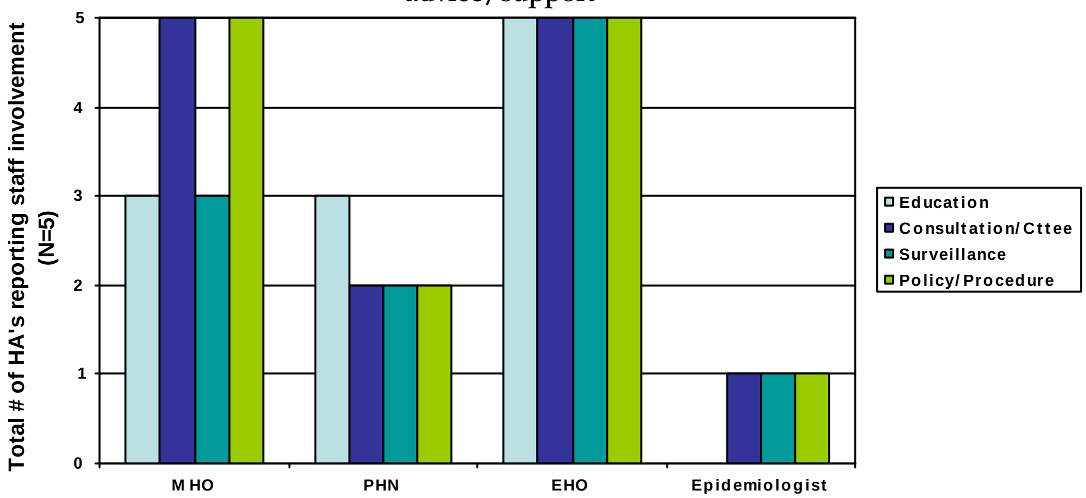
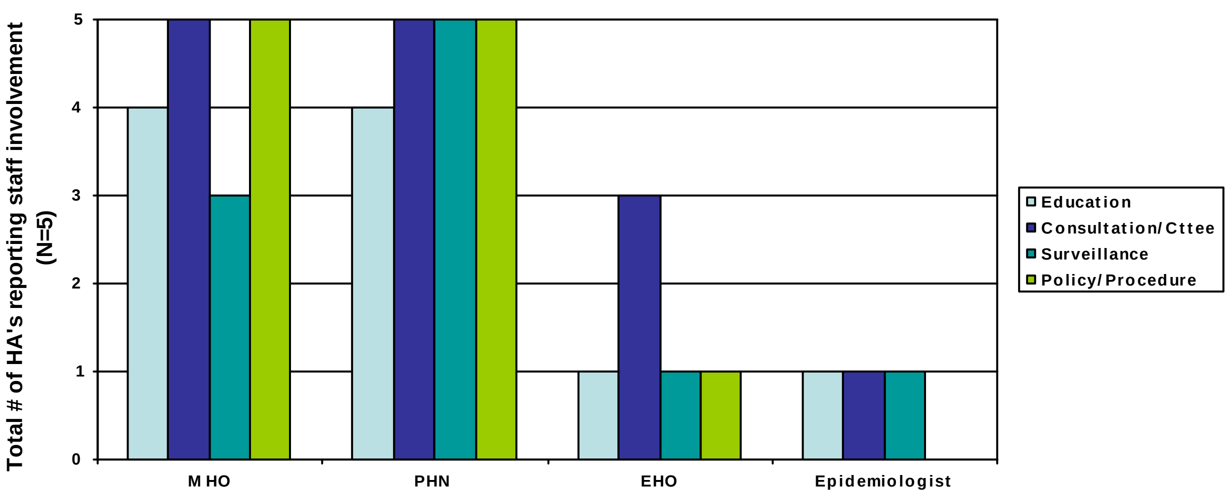


Figure 5
Number of HAs reporting staff involvement in respiratory outbreaks - broken down by type of advice/support



PHNs and EHOs appear to offset each other with relation to their roles in enteric and respiratory outbreaks with PHNs playing a major role in respiratory outbreaks and EHO playing a major role in enteric outbreaks.

Interestingly, only one HA reported having an epidemiologist available for enteric and respiratory outbreak support although two HAs reported having an epidemiologist on staff in their public health department.

All regions had access to administrative support in any outbreak situation.

The one province-wide health authority reports that it provides physician epidemiology, infection control practitioner, public health nurse, and often field epidemiologist support to the province on an as needed basis. This support covers all the activity areas from education, consultation, surveillance, the development of policies and procedures through to outbreak investigation and response.

DISCUSSION

It should be noted from the outset that there are acknowledged limitations inherent to any observational survey design, and that the aim of the public health professionals and other staff who participated in the development of this questionnaire was to capture a high-level snap-shot of public health's involvement in infection control activities related to healthcare associated infections (HAI). Consequently, the assessment of the findings has been restricted to gross interpretations rather than on minute details which could produce erroneous results.

However, two limitations in particular should be kept in mind. First, the range of percentages allocated (25% increments) was too wide to collect precise measurements of actual time spent conducting certain job tasks. Second, data were to be collected from interviews with Medical Health Officers; however, some regions involved other staff. PICNet is unable to comment on how each approach might influence the validity of the data. Definitions were provided, however, the interpretation of the questions may have varied between professional groups which could influence the accuracy of the data collected.

It is not surprising; however, that the analysis of the public health questionnaires confirms the province-wide involvement of public health departments in outbreaks that are related to HAI. It is interesting to note, however, that despite recent events such as SARS, which demonstrated the need to bridge boundaries between facilities and the community, there are only three public health personnel within the six regional health authorities dedicated full-time to infection control issues related to HAI and that the majority of other public health staff involvement was reported as <25% (closer to 10%) of their time[a]. The largest percentage of the routine advice/support is being provided by two personnel at the one province-wide health authority. The full-time infection control nurse and the part-time physician epidemiologist spend up to 75% of their time (ICP = 1.0 FTE; MD = 0.5 FTE) providing routine advice/support to long-term care and community health settings and a slightly smaller percentage of their time providing the same routine advice/support to rehabilitation/transitional care and acute care facilities across the province.

Public health has a broad mandate. Similar to occupational health and safety, public health professionals are engaged in an extensive range of job responsibilities that encompass both IC and non-IC tasks. Currently, as a way to more clearly define public health's role, core programs are being developed for

[a] A key limitation of the questionnaire was the width of the percentage time ranges provided. The wide ranges of the percentage allowed for more error in the interpretation of the numerical data. All respondents reported that the time spent by MHOs and other public health professionals providing routine advice/support on infection control activities related to HAI is in the range of 5-10%.

public health in British Columbia. The core programs will target one of four broad categories. These are not mutually exclusive, and there will be overlap:

- Health Improvement Programs – intended to improve overall health and well-being, and prevent a wide range of acute and chronic disease and disability, as well as injuries.
- Disease, Injury and Disability Prevention Programs – intended to prevent specific health problems that make, or might make, a significant contribution to the burden of disease.
- Environmental Health Programs – intended to protect people from environmental hazards, whether caused by natural or human agency, in the built and natural environments.
- Health Emergency Management Programs – intended to coordinate available resources to deal with emergencies effectively, thereby saving lives and avoiding injury or disease. [1]

A key component in this initiative is ensuring that the system capacity requirements are met. A supportive infrastructure and capacity to deliver core programs is an essential component of the core functions framework. To ensure public health has the basic platform and capacity, system capacity building is required at both the provincial level and in the health authorities. Capacity requirements include ensuring adequate numbers of trained and competent staff.

Key Findings:

- **Across the regional health authorities only 3 public health personnel are dedicated to infection control activities specific to healthcare associated infections**
- **The routine involvement of public health in infection control activities related to healthcare associated infections is reported as <25% (closer to 10%).**

It would appear that public health activities in HAI infection control are not duplications of work done by others in the health care system. Consistently among the health authorities, the public health departments had less involvement with acute care facilities. This was expected as a large number of acute care facilities have dedicated infection control programs. In other words, the results suggest that public health departments provide services to facilities outside the acute care setting (and their affiliated directly funded LTC facilities) where infection control resources are less. This is further supported by the large percentage of public health time spent providing advice/support to non-directly funded organizations. This is likely due to the lack of infection control resources and support in the business/private health settings, as well as the regulatory role of Public Health in licensed care facilities. Looking into the future, responsibility for meeting the infection control needs of the increasing numbers of assisted living facilities will only increase.

Key Findings:

- **Public health primarily provides routine advice/support to organizations other than acute care facilities (and their affiliated long-term care institutions).**

When one looks at who spends what time on what activity area, it is quite likely that there is bias built into the responses. For those regions where we spoke to individuals in addition to, or instead of the Medical Health Officers we noted the staff tended to report involvement in a wider breadth of areas. However, it is unlikely that this affects the overall impressions gleamed from this area. The first impression is that the majority of everyone's time is spent on providing consultations and participating on committees. This is followed shortly thereafter by education and the development of policies/procedures. The least amount of time was spent on surveillance and research related activities.

Key Findings:

- **Of the time spent providing routine advice/support the majority of public health staff time is allocated to the areas of consultations and participating on committees.**

It is without surprise the area with the most public health staff involvement over the largest amount of activities is in the area of outbreak management. Medical Health Officers, public health nurses and environmental health officers are the principle responders. Their involvement ranges from providing consultations, participating on committees, educating, developing policies and procedures and working on surveillance-related activities.

Key Findings:

- **In outbreak situations, a large number of public health staff becomes involved in a number of activities.**

With the increasing blur between facility and community based care (i.e., microbes know no boundaries), coupled with the fact that Public Health Departments have legal mandates and obligations such as those found in the Health Act and Communicable Disease Regulations whereby they are responsible for the protection of the public's health, the minimal day to day involvement in infection control related activities by public health is noteworthy. In British Columbia, community outbreaks of antibiotic resistant organisms (i.e. MRSA, VRE) have already been well documented and it's likely the number of healthcare associated infections occurring outside the traditional facility setting will only increase as we shift to more invasive procedures in the community health setting**.** Public health is a key player in the prevention and control of HAI, and as such, must be properly staffed to fulfill this requirement. Unfortunately, while each of the six BC HAs identified that they are under-resourced in terms of IC issues, it is not possible from these data to outline the exact nature of these deficits. Consequently, the following recommendations have been put forward:

Recommendations:

1. **Determine what public health involvement (i.e. roles and responsibilities) should be in the area of infection control activities related to healthcare associated infections: and**
    a. **Encourage greater collaboration among all professionals dealing with infectious diseases (e.g., ICPs, OH, public health) including in-service training opportunities, to increase awareness of each others' roles**
2. **Assess adequacy of current public health personnel in the area of healthcare associated infections**

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1. *Public Health Renewal in British Columbia: Core Functions in Public Health*. Victoria: Population Health and Wellness, Ministry of Health Services; 2005. Available: http://www.health.gov.bc.ca/prevent/pdf/core_functions.pdf

SECTION 2 - SURVEILLANCE

Surveillance

INTRODUCTION

An infection control program should consist of an effective working team of Infection Control Professionals (ICPs) and Infection Control Officers (ICO); personnel resources to collect, enter and analyze data on the surveillance of healthcare associated infections (HAI); the ability to set and recommend policies and procedures based on synthesis of surveillance data, clinical practice guidelines and literature review; resources to directly intervene to interrupt the transmission of infectious diseases; and resources to educate and train healthcare workers and providers in basic infection control procedures.[1]

This section of the Needs Assessment Working Group Resource Analysis focuses on the surveillance aspects of a capable IC program. The purpose of the surveillance survey was to provide a snapshot of the scope and nature of surveillance activities in the province during the review period (November 2005 to March 2006), highlight areas where there are opportunities or impediments to a successful surveillance program, identify the resources required, and highlight opportunities for standardization and collaboration.

METHODS

An infection control surveillance questionnaire was developed by members of the PICNet Needs Assessment Working Group (NAWG) and vetted by the NAWG and the PICNet Surgical Site Infections Surveillance Working Group prior to dissemination. In November 2005, a round table discussion was arranged with senior ICPs from across the province and the majority of the questionnaires for provincial acute care facilities (ACFs) and directly funded long-term care facilities (LTCFs) were completed at that time. A convenience sample was taken from among 80 acute-care facilities and 169 of their associated long term care/rehabilitation facilities[a] in British Columbia. Questions were revised where clarification was required prior to sending the form to the remaining facilities. All data was submitted centrally to the PICNet Management Office for analysis with over 90% of the questionnaires returned by January 2006. Follow up e-mails and telephone calls were made to clarify and/or request additional information. Additional questionnaires were distributed in February 2006 to facilities in PHSA and VIHA to increase representativeness of data.

The questionnaire incorporated the following areas: Surgical Site Infection (SSI) Surveillance, Urinary Tract Infections (UTI), Blood Stream Infections (BSI), Pneumonias (both ventilator [VAP] and healthcare-acquired [HAP]), Methicillin Resistant *Staphylococcus aureus* (MRSA), vancomycin resistant *Enterococci* (VRE), and *Clostridium difficile* associated diarrhea (CDAD). A section on surveillance of diarrheal illness, influenza-like illness, and antibiotic resistant organisms (other than MRSA and VRE) was included. General surveillance questions were also integrated in the form. A copy of this form is available on request. Data collected included definitions used, patient population surveyed; admission screening, laboratory methods used and data capture methods. At no time were patient or professional names, or site-specific surveillance data requested. It must be noted that the definitions used for surveillance in the facilities surveyed varied greatly. The level and intensity of surveillance reported by each facility was subject to interpretation by the respondent.

Data were entered into EpiData and analyzed in SPSS v.10.1.

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[a] Of note, only directly funded LTCFs were included in the survey; data collected does not reflect surveillance done by privately owned and operated LTCFs.

RESULTS

1. ***RESPONDENT FACILITY PROFILE***

A sample of 51 acute care facilities (ACF) and 26 associated long term care/rehabilitation facilities (LTCF) were selected base on the availability of an ICP to supply the necessary information. A total of 64 completed questionnaires were received back. Of these, 40 (62.5%) represented data from acute care facilities and 17 (26.6%) were from LTCFs and Rehabilitation centres. Seven (10.9%) questionnaires included responses for the ACF and its associated LTCFs combined. Therefore, the overall response rate for the acute care facilities contacted was 47 (92%) and for the associated LTCF 24 (92%).

Figure 1 provides an overall picture of surveillance for HAIs in acute care facilities surveyed and Figure 2 illustrates surveillance activities in long term care facilities. The level of surveillance activity for ACFs is excellent for MRSA, VRE and CDAD surveillance but is less than optimal for the remaining activities recommended by both the American Practitioners in Infection Control (APIC) and the Community and Hospital Infection Control Association – Canada (CHICA) as integral to an effective IC program[2,3]. Surveillance activity is less for LTC/Rehabilitation, which is not unexpected and is consistent with the philosophy that these facilities are the patients' homes.

Figure 1

Surveillance for HAI in British Columbia Acute Care Facilities (N = 47)

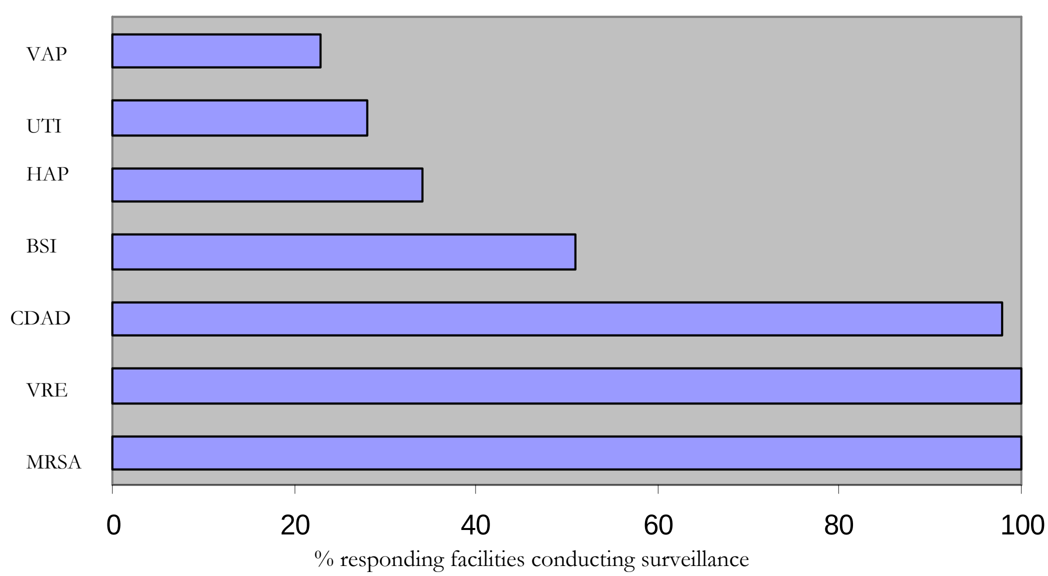
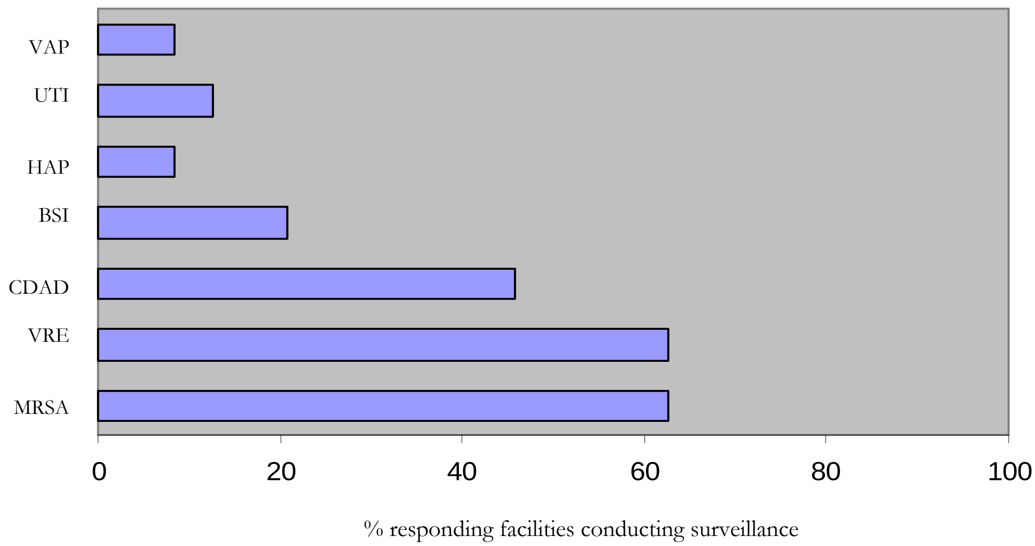


Figure 2

Surveillance for HAI in British Columbia Long-Term Care/Rehab Facilities (N=24)



SURGICAL SITE INFECTION (SSI) SURVEILLANCE: ACUTE CARE

1. SURGICAL PROCEDURES

Data on acute care facilities surveyed is provided in Table 1. Over half of the responding ACFs performed orthopaedic (76.6%), obstetrical (87.2%), breast (76.6%) and gastrointestinal (95.7%) operations. Of those facilities indicating the procedures conducted within each surgical category, the majority of orthopaedic surgeries were: knee surgery, hip replacement surgery, hip fracture procedures and spinal surgery. The principle obstetrical surgeries performed were Caesarean (C-) sections and hysterectomies. The main breast surgeries reported were mastectomies, breast reductions and reconstructive surgeries. The principle gastrointestinal (GI) procedures included appendectomies, bowel surgeries and laparoscopic cholecystectomies. Among the other surgical classes, frequently conducted neurosurgeries included cranial and shunt surgeries respectively) while cardiovascular (CV) procedures included valve and bypass operations and respectively. All responding ACFs conducted nephrectomies. At least six facilities performed cataract surgeries.

Table 1: SSI surveillance in British Columbia acute care facilities (N=47)

Surgery	Number (%) of provincial acute care facilities conducting surgery	Number (%) of provincial acute care facilities conducting surveillance*
Orthopedic	36 (76.6))	21 (58.0)
Breast	36 (76.6)	16 (44.4)
Neuro	8 (17.0)	5 (62.5)
CV	7 (14.9)	5 (71.4)
Obstetrics	41 (87.2)	25 (60.9)
Renal	15 (35.7)	10 (66.7)
GI	45 (95.7)	16 (35.6)

*of those facilities conducting surgery; missing values excluded from the calculations

2. SSI SURVEILLANCE PROGRAMS

SSI surveillance percentage ranged from 35.6% to 71.4% depending on the procedure within the 45 reporting facilities that performed surgery. The most frequently performed surveillance was with cardiovascular surgeries (5 facilities or 71.4%) followed by renal (10 facilities or 66.7%). Surveillance for both these procedures ranged between health authorities from 0 to 100%. Surveillance by health authority is presented in Table 2.

Table 2: Number (%) of acute care facilities conducting SSI surveillance, by health authority

Region	Orthopedic	Breast	Neuro	CV	Obstetrics	Renal	GI
A	3 (33.3)	1 (12.5)	0 (0)	2 (66.7)	9 (100)	1 (20.0)	1 (10.0)
B	6 (100)	6 (75.0)	2 (100)	N/A	8 (72.7)	3 (100)	6 (75.0)
C	0	0	N/A	N/A	0	0	0
D	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)	0 (0)	0 (0)
E	2 (28.6)	1 (33.3)	1 (50.0)	1 (50.0)	2 (50.0)	N/A	1 (16.7)
F	5 (100)	4 (80.0)	1 (100)	1 (100)	3 (75.0)	3 (100)	4 (80.0)
Province	**17 (60.7)**	**12 (46.2)**	**5 (55.6)**	**5 (62.5)**	**22 (75.9)**	**7 (46.7)**	**12 (38.7)**

* of those facilities conducting surgery; missing values excluded from the calculations

* N/A - reported no surgeries conducted

Surveillance methodologies from those ACFs providing data on their SSI surveillance programs are summarized in Table 3. Of the 29 facilities conducting any type of SSI surveillance, three (10.3%) indicated that no risk stratification method was used. It should be noted, however, that many facilities did not complete this field, potentially indicating a lack of knowledge regarding risk stratification methodology. Questions regarding the coding of procedures were not well completed as well. However, seven facilities indicated use of ICD-10 codes. Post-discharge surveillance varied by surgery type from 0% for neurosurgical procedures to 10 facilities (55.6%) conducting post-discharge obstetrical surveillance (c-section and hysterectomy). While the majority of sites captured the number of procedures conducted as denominator data for calculation of SSI rates, one site reported not capturing any denominator data for their neurosurgery SSI surveillance. All facilities that conducted SSI surveillance collected wound class data and indicated that the results were reported to other authorities (e.g., Infection Control Committee [ICC], Medical Advisory Committee [MAC]).

Table 3: SSI Surveillance Program Characteristics

Procedure (N= respondents) (Percentage = N /total facilities reporting performing surgeries *100)	**Retrospective surveillance**	**Patient pop = inpatient**	**Patient pop= both**	**ASA risk score =Y**	**Classified by wound class=Y**	**Denominator = number of procedures**	**Post-discharge Surveillance =Y**	**Results reported =Y**
Orthopedic N=8 (38%)	5 (62.5)	4 (50.0)	4 (50.0)	6 (85.7)	8 (100)	7 (87.5)	4 (50.0)	7 (87.5)
Breast N=8 (50%)	4 (50.0)	2 (25.0)	6 (75.0)	6 (85.7)	8 (100)	8 (100)	3 (37.5)	8 (100)
Neurosurgery N=2 (40%)	0 (0)	2 (100)	0 (0)	2 (100)	2 (100)	1 (50.0)	0 (0)	1 (100)
Cardiovascular N= (80%)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	4 (100)	4 (100)	1 (50.0)	4 (100)
Obstetrics N=18 (72%)	4 (22.2)	7 (38.9)	11 (61.1)	17 (94.4)	18 (100)	18 (100)	10 (55.6)	18 (100)
Renal N=6 (60%)	4 (66.7)	1 (16.7)	5 (83.3)	4 (66.7)	6 (100)	6 (100)	2 (33.3)	6 (100)
GI N=11 (68.8%)	5 (45.5)	4 (36.4)	7 (63.6)	8 (72.7)	11 (100)	11 (100)	5 (45.5)	10 (100)

* missing data from facilities not providing program details were excluded from the percent calculations

Within regions, the methods used for surveillance in ACFs were similar and main differences were whether the patient population under surveillance included inpatients, outpatients or both. Between regions, variation in methodology also included the patient population as well as whether post-discharge surveillance was conducted. Many ACFs reported SSI surveillance programs that had been ongoing for more than 10 years. SSI surveillance for C-sections was among the programs most recently implemented in BC acute care facilities. Of the 18 ACFs providing data on their SSI surveillance programs for C-sections, seven facilities initiated C-section SSI surveillance in 2005, while four hospital programs had been in existence for at least 10 years,. Other types of surveillance conducted included SSI related to cataract surgeries in at least 8 (17.0%) responding facilities.

Of those facilities responding to questions regarding electronic data entry, 26 (86.7%) indicated that surgical site infection data was captured electronically. Software used included Microsoft Excel, Access, EpiInfo and SPSS.

URINARY TRACT INFECTION (UTI) SURVEILLANCE: ACUTE AND LTC

Thirteen (27.7%) ACFs and three (12.5%) LTCF/Rehabilitation centres performed UTI surveillance. These numbers include one questionnaire that provided data for the ACF and associated LTCFs on one form. The proportion of facilities by Health Authority is presented in Tables 4 and 5. Eight facilities indicated that surveillance had existed for at least 10 years. Of the facilities providing data on patient population, 12 (100%) surveyed inpatients. The programs from four (28.6%) facilities were lab-based, one (7.1%) was clinically based and nine (64.3%) were based on both laboratory and clinical diagnoses. Five (35.7%) facilities conducted surveillance that was focused on specific units while eight (57.1%) did comprehensive surveillance on all patients. All 14 facilities doing UTI surveillance indicated that either a Public Health Agency of Canada or CDC case definition was used. Seven (50.0%) of the respondents indicated that only a line list of cases was compiled and no denominator was used. Eight (57.1%) facilities captured UTI surveillance data electronically. All facilities reported data to MAC, ICC and other appropriate authorities.

Table 4: Number (%) of BC acute care facilities conducting surveillance, by health authority

Region	UTI	BSI	VAP	HAP	MRSA	VRE	CDAD
A	1 (9.1)	5 (45.5)	1 (9.1)	1 (9.1)	12 (100)	12 (100)	12 (100)
B	9 (47.4)	9 (47.4)	8 (42.1)	13 (68.4)	16 (84.2)	16 (84.2)	16 (84.2)
C	0 (0)	0 (0)	1 (100)	0 (0)	5 (100)	5 (100)	5 (100)
D	2 (50.0)	3 (75.0)	1 (25.0)	2 (50.0)	3 (75.0)	3 (75.0)	2 (50.0)
E	1 (14.3)	4 (57.1)	0 (0)	0 (0)	7 (100)	7 (100)	7 (85.7)
F	0 (0)	3 (75.0)	0 (0)	0 (0)	4 (100)	4 (100)	4 (100)
Province	**13 (27.7)**	**24 (51.1)**	**11 (23.4)**	**16 (34.0)**	**47 (100)**	**47 (100)**	**46 (97.8)**

N=47 ACF (includes questionnaires that were returned as ACF+LTC)

Table 5: Number (%) of BC LTCF/Rehab settings conducting surveillance, by health authority

Region	UTI	BSI	VAP	HAP	MRSA	VRE	CDAD
A	0 (0)	1 (14.3)	0 (0)	0 (0)	7 (100)	7 (100)	3 (42.9)
B	1 (14.3)	1 (14.3)	0 (0)	1 (14.3)	1 (14.3)	1 (14.3)	1 (14.3)
C	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
E	1 (16.7)	2 (33.3)	1 (25.0)	0 (0)	6 (100)	6 (100)	6 (100)
F	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)
Province	**3 (12.5)**	**5 (20.8)**	**2 (8.3)**	**2 (8.3)**	**15 (62.5)**	**15 (62.5)**	**11 (45.8)**

N=24 LTC (includes questionnaires that were returned as ACF+LTC)

BLOODSTREAM INFECTION (BSI) SURVEILLANCE

Surveillance for BSI was conducted in 24 (51.1%) ACFs and five (20.8%) LTCF/Rehab settings.
Characteristics of BSI surveillance programs are shown in Table 6 and the proportion of facilities conducting BSI surveillance by health authority is presented in Tables 4 and 5. While two (7.4%) facilities had initiated programs in January 2006, 11 (40.7%) facilities indicated that BSI surveillance had existed for at least 10 years. Seventeen facilities (63.0%) surveyed inpatients while 10 (37.0%) followed both inpatients and outpatients. Five (18.5%) BSI programs were lab-based, one (3.7%) was clinically based and 21 (77.8%) used both laboratory and clinical information. Eight (30.8%) facilities conducted surveillance that was focused on specific units while 18 (69.2%) did comprehensive surveillance on all patients. Of the 23 facilities providing data on the BSI definition used, all indicated that either a Public Health Agency of Canada or CDC case definition was used. Nineteen facilities provided data on the denominator used: 10 (52.6%) indicated that only a line list of cases was compiled and no denominator was used. Eighteen (69.2%) facilities captured BSI data electronically. The majority of facilities (88.9%) reported to MAC, ICC and other appropriate authorities.

Table 6: Characteristics of Provincial BSI surveillance programs

BSI:	**# (%) of acute care facilities**	**# (%) of LTC/Rehab facilities**
Surveillance for all BSI CVC BSI only	17 (85.0) 3 (15.0)	4 (100) 0 (0)
Surveillance on all wards	15 (65.2)	4 (80.0)
Surveillance data Lab Clinical Both	 4 (16.7) 1 (4.2) 19 (79.2)	 1 (20.0) 0 (0) 4 (80.0)
Surveillance type Prospective Retrospective Both	 12 (50.0) 5 (20.8) 7 (29.2)	 3 (60.0) 1 (20.0) 1 (20.0)
Patients eligible for surveillance Inpatient Inpatient/Outpatient	 14 (58.3) 10 (41.7)	 4 (80.0) 1 (20.0)
Reported to MAC, ICC, Region	19 (86.4)	5 (100)

*missing values excluded; includes responses where data for LTC was grouped with ACFs

PNEUMONIA SURVEILLANCE

Surveillance for ventilator-associated pneumonia (VAP) was conducted in 11 (23.4%) ACFs and two (8.3%) LTCF/Rehab facilities (Tables 4 and 5). Healthcare-acquired pneumonias (HAP) were followed in 16 (34.0%) ACFs and two (8.3%) LTCF/Rehab settings. Of the 18 facilities conducting HAP surveillance, all programs were laboratory and clinically based. Surveillance for VAP was lab-based in one (7.7%) facility and based on both laboratory and clinical data in 10 (76.9%) facilities. HAPs were prospectively followed in five (27.8%) facilities, retrospectively in three (16.7%) facilities and 10 (55.6%) conducted both retrospective and prospective surveillance. Five (38.5%) facilities conducted VAP surveillance prospectively, three (23.1%) retrospectively, and four (30.8%) conducted both retrospective and prospective surveillance. All facilities following HAPs or VAPs used CDC or Public Health Agency of Canada definitions. Eleven (61.1%) facilities reported collection of only HAP cases and no denominator data. Similarly, three (30.0%) facilities indicated that only VAP cases and no denominator data were used.

All 18 facilities conducting HAP surveillance and 12 (92.3%) facilities conducting VAP surveillance reported to MAC, ICC or other appropriate authorities. Eight (44.4%) facilities reported that data was entered electronically. Software used included Microsoft Access and Excel.

MRSA AND VRE SURVEILLANCE

MRSA surveillance was conducted in all (100%) of the reporting acute care facilities and in 15 (62.5%) of the reporting LTCF/Rehab settings. This included seven respondents that provided data for both the ACF and its associated LTCFs on one questionnaire. The proportion of facilities conducting MRSA surveillance in both acute and long-term care settings is presented by health authority in Tables 4 and 5.

Most facilities (80%) reported following MRSA cases for greater than five years. Over half (57.1%) of LTCFs and 28 (75.7%) ACFs reported collection of outpatient as well as inpatient data. MRSA surveillance included repeat events in approximately one-third of both acute and long-term care facilities. Admission screening was done in more than 90% of both ACFs and LTCFs with the same definitions used in all facilities reporting: admission for >= 48 hours in another HCF in last 90 days and/or known contact with an MRSA case. All ACFs reported screening of MRSA contacts; contact screening was done in 11 (78.6%) LTCFs. Twenty-five facilities (55.6%) reported that denominator data was not used and only a line list of reported MRSA colonizations/infections was captured. Definitions for inpatient-acquired MRSA varied by facility based on the length of time in the facility prior to MRSA identification. Of the 29 facilities providing definitions used, 14 (48.2%) facilities defined inpatient-acquired MRSA as MRSA acquisition greater than 48 hours after admission, four (13.8%) facilities used greater than 72 hours after admission, three (10.3%) facilities used greater than one week after admission and eight (27.6%) sites used the Health Canada definition of 48 to 72 hours post-admission. Outpatient-acquired MRSA was defined by no history of hospitalization by 21 (67.7%) facilities, the Public Health Agency of Canada definition of no hospitalization in the past 12 months by eight (25.8%) facilities and based solely on clindamycin and TMP-SMX sensitivity in two (6.5%) facilities. Additional characteristics of MRSA surveillance programs in acute care and long-term care settings are presented in Table 7.

Table 7: Characteristics of Provincial MRSA surveillance programs

Parameter	# (%) of acute care facilities	# (%) of LTC/Rehab facilities
Surveillance on all wards	36 (97.3)	13 (100)
Patients eligible for surveillance		
Outpatient	1 (2.7)	0 (0)
Inpatient	8 (21.6)	6 (42.9)
Both	28 (75.7)	8 (57.1)
Surveillance data		
Lab	16 (42.1)	5 (35.7)
Clinical	3 (7.9)	2 (14.3)
Both	19 (50.0)	7 (50.0)
Includes repeat events	12 (32.4)	4 (28.6)
Documentation of:		
Infection type (infection /colonized)	30 (81.1)	11 (78.6)
Multiple sites	31 (83.8)	12 (85.7)
Epidemiology link to patient	33 (89.2)	12 (85.7)
Epidemiology link to room	35 (94.6)	12 (85.7)
Where MRSA acquired	36 (97.3)	13 (92.9)
Reported to MAC, IC Committee, Region	32 (86.5)	11 (78.6)
Admission screening conducted	37 (97.4)	14 (93.3)
Screening of MRSA contacts	37 (100.0)	11 (78.6)
Organisms saved	23 (63.9)	4 (30.8)
Organisms typed	20 (57.1)	2 (15.4)

*missing values excluded; includes responses where data for LTC was grouped with ACFs

All (100%) of the resporting ACFs (100%) and 15 (62.5%) of the reporting LTCFs performed VRE surveillance (Tables 4 and 5). Surveillance programs for VRE had similar characteristics to MRSA programs and are summarized in Table 8. Fifteen (68.2%) ACFs reported that VRE surveillance had been in place for greater than five years. Twenty-three (92.0%) ACFs and eight (88.9%) LTCFs electronically capture VRE data. The software used included Microsoft Access, Excel, AICE, Meditech, and Med QM.

Table 8: Characteristics of Provincial VRE surveillance programs

Parameter	# (%) of acute care facilities	# (%) of LTC/Rehab facilities
Surveillance on all wards	34 (94.4)	12 (92.3)
Patients eligible for surveillance:		
Inpatient	8 (22.2)	6 (42.9)
Inpatient/Outpatient	28 (77.8)	8 (57.1)
Surveillance data:		
Lab	21 (43.2)	5 (35.7)
Clinical	2 (8.1)	2 (14.3)
Both	18 (48.6)	7 (50.0)
Includes repeat events	12 (33.3)	4 (30.8)
Documentation of:		
Infection type (infection/colonized)	29 (80.6)	11 (78.6)
Multiple sites	30 (85.7)	12 (85.7)
Epidemiology link to patient	32 (88.9)	11 (78.6)
Epidemiology link to room	35 (97.2)	12 (85.7)
Where VRE acquired	34 (94.4)	13 (92.9)
Reported to MAC, ICC, Region	32 (88.9)	11 (78.6)
Admission screening conducted	36 (97.3)	14 (93.3)
Screening of VRE contacts	36 (100)	11 (78.6)
Organisms saved	21 (60.0)	3 (25.0)
Organisms typed	16 (47.1)	1 (8.3)

*missing values excluded; includes responses where data for LTC was grouped with ACFs

Definitions used for inpatient-acquired VRE were listed by each facility as the same as that for MRSA.

C. DIFFICILE ASSOCIATED DIARRHEA (CDAD) SURVEILLANCE

Forty-six (97.8%) of the reporting ACFs and 11 (45.8%) of the reporting LTCF/Rehab settings performed CDAD surveillance with 41.9% collecting data for more than five years. Surveillance was comprehensive and conducted on all wards in all responding facilities. Relapse cases of CDAD were detected by most acute (84.6%) and long-term care (90.0%) facilities. The majority (90.0%) of LTCFs included repeat cases compared to 21 (60.0%) acute care facilities that reported inclusion of repeat events.

While all facilities reported laboratory detection of toxin A for CDAD diagnosis, culture and antigen detection were infrequently done. Nine (23.1%) facilities reported admission screening for CDAD. In these facilities, this was based on the use of a gastrointestinal algorithm for admitted, symptomatic patients. CDAD data was entered electronically in 34 (87.2%) ACFs and by all (100%) LTCFs. Software used included MedQM, Microsoft Access and Excel. Additional characteristics of CDAD surveillance programs in BC acute care and long-tem care facilities are reported in Table 9.

Thirty facilities reported that surveillance definitions were used; 14 (46.7%) facilities reported using Health Canada (CNISP) definitions and 16 (53.3%) use CDC definitions. Common definitions were used between all facilities in a given health authority, however recording of CDAD relapses varied by facility and by Health Authority. CDAD relapse definitions ranged from an episode of illness with symptom onset within six weeks to three months from the previous CDAD episode.

Table 9: Characteristics of Provincial CDAD surveillance programs

CDAD:	# (%) of acute care facilities	# (%) of LTC/Rehab facilities
Surveillance on all wards	38 (100)	8 (100)
Surveillance data:		
Lab	17 (43.6)	1 (10.0)
Clinical	5 (12.8)	2 (20.0)
Both	17 (43.6)	7 (70.0)
Surveillance type:		
Prospective	21 (53.8)	8 (80.0)
Retrospective	6 (15.4)	2 (20.0)
Both	12 (30.8)	0 (0)
Patients eligible for surveillance:		
Inpatient	14 (35.9)	4 (40.0)
Inpatient/Outpatient	25 (64.1)	6 (60.0)
Includes relapses	33 (84.6)	9 (90.0)
Includes repeat events	21 (60.0)	9 (90.0)
Lab Method:		
Culture	12 (34.3)	7 (77.8)
Toxin A	35 (100)	9 (100)
Toxin B	21 (60.0)	8 (88.9)
Antigen detection	9 (26.5)	5 (55.6)
Reported to MAC, IC Committee, Region	36 (97.3)	8 (88.9)
Admission screening conducted	9 (23.1)	5 (50.0)
Organisms saved	2 (5.6)	1 (11.1)
Organisms typed	5 (14.7)	1 (12.5)

*missing values excluded; includes responses where data for LTC was grouped with ACFs

OTHER SURVEILLANCE

Very few facilities reported conducting any other types of surveillance. While not a comprehensive list, other surveillance activities included six facilities conducting surveillance for cataract SSI and one facility conducting SSI surveillance for plastic surgery. In addition, five facilities capture data on extended-spectrum beta lactamase producing organisms (ESBLs) and influenza-like illness and three facilities capture data on Tuberculosis.

GENERAL SURVEILLANCE

The total percent of time an infection control professional (ICP) committed to SSI surveillance was reported by 36 facilities at a median of 20% (range 0-75%). There were 34 (94.4%) facilities indicating that ICPs entered data. Only four facilities (11.1%) indicated that other individuals, primarily clerical staff, entered data.

Eighteen (50.0%) facilities indicated that their program was shared with other sites in the region. Data was stored on a secure server in 27 (77.1%) of the responding facilities. Six facilities (17.1%) indicated that their data is subject to Freedom of Information, of which five facilities reported that the data was coded to protect patient identity.

Sixteen (42.1%) facilities reported access to epidemiological services. These services ranged from access to an individual with Masters/PhD level training in epidemiology (78.6%) to individuals who had taken a course in epidemiology. Only four (11.1%) facilities indicated involvement in other infection control surveillance projects.

DISCUSSION: GAPS AND RECOMMENDATIONS

Surveillance for healthcare associated infections is a foundational activity of an infection control program. Continuous monitoring of healthcare associated infection rates can be used to implement quality improvement activities and programs, assess effectiveness of interventions and benchmark with comparable facilities. Surveillance data can also be used to quickly identify and confirm outbreaks and provide epidemiological profiles for clinical and research purposes. [4]

In our survey, 67 questionnaires were distributed to facilities chosen by the Needs Assessment Working Group as a representative sample of acute and long-term care facilities in British Columbia. A response rate of 92% was achieved. This represented a monumental effort on the part of the participating facilities that must be acknowledged.

1. ***MRSA and VRE SURVEILLANCE***

The most common surveillance activities reported in acute care facilities were for MRSA and VRE with all of institutions performing some type of routine surveillance on all clinical wards. In long-term care/rehabilitation facilities, the reported level of surveillance activity throughout the province was generally low. In part, this was likely because the survey requested data on surveillance that was conducted by the ICP and not other facility staff. Some LTCFs indicated that residential care staff collected data and sent a line list of infections to the ICP; however, this was not captured in the proportion of facilities conducting surveillance. In addition, the lower level of antimicrobial resistant organism (ARO) surveillance is consistent with the philosophy that these facilities are the homes of residents, thus resulting in fewer LTCFs conducting ARO surveillance. It should also be noted that these LTC data reflect surveillance done in directly-funded LTCFs with ICPs and may over represent surveillance conducted in all provincial LTCFs. Also, anecdotally, many of the privately owned and operated LTCFs, not included in our survey, conduct minimal surveillance, if at all. As a result, it is important to note that recommendations will be most applicable to acute care and not long-term care facilities.

In both facility types, however, methodologies for ARO surveillance were similar likely due to the fact that programs had been in place for more than 5 years in over 80% of responding facilities for MRSA and in over 65% of facilities for VRE. The majority of facilities used common definitions from CDC or the Public Health Agency of Canada. Importantly, the definition of community acquired versus nosocomial or healthcare associated MRSA differed, with two sites basing their definition on antimicrobial susceptibility pattern rather than epidemiological profile. This has important implications when assessing the percentage of community-acquired cases of this antibiotic resistant organism. A high proportion of facilities reported documentation of body sites and where MRSA and VRE were acquired and most reported results within their region to MAC and IC Committee. While we are unable to comment on the comprehensiveness of outpatient surveillance, approximately 75% of responding ACFs and 57% of LTCFs did report the ability to collect outpatient data. Facilities also reported good evidence of screening of contacts in 93.2% of facilities. Although many sites did report exclusion of repeat events, it is important to note that one-third of both acute care and long-term care facilities were unable to exclude repeat events for both MRSA and VRE. As surveillance for MRSA and VRE aims to measure trends in incidence (new infections) and not prevalence (both new and existing infections), ARO surveillance programs should aim to exclude repeat events to avoid the same patient being counted repeatedly.

While data on admission screening was incomplete for some facilities, there were variations in screening definitions used that could affect detection as facilities with more intense screening methodologies are more likely to report higher rates of MRSA and VRE. Over half (56%) of facilities reported presentation of raw data rather than as rates. This gap in surveillance methodology should be rectified; in order to identify outbreaks, perform trending and benchmark, a facility must have baseline rates on the incidence of HAIs. The survey also found that over one-third (36%) of acute care facilities did not characterize or save isolates. This proportion was lower in LTCFs. The availability of appropriate medical microbiology laboratory capacity is essential to outbreak detection, particularly for characterization of isolates. This information is important to support epidemiological data in confirming whether an outbreak is based on a common source or whether transmission is linked.

Key Findings:

- **Reported participation in MRSA and VRE routine surveillance is high with all the facilities declaring they perform this activity**
- **Surveillance definitions are consistent within the facilities surveyed; however, actual protocols remain unclear (i.e. how much is screening vs actual surveillance?)**
- **The majority of facilities screen patients on admission, screen contacts and approximately half have similar definitions for facility acquired versus community acquired MRSA or VRE.**
- **Inconsistencies in intensity of surveillance and screening of contacts are present.**
- **Lack of a defined denominator (e.g. MRSA/1,000 inpatient days or inpatient admissions) and inclusion of repeat events prevents trending and benchmarking.**
- **Variation in the definition of community versus hospital associated MRSA and VRE impedes accurate determination of community acquisition.**

Recommendation:

1. **Adopt Public Health Agency of Canada definitions and protocols for MRSA and VRE surveillance particularly with regard to place of acquisition (community versus healthcare associated)**
2. **Use a provincial standard (e.g. 10,000 inpatient days and/or 1,000 inpatient admissions) as a denominator for MRSA/VRE surveillance to allow comparisons.**

2. ***CDAD SURVEILLANCE***

Surveillance for CDAD was the third most common type of activity conducted with a 97.8% of reporting acute care facilities and 45.8% of reporting LTCFs participating. Similar to MRSA and VRE, our results showed that definitions are generally consistent and most facilities (85% of ACFs; 90% of directly-funded LTCFs) document relapses and distinguish them from repeat events. In addition, both inpatients and outpatients were eligible for surveillance in two-thirds of facilities. While nine facilities indicated that admission screening for CDAD was done, these were related to the use of gastrointestinal algorithms and therefore still detected clinically significant isolates. Questions regarding laboratory capacity found that while all laboratories detected toxin A, only 60% of acute care facilities detected toxin B and 27% of facilities used culture as a diagnostic tool. This has implications for tracking molecular profiles such as the Montreal hypervirulent strain or in terms of screening for new emergent strains. The BC Association of

Medical Microbiologists (BCAMM) has recently completed a protocol for laboratory diagnosis of CDAD that has made diagnosis recommendations. In addition to this, although 42% of acute care facilities reported that CDAD surveillance had been in place for five years or greater, recent development of a PICNet surveillance protocol for CDAD will enable further standardization of methodology in the near future.

Key Findings:

- **There is consistent use of Public Health Agency of Canada or CDC definitions for cases, and recurrences.**
- **A majority of sites perform this type of surveillance.**
- **There is variation in laboratory diagnostic methods and in the use of definitions for relapse of CDAD.**

Recommendations:

1. **Encourage laboratories to adopt the recently completed BCAMM guidelines for laboratory diagnosis of CDAD for acute care.**
2. **Adopt the PICNet surveillance protocol for CDAD across the Health Authorities.**
3. **Use a provincial standard (e.g. 10,000 inpatient days and/or 1,000 inpatient admissions) as a denominator for CDAD surveillance to allow comparisons.**

Our results for surveillance of MRSA, VRE and CDAD demonstrate great opportunities for standardization provided consensus on screening methods and selection of denominator is reached. This will be important for determining trends within institutions, within the regions and, if desired, between regions.

3. *SURGICAL SITE INFECTION SURVEILLANCE*

Surgical-site infections, the third most common nosocomial infections, cause substantial morbidity and mortality and increase hospital costs. [5] Surveillance programs have been shown to be an effective measure in reducing surgical-site infection rates. [6] Data on surgical site infection surveillance were reported only for acute care facilities conducting surgery (n=47 facilities). Sixteen percent of facilities did not conduct any type of SSI surveillance activity. The most common surgeries conducted were orthopedic, gastrointestinal, obstetrical and breast, however, those surgeries with the highest proportion of facilities reported conducting surveillance on orthopedic, cardiovascular and obstetrical (mainly Caesarean section) surgeries. Procedures under surveillance did not correlate with the most commonly performed operations. As well, they did not necessarily correlate to those procedures associated with higher morbidity and mortality from a post-operative infection. Notably orthopedic, neurological and cardiovascular procedures were followed in less than 1/4 of the facilities performing these surgeries. Only Caesarean sections were followed postoperatively in more than 75% of facilities.

Results also found that the intensity of SSI surveillance was not related to facility size or complexity of care. Teaching hospitals did tend to do more surveillance for SSI related to breast, neurologic, cardiovascular, and orthopedic procedures as would be expected given the distribution of caseload weighted towards this group. However, there was no difference between teaching and non-teaching facilities for obstetrical or gastrointestinal SSI surveillance.

Strong components of SSI surveillance programs included the use of the CDC's National Nosocomial Infection Surveillance system (NNIS) definitions including capture of wound class data by all responding facilities. According to NNIS methodology, a minimal SSI surveillance program should include the capture of ASA risk stratification index and denominator data for the calculation of SSI rates. Capture of this desirable information ranged from 50 to 100% of facilities for those sites that completed this information. The fact that the fields were not filled in by many sites may indicate a lack of knowledge regarding this risk stratification methodology. Differences in methodology varied by health authority, but also by procedure. The patient population surveyed ranged from 17% surveying inpatients (vs. both inpatient and outpatients) for renal SSI to 100% of facilities surveying only inpatients for neurosurgery-related SSI. The use of post-discharge surveillance also ranged from 0% of facilities conducting post-discharge surveillance for neurosurgery SSI to 56% for obstetric SSI. While differences in methodology were more likely to be between health authorities, there were some differences within health authorities in patient population and procedure coding (e.g., ICD-9 versus ICD-10 codes).

In order to conserve scarce resources, some programs survey only a fraction of their procedures or may rotate surveillance among different procedure types. Interestingly, this review found that SSI related to cataract surgery was conducted by a number of facilities on a routine basis. Given the low rate of SSI associated with this procedure and the large associated workload, this is a possible area for reallocation of infection control resources to other surveillance activities.

In summary, considerable variation in procedure coding, use of ASA scores to stratify procedures by risk, collection in denominator data, inpatient and outpatient data collection, and the need to define the methods by which infected cases are identified are just a few of the issues identified.

Key Findings:

- **The majority of facilities surveyed use NNIS definitions and classify procedures by wound classification.**
- **Almost one-fifth of facilities do not conduct SSI surveillance.**
- **Variation exists in the procedures surveyed between sites, within the HA and the region.**
- **Variation in coding procedures makes comparison of surgeries between facilities difficult.**
- **Variations in methodology to identify infected cases exist, particularly with regards to outpatient follow-up.**
- **Some facilities do not collect denominator data.**

Recommendations:

1. **Develop standardized case definitions and indicators for use in British Columbia hospitals. (This has been forwarded to the PICNet SSI surveillance working group for consideration)**

NOTE: The complexity and variation in methods for outpatient procedures and lack of agreement regarding its value precludes the Needs Assessment Working Group from making any further recommendations related to SSI surveillance (this has been referred to the PICNet SSI surveillance working group for consideration).

Surveillance for UTI, BSI, VAP and HAP are infrequently done. While it is recognized that some of these infections are associated with high morbidity and mortality, it is possible that the lack of surveillance may be due to the intensity of resources required for certain of these activities, particularly CVC BSI and VAP. However, this does not negate the importance for following infection rates.

Key Findings:

- **Surveillance for other HAIs is infrequently performed.**
- **Only a few sites perform surveillance for BSI and VAP despite the significant morbidity and mortality associated with these HAIs.**

Recommendations:

1. **Encourage sites to perform CVC BSI surveillance (both laboratory and clinically based) at a minimum.**

Infection control programs were strikingly under serviced in terms of access to epidemiological services and data entry. Only two regions reported access to degree epidemiologists. The vast majority (94%) of infection control professionals entered their own surveillance data, an activity that could more appropriately be designated to clerical staff and/or minimized with the use of electronic data-capture forms.

Key Findings:

- **Despite limited resources, data collection (of some sort) is conducted at all facilities surveyed.**
- **The majority of facilities do not have access to a professional epidemiologist (i.e. a masters or doctoral prepared epidemiologist).**
- **The majority of facilities report no access to clerical staff for data entry.**

Recommendations:

1. **Review epidemiological services available in health authorities and devise a plan to provide epidemiological services to all facilities to assist in developing a comprehensive and consistent surveillance program.**
2. **Determine scope of responsibilities (i.e. roles and responsibilities) of infection control staff and then assess adequacy of administrative support, HR, IT and equipment within this scope.**
3. **Encourage use of shared databases wherever possible (the difficulties with variation in patient and laboratory information systems and integration with existing systems is recognized by the surveyors).**
4. **Use electronic data capture and existing electronic information (e.g., Cardiac Registry for SSI surveillance) wherever possible to minimize duplication of effort.**

In 1985, the SENIC (Study on the Efficacy of Nosocomial Infection Control) project identified three essential elements of infection surveillance and control programs. [7] These included epidemiological surveillance for HAIs, developing policies and procedures to control these infections based on the surveillance data, and training specific personnel to do the surveillance and coordinate the control activities. The SENIC project found that hospitals with these infection control components reduced their HAI infection rate by approximately 32% when compared to hospitals that did not. The results demonstrate the great potential and opportunities for standardization of surveillance methodology throughout the HAs and subsequently the province of British Columbia; however, this will require an investment in infection control personnel, information system (database) support, provision of medical microbiology and epidemiology services and clerical assistance.

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SECTION 3 - PRACTICE

Infection Control Practices

INTRODUCTION

The literature and the opinions of many stakeholders agree that practice consistency is an important feature in the drive to improve the management and control of healthcare associated infections (HAI). If public health focuses on community infection threats, while infection control focuses on healthcare facility threats and occupational health and safety concerns itself with protection of the workers, these independent perspectives will find it difficult to produce the seamless infection control practices required by patients for effective prevention and control of healthcare associated infections. To ensure practice consistency, it is necessary to establish an informed foundation of the current practices within each practice group (e.g., infection control professionals) in each separately controlled operating unit (e.g., facility). This, in turn, should directly influence each practice group's behaviour through development and implementation of standards, policies and guidelines (SPGs).

The intended purpose for this section was to review the SPGs currently in place within health authorities that relate to HAI and to determine the following:

- What standards, policies, and guidelines currently direct the behaviour of infection control personnel and are these evidence-based?
- What exists to suggest there is consistency of infection control practices and definitions among the practitioners? and,
- How do the standards, policies, and guidelines direct or define the relationship of infection control professionals to the other healthcare staff?

Standards, policies and guidelines represent the evidence of what the professional must, should, or may do under the circumstances covered by the directive within the adopting facility. The evidence about SPGs is that approximately 10% to 25% of health professional practices enjoy the support of formal evidence[1]. It follows that the remaining 75% to 90% of "behavioural directives" in health care are based upon the considered judgment of their authors, based upon their training and the professional practice experiences. As a consequence, local facilities may have "Preferred Practices" ~ SPGs that were developed to meet local need by local practitioners. While likely to be variable in nature, these local directives are very important indications of the level of evidence-based practice currently employed in each facility.

METHODS

In the fall of 2005, a request was made to all the Health Authorities to submit their infection control manuals and other key documents relating to infection control (e.g., annual reports) to the consultant working on this section of the project. This included information from public health, occupational health and safety, and infection control within acute and long-term care facilities. The materials were either provided in paper or electronic format.

RESULT HIGHLIGHTS

The majority of the information received related to infection control practice within facilities and less information came from the areas of occupational health and safety and public health.

A preliminary review of the information received indicates that there is a large degree of variance between and within health authorities relating to what SPGs exist relating to infection control practice as well as the methodologies used. In some cases, health authorities referred to existing guidelines created by organizations such as the Public Health Agency of Canada and the Centers for Disease Control and Prevention in the United States. In other cases, multiple local documents exist with a health authority with no standardization across the region or province. An area deserving specific mention is the variations in terminology/definitions used across the province. For example, there lacks a common agreement as to what is meant by terms such as "health care associated infection". In some cases, the relevancy of the standards, policies and guidelines was also in question as a number of documents received had not been reviewed within the past 5 years and/or were labelled as draft documents.[a]

Finally, it should be noted that a number of health authorities did not include infection control in their annual report or produce a specific report on infection control activities.

DISCUSSION

Relevant and consistent infection control practice guidelines, standards and policies currently do not exist within all health authorities. Although such documents must be developed in such a way that they respect individual differences, there are distinct advantages in the sharing of existing material and collaborating on the development of new documents across all health authorities. And while the improvement of infection control practices and guidelines should ideally rest within those involved in the daily practice of infection control, in conversations with practitioners about the preliminary findings, the common response was that there lacked sufficient time, and in some cases the necessary expertise, to seriously address this "important area"[2]. Based on these conversations, it can be summarized that there is a significant need for broader organizational support to allow for the development and incorporation of policies/guidelines/standards. At a minimum, the acknowledgement by management is required for the time to participate on the necessary committees.

As well the reporting on the activities of the infection control program varied within and across health authorities. This is noteworthy, as it speaks to either a lack of capacity, a variance in expectation relating to different infection control programs across the province, or both.

Although the findings are preliminary, the Key Findings can be summarized as follows:

Key Findings:

- **Variations exist within and across health authorities with relation to the terminology used in infection control program.**
- **While a number of standards and guidelines exist some facilities lack consistent and up-to-date standards and guidelines for infection control practice.**
- **Reporting on infection control activities (i.e. via annual reports) is variable and when done is often not comprehensive (i.e. is limited to patient data, not staff).**

[a] Information obtained via verbal exchanges between consultant and Needs Assessment Working Group members

While there is still a significant amount of data that still require review, there are some preliminary recommendations that may begin the discussions associated with the way forward:

Recommendations:

1. **An agreement on the common definitions related to infection control practice should be made between all health authorities.**
2. **Relevant and consistent infection control practice guidelines, standards and policies should exist across all health authorities.**
3. **All infection control programs should prepare an annual report which, at a minimum, reports on a set number of elements within an infection control program.**

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SECTION 4 - CONCLUSION

CONCLUSION

The basis of a good infection control program includes both adequate human and financial resource capacity. This includes an effective working team of practitioners and physicians trained in infection prevention and control; the human resources needed to collect, enter and analyze data on the surveillance of HAI; the ability of qualified staff to set and recommend policies and procedures based on synthesis of surveillance data, clinical practice guidelines and literature review and the resources to directly intervene to interrupt the transmission of infectious diseases; and resources needed to educate and train healthcare workers and providers in basic infection prevention and control procedures. [1]

With the increased focus on infection control following the SARS outbreak and increasing rates of antimicrobial resistant organisms, the roles of individuals working in this area have expanded, as have the requirements for depth of knowledge. The demands for infection control (IC) services have substantially increased the need for resources to provide educational programs and surveillance activities. Multiple responsibilities and lack of resources hinder essential infection control activities such as assessing health care workers' educational needs or incorporating infection prevention strategies based on best practices.

Among all provincial health authorities, the results of this needs assessment indicate that IC resources are lacking. In all areas surveyed, Facility Infection Control, Surveillance, Occupational Health and Public Health an underlying theme emerged; there is a lack of the resources necessary to provide effective infection prevention and control programs.

None of these elements function in isolation. Surveillance for healthcare associated infections (HAI) is a foundational activity of a good infection control program. Continuous monitoring of HAI rates can be used to implement quality improvement activities and programs, assess effectiveness of interventions and benchmark with comparable facilities. Surveillance data can also be used to quickly identify and confirm outbreaks and provide epidemiological profiles for both clinical and research purposes.

In 2002, the Public Health Agency of Canada's Division of Nosocomial and Occupational Infections developed guidelines for the "Prevention and Control of Occupational Infections in Health Care" to assist occupational health (OH) practitioners, medical directors and others responsible in the prevention and management of health care workers' exposures to, and infections with, infectious diseases. This guideline reinforced the necessity for collaboration between OHS and infection control programs in order to reduce occupational health hazards. [2]

The analysis of the public health questionnaires confirms the province-wide involvement of public health departments in outbreak situations related to HAI. It is interesting to note, however, that despite recent events such as SARS, where the boundaries between communities and institutions were bridged; there are limited public health personnel within the six regional health authorities dedicated full-time to infection prevention and control issues related to healthcare associated infections.

In order for IC programs to improve there must be a focus on three areas: addressing the lack of resources, addressing the lack of educational opportunities and addressing the lack of standardization across the infection control community.

First and foremost standards for IC staffing levels in all health authorities should be reviewed to ensure the necessary positions are created to meet those standards.. As highlighted in all areas of this assessment, there is a lack of experienced practitioners to fill positions. Simply providing funding to hire more practitioners is not a solution on its own. Opportunities for specialized training in infection control need to be provided as well as funding for the education and mentoring of new recruits. Minimum standards for the core competencies of all health care professionals trained in IC need to be identified. As in all areas of health care access to highly trained and skilled workers is limited. Strategies need to be explored that will provide greater access to physicians with specialized training in infection control and experienced practitioners through the sharing of resources and greater collaboration between Health Authorities. Succession planning needs to occur in all areas to address the present staff shortages as well as those anticipated due to attrition and retirement.

As noted, much infection control staff time is taken away from essential activities by performing tasks better suited to others. Some solutions that may alleviate this problem would be providing local epidemiological services to facilities to assist in developing comprehensive and consistent surveillance programs. Allocating clerical staff for data entry to allow more appropriate use of ICP time and encouraging the use of shared databases wherever possible. Electronic data capture should be used and existing electronic information should be incorporated wherever possible to minimize duplication of effort. If HAI surveillance indicators are to be used for comparison to provincial and national benchmarks, it is recommended that recognized surveillance definitions and procedures be adopted.

Implementation of OHS staffing resources dedicated solely to the prevention of occupationally acquired infections could have wide-reaching benefits for overall infection control. It would ensure integration of up to date OHS polices and procedures into the IC program and ensure consistent and timely coverage for all employees including contracted workers and medical staff. These individuals would act as liaisons with other IC professionals and collaborate in the development of response plans in emergent situations. Increasing the number of OHS professionals in addition to a greater geographic distribution of these staff across a HA is recommended. Efforts should be directed towards the development of guidelines outlining a recommended ratio of occupational health professionals to employees; professional staffing ratios may need to be individualized for the HA depending on the scope of service provision and geographic separation between worksites. Adequate coverage of each HA by a trained occupational physician is also essential, and resources need to be made available to ensure that this occurs.

Public health has a broad mandate. Similar to occupational health and safety, public health professionals are engaged in an extensive range of job responsibilities that encompass both IC and non-IC tasks. Currently, as a way to more clearly define public health's role, core programs are being developed for public health in British Columbia. A key component in this initiative is ensuring that the system capacity requirements are met. A supportive infrastructure and capacity to deliver core programs is an essential component of the core functions framework. To ensure public health has the basic platform and capacity, system capacity building is required at both the provincial level and in the health authorities. Capacity requirements include ensuring adequate numbers of trained and competent staff.

Determining what public health involvement should be in the area of infection control activities related to healthcare associated infections will help assess adequacy of current public health personnel in the area of healthcare associated infections and ensure integration of public health activities within the broader provincial infection control community of practice.

It would appear then that public health activities in HAI infection control are not duplications of work done by others in the health care system. Consistently between the health authorities, the public health departments had less involvement with acute care facilities (and their affiliated long-term care facilities), which was expected as a large number of acute care facilities have dedicated infection control professionals. In other words, the results demonstrate that public health departments provide services to facilities outside the acute care setting. This is further supported by the large percentage of public health time spent providing advice/support to non-directly funded organizations. This is likely due to the lack of infection control resources and support in the business/private health settings, as well as the regulatory role of Public Health in licensed care facilities. Looking into the future, responsibility for meeting the infection control needs of the increasing numbers of assisted living facilities will only increase.

Finally, variations exist within and across health authorities with relation to the terminology used in infection control programs. There is a lack of consistent and up-to-date standards and guidelines for infection control practice within health authorities and as a whole inconsistent reporting on infection control activities across the province. Agreement on the common definitions related to infection control practice should exist among all health authorities and relevant and consistent infection control practice guidelines, standards and policies should exist across all health authorities.

PICNet includes acute care, public health, occupational health and safety, residential/transitional care and the community. In other words, PICNet consists of the entire multidisciplinary team involved in infection prevention, surveillance and control in the province of British Columbia. The role of PICNet is to maximize coordination and integration of activities related to health care associated infection prevention, surveillance and control for the entire province using an evidence-based approach.

PICNet aims to foster collaboration in activity areas such as: service delivery, communications, training, education, surveillance, research and the development of preferred practice guidelines, policies and procedures. PICNet also advocates for appropriate and sustainable resources.

Clearly PICNet has a role, working in collaboration with the health authorities in BC, to address the gaps in infection prevention and control identified in this assessment.

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SECTION 5 – NEXT STEPS

NEXT STEPS

On June 21, 2006, members of PICNet's community of practice met and reviewed the data from the Needs Assessment. The methodology and the results were presented and then participants divided into three pre-determined groups to address Gaps/Oversights, identify Priorities and propose Approaches to meet those priorities.

One common Gap/Oversight that was discussed in all three groups was the need to qualify where and when the information from this Needs Assessment was gathered. Although most participants understood that this Needs Assessment was designed to be a "snapshot" in time, there was concern that others may misinterpret the information. As a result, we have done our utmost to qualify all the data within each section of the report. Similarly, some participants wanted to ensure that it was clear as to the period of time this survey covered because changes have occurred within their system since then. Again, the writer's have made the necessary amendments to the final document to capture this element.

As discussed, the participant divided into three groups to discuss Priorities and Approaches. Although a great deal of information was captured in this Needs Assessment, three common themes emerged from across all the areas reviewed and we felt these areas warranted our attention first. These three themes concerned the following areas:

1. Staffing
2. Education/Training
3. Surveillance and Best Practices

The participants reviewed all the results from the report and the following priorities and approaches highlighted in blue were proposed: [a] [b]

STAFFING	PRIORITY	APPROACH
THEME: Insufficient number of skilled staff to provide infection control services	Establish recommendation for number of infection control professionals in different types of health care facilities in BC • need to be sensitive to the fact that each HA understands their needs best, so make it a recommendation not a standard	***PICNet proposing development of a working group to look at Education/Training/Practice issues***
	Assess roles and responsibilities of personnel involved in infection prevention and control (ICP's, physicians and/or doctoral level staff, epidemiologists, occupational health, public health) • develop recommendations for staffing in these areas • support HAs in achieving dedicated support in these areas	***PICNet proposing development of a working group to look at Education/Training/Practice issues***
	Develop strategies for the active recruitment of infection prevention and control staff	***PICNet proposing development of a working group to look at Education/Training/Practice issues***

[a] The italized information is proposed by PICNet
[b] Note: some priorities were assimilated as they were identified by more than one group

EDUCATION/TRAINING	PRIORITY	APPROACH
THEME: Inconsistent standards for education/training to develop the skill set for provision of infection control services.	Establish basic skills (i.e. core competencies) for staff working in infection prevention and control	***PICNet proposing development of a working group to look at Education/Training/Practice issues***
	Establish education/training requirements for infection control based on core competencies	***PICNet proposing development of a working group to look at Education/Training/Practice issues***
	Establish funding for infection control education/training and continuing education	1. HAs need to dedicate resources and support professional development opportunities 2. Include infection control education requirements in strategic planning activities 3. Identify infection control education requirements as part of quality management initiatives
	Increase educational/training opportunities across all disciplines	PICNet: 1. Use PICNet website to promote educational opportunities 2. PICNet can make educational opportunities available via teleconference or other technologies 3. Provide and/or link to existing modules through PICNet website 4. Create an inventory of programs that are available to share and a list of individuals who can serve as resources (i.e. mentoring, access to leadership within networks such as CHICA-BC, CHICA-Canada) **5.** Influence educational institutions to incorporate infection control standards into formal educational programs for all disciplines **6.** Increase awareness of all professional groups involved in infection control (i.e. promote Team/Interdisciplinary Approach) ***PICNet proposing development of a working group to look at Education/Training/Practice issues***

SURVEILLANCE/BEST PRACTICES	KEY PRIORITIES	APPROACH
THEME: Inconsistent standards in surveillance and best practices to guide those who deliver infection control services	Surveillance – is it really being done? How?	Create a surveillance working group with members from across the continuum of care to: i. Define surveillance and outline surveillance protocols; ii. Assist with prioritizing HAI surveillance activities; iii. Identify best practices and other key resources in HAI surveillance across the Province and beyond: iv. Encourage use of shared databases wherever possible (the difficulties with variation in patient and laboratory information systems and integration with existing systems is recognized by the surveyors). • Encourage use of electronic data capture and existing electronic information (e.g., Cardiac Registry for SSI surveillance) wherever possible to minimize duplication of effort. • Review epidemiological services available in health authorities and devise a plan to provide epidemiological services to all facilities • Identify key educational/training opportunities in surveillance for health professionals
	Identify what are core elements in an infection control program?	***PICNet proposing development of a working group to look at Education/Training/Practice issues***
	Continue to promote the development of IC guidelines with input from across the continuum of care (e.g. IC, Occupational Health, Residential Care, Public Health)	***PICNet – ongoing activity***

The results from the Needs Assessment have been presented to the Provincial Medical Services Committee (PMSC) along with the Priorities and proposed Approaches for addressing these priorities. PMSC has given its permission for PICNET to share this document with its community of practice and action on the priority items will begin.

Appendix A - Definitions

(Unless otherwise referenced the following definitions and their references can be found on the PICNet website at: www.picnetbc.ca)

Acute Care Facilities: A hospital where lengths of stay average < 30 days, and where a variety of services are provided, including surgery and intensive care.

Committees: A body of persons elected to or appointed for a specific function [2]

Community Health Settings: Community Services refers to home and community based programs that provide assessment and/or care to clients in their home environment which could be individual homes or Assisted Living Facilities or Supportive Housing or Group Homes. This is encompasses many programs including but not limiting to Home Care Nursing, Home Support, Adult Day Programs, Meal Programs, Respite Programs, Community Long Term Care Services (may be called Case Management now), Home Respiratory, and Home Rehab.

Then there are programs that fall under the Mental Health umbrella that use Community Services such as Home Support or they may have their own staff who provide assistance with care in the home – this includes but is not limiting to Adult Community Support Services, Adult Short-Term Assessment and Treatment Services, Elderly Services and Developmental Disability/Mental Health Services. [1]

Consultations: the act of instance of consulting; giving professional advice to others working in the safe field.[2]

Education: The act or process of educating or being educated; systematic instruction, schooling, or training. [2]

Long-Term Care Facilities: Residential care that includes a variety of levels and types of care for clients who can no longer safely live at home e.g. because of their need for medication supervision, 24-hour surveillance, assisted meal service, professional nursing care and/or supervision. Terminology varies provincially e.g. nursing home, chronic care hospital, and extended care unit.

Policy: A policy is a required course of action adopted to achieve a desired outcome. A policy statement describes what must and must not be done, but in general, does not describe how the work is done. It states expectations, assigns responsibility, sets limits, and serves as the basis for consistent decision-making [4]

Procedure: The sequence of steps to be followed in establishing some course of action [4].

Rehab/Transitional Care: Transitional care serves those who have been discharged from the hospital but still require short-term rehabilitation and special care in order to make the transition from the hospital to home.

Research: The systematic investigation into and the study of materials, sources etc., in order to establish facts and reach new conclusions; an endeavour to discover new or collate old facts etc., by the scientific study of a subject or by a course of critical investigation [2]

Surveillance: the systematic collection, analysis, interpretation and dissemination of data [3]

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