PICNet
Provincial Infection Control Network – BC

The

Provincial Infection Control Network (PICNet)

Surgical Site Infection Surveillance

Working Group's

Strategic Plan and Options Paper Report

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The Provincial Infection Control Network (PICNet) Surgical Site Infection Surveillance Working Group's Strategic Plan and Options Paper Report

Executive Summary

Background Information

In December 2004 the BC Patient Safety Task Force chaired by Dr. D. Cochrane issued a report recommending the development of a standardized surgical site and infection control surveillance and reporting program [(1)] This program would include a Provincial Infection Control Committee that would publish an annual nosocomial infection report based on the surveillance results of all Health Authorities. The overall goal of the new program would be to reduce the incidence of surgical site and other healthcare-associated infections.

The following PICNet Surgical Site Infection Surveillance Working Group Strategic Plan and Options Paper Report outlines a framework and rationale for the creation of a provincial infection surveillance system. The report is thus a first step in the development of the recommended program.

Surveillance

Surveillance of surgical site infections (SSI) is a key activity in the monitoring and reduction of infection rates. SSIs develop in 2 to 5 percent of Canadian patients during the post operative period and add an average additional cost of $3700 per SSI to the health care system. [(44)]

Patients with SSIs have a five times greater chance of re-admission and are twice as likely to die as a result of this potentially avoidable complication.[(2)] Although there is ample evidence that a significant proportion of healthcare-associated infections can be prevented with ongoing surveillance, the results from the PICNet's Assessment of Infection Control Activities across the Province of British Columbia [(45),] indicates that the majority of hospitals in British Columbia do not participate in any formal program for SSI surveillance.

Benefits of an Effective Surveillance Program

1. **Decreased Morbidity**
   Preventing surgical site infections has the potential to decrease morbidity. SSIs develop in two to five percent of Canadian patients during the post operative period. Each one of these infections adds an average additional cost of $3700 to the health care system. [(44)] An effective surveillance program can prevent up to 35% of such infections. [(13).]

2. **Cost Savings**
   Based on 100,000 inpatient surgeries in BC per year at a 5 percent infection rate, even a 15% reduction in infection rate will save the system **$2,775,000 per year** – far more than the costs of establishing a province-wide surgical site infection surveillance program. (See Appendix B).

3. **Meeting Accreditation Standards**
   An effective surveillance program will ensure that the Health Authorities and facilities will comply with the expectations of the Canadian Council on Health Services Accreditation's (CCHSA) Patient Safety Goals and Required Organizational Practices.

4. System and Operational Improvements

The surveillance system will equip the facilities with:

- a consistent and accurate method of data collection
- the ability to analyze and report SSI surveillance data and give timely feedback of SSI rates to surgical teams
- a system to monitor and quickly identify the presence, magnitude and risk factors of an SSI cluster or outbreak
- a process to identify and promote best practices
- a means to implement changes that are based on surveillance data analysis in order to minimize the occurrence of SSIs

The most important benefit of surveillance is a reduction in surgical site infections.

Interpreting Surveillance Results

A robust surveillance system requires standardized definitions and data collection methods. But even with standardization, individual interpretations of the definitions and varied patient and procedural factors can influence the results. The comparison of results between hospitals is difficult and may lead to erroneous conclusions.

The PICNet SSI Surveillance Working Group does not recommend comparison of results between hospitals or surgeons.

Ingredients for a Successful Surveillance Program

The success of any surveillance program depends on the goodwill and acceptance of those involved. A system viewed as a mandatory inspection practice that includes penalties for lack of acceptable results is liable to fail.

The most essential part of a surveillance system is a consistent, cohesive, and cooperative multidisciplinary group at the facility level including well trained ICP's that:

- regularly reviews current policies and procedures.
- analyzes surveillance reports.
- *has the authority and ability to introduce changes that will lower the infection risk.*

Current Surveillance Systems

Current surveillance systems used in the US, Europe and Australia create benchmark figures by analyzing data from multiple facilities. The participating hospitals, using the same methods and definitions, are expected to compare their results with the published benchmarks, and to track their facility rates over time. It is best to view benchmarks as only rough calculations because the surveillance methods used can cause variations from the benchmarks. These large systems require sufficient numbers of a specified surgical procedure at the facility to create data that may be statistically significant when compared to the benchmark. This excludes or reduces its use in many smaller hospitals. The PICNet SSI Surveillance Working Group has made recommendations for all facilities performing surgery in BC, despite their size or variety of surgical procedures performed.

Summary of Major Recommendations

After considering four options, the PICNet SSI Surveillance Working Group recommends a two-tiered phased in approach for province-wide SSI surveillance:

A. Provincial Level:

Establish the *Surveillance of Health Care Associated Infection Program for British Columbia* (SHAIP-BC) to serve as the provincial resource team initially responsible for the surveillance of surgical site infections; but with the long term goal to include surveillance of other healthcare associated infections. It should be a multidisciplinary group including Infection Control Practitioners (ICP's), Epidemiologists, Statisticians, Surgeons, OR Nurses, Pharmacists, Administrators, Medical Microbiologists and others interested or concerned with the prevention of surgical site infections. This program would report through the Provincial Medical Services Committee (PMSC) to the Ministry of Health.

SHAIP-BC will:

1. function as an independent, neutral entity within the provincial health system, reporting to PICNet and PMSC.
2. create and assist in the implementation of standardized surveillance protocols province-wide.
3. develop agreements with Health Authorities in order to share SSI data analysis and interpretation.
4. coordinate program integration with other provincial and federal initiatives that deal with infection prevention and patient safety in order to avoid overlap and duplication of efforts.
5. provide the tools for, and assistance with data collection and processing for the province.
6. develop pilot projects to provide experience and information to assist in the creation of SSI surveillance programs within the Health Authorities.
7. assist smaller facilities with Infection Control audits as requested.
8. assist the Health Authorities to set up facility-based programs.
9. provide training in surveillance methods and procedures as required.
10. collate and disseminate aggregate provincial surveillance data.
11. create a specialized team for investigating and interpreting unusual results or outbreaks.
12. have the administrative ability to develop province-wide surveillance programs for other healthcare associated infections, once the SSI system is established.

B. Health Authority Level

Each Health Authority will create a local group to design, implement and manage the SSI program in their institutions. They will select SSI surveillance suitable for their specific needs and surgical procedures performed, using the standardized surveillance methods agreed upon with SHAIP-BC. The Health Authorities will be responsible for processing the data and releasing appropriate information back to the facility of origin and into the public domain. They will provide SHAIP-BC with the necessary information to determine the provincial rates.

The Health Authority level program should include:

1. data collection on infection rates.
2. infection control audits.
3. mechanisms for the review of the surveillance and/or audit information collected.
4. appropriate recommendations and implementation of improved practices with the goal of lowering the SSI rate.

This two tiered approach gives the Health Authorities flexibility and autonomy in selecting which surgical procedures to survey while ensuring consistency and accuracy in the surveillance methods because all Health Authorities will use the same surveillance system and data collection/analysis methods.

Process and Budget Recommendations

The PICNet SSI Surveillance Working Group recommends that:

1. The PICNet Steering Committee plays a major role in taking forward the implementation of provincial SSI surveillance in BC hospitals to the PMSC.

2. The BC Ministry of Health authorizes funding to develop and implement a *Surveillance of Health Care Associated Infection Program for British Columbia* (SHAIP-BC). It will begin by developing a province-wide surgical site infection surveillance system. The budgeted amount should take into consideration that the Health Authorities will need to allocate additional funds to hospitals. Otherwise it will be unrealistic to expect the hospitals to be able to initiate and maintain effective surveillance activities.

3. The planning process begins as soon as possible so that pilot SSI surveillance sites can be in place before the end of 2007.

Strategic Plan and Options Paper Report - *PART I*

Vision Statement

To provide a framework for a standard method of surgical site infection surveillance and reporting that can be applied across BC.

Preamble

Surgical site infections (SSIs) are the third most common hospital associated infection in the United States and in Canada.[28] It is estimated that each year SSIs develop in two to five percent of patients who have had a surgical procedure.[2] Patients with SSIs have a five times greater chance of re-admission and are twice as likely to die as a result of this potentially avoidable complication www.medqic.org. Each SSI costs an additional $3700 and it adds on average seven more days of hospitalization per patient[44].

Surveillance of surgical site infections (SSIs) is a key activity of any infection prevention and control program. In recent years SSI surveillance has become a hot topic, with both the public and government lobbying for more transparency in reporting SSI rates. In 2004 the Cochrane Report[1] called for the development of a standardized surgical site and infection control surveillance and reporting program in BC.

Clinical and Fiscal Significance of an Effective Surveillance Program

The simple act of surveillance alone has been demonstrated to reduce SSIs when information on infection rates is reported back to the surgical team.[4, 22] In 1985 Haley et al noted that a strong infection surveillance program with feedback of SSIs rates to surgeons reduced SSI rates by up to 35% for all surgical categories. This study resulted in the current US national recommendations for uniform review of surgical site infections. [13]

Decreased Morbidity

An effective provincial surveillance program is able to reduce the infection rates by 10 to 35 percent [13]

Cost Savings

Based on 100,000 inpatient surgeries in BC per year at a 5 percent infection rate, even a 15% reduction in infection rate will save the system **$2,775,000 per year** – far more than the costs of establishing a province-wide surgical site infection surveillance program (See Appendix B).

Meeting Accreditation Standards

An effective surveillance program will ensure that the Health Authorities and facilities will comply with the expectations of the Canadian Council on Health Services Accreditation's (CCHSA) Patient Safety Goals and Required Organizational Practices.

Operational and Program Benefits

An effective surveillance program will provide the Health Authorities and facilities with:

- a consistent and accurate method of data collection
- the ability to analyze and report SSI surveillance data and give timely feedback of SSI rates to surgical teams
- a system to monitor and quickly identify the presence, magnitude and risk factors of an SSI cluster or outbreak
- a process to identify and promote best practices

- a means to implement changes that are based on surveillance data analysis in order to minimize the occurrence of SSIs

Requirements

It is now generally agreed that surveillance for post-operative wound infections requires:

1. standardized clinical definitions of infection
2. stratification of cases based on risk factors (procedural, patient and wound classification)
3. consideration of the population under study (that is, outpatient, inpatient or both)

Most hospitals use surveillance systems based on the US Centers for Disease Control and Prevention *National Nosocomial Infection Surveillance System* (NNIS) methodology. However, there is no consensus regarding what techniques to use. [5,6,8,9,14,15,17,20,21,27]

Terms of Reference

The SSI Surveillance Working Group was asked to make recommendations to PICNet's Steering Committee on SSI surveillance. PICNet is committed to working with the Health Authorities on best indicators to use for monitoring surgical site infections (SSI) within their regions. We recommend that consistent surveillance practices are used across the province.

The *PICNet* SSI Surveillance Working Group accepted the following roles and responsibilities:

- Recommend an overall framework for SSIs surveillance to the Health Authorities.
- Define priority areas for surveillance within the scope of SSIs
- Develop standardized definitions for the priority SSIs under surveillance
- Recommend best practices for implementation
- Liaise and integrate with other project groups, provincial and national initiatives working on SSI prevention where/when applicable. (British Columbian Reproductive Care Program, (BCRCP), Safer Healthcare Now, (SHN), Patient Safety Task Force, Canadian Nosocomial Infection Surveillance Project (CNISP).

Membership

Co-chairs: Felicia Laing, Fred Roberts

Bonnie Anderson, Elizabeth Bryce, Janice DeHeer, Patrick Doyle, Bruce Gamage, Bonnie Henry, Ben Mack, Peter Riben, Gail Shimokura, Pamela Kibsey,, Kim Soltysik

PICNet's Needs Assessment

The Assessment of Infection Control Activities across the Province of British Columbia took place from November 2005 to March 2006. [45]

The purpose of the survey was to:

- provide an overview of the scope and nature of surveillance activities in BC hospitals during the review period.
- find opportunities or impediments to a successful surveillance program.
- identify the resources required for a successful surveillance program.
- indicate areas for standardization and collaboration.

Survey Results:

1. Twenty percent of the responding facilities do not conduct any surgical site infection surveillance.
2. Methodological variation exists in the sites that do surveillance.

3. The quality of the surveillance is mixed due to the lack of:
    - standardized definitions
    - risk stratification (or ability to adjust for risk factors)
    - use of denominators to compare rates.
4. The hospital Infection Control Practitioners require:
    - education on surveillance methodology
    - resources to survey and analyze the collected information accurately, consistently and in a timely manner.

Safer Healthcare Now!

By late 2005 the Canadian Patient Safety Institute had launched the Safer Healthcare Now! Campaign (http://www.saferhealthcarenow.ca). Participating hospitals across Canada implemented any one of six targeted interventions that had been proven to improve the quality of healthcare delivery. These six interventions focus on patients and their safety while in the care of health providers.

Preventing surgical site infections is one of the six national interventions. There is strong evidence that compliance with four components of surgical patient care leads to decreased SSI rates. Outcome measurements for SSI rates have not been well defined and are not standardized for Safer Healthcare Now! (SHN)

The SHN initiative is not a replacement for SSI surveillance. Rather, it is a quality improvement initiative that aims to lower SSI rates. The proposed standardized surveillance system (SHAIP-BC) will complement SHN. It is necessary to collect data, measure rates and confirm that improved surgical patient care interventions are effective.

General Considerations

The following principles are desired in a *Provincial Surveillance System:*

1. The system should have accountability at the Health Authority level. .[29,30]
2. The system should be voluntary.
3. The provincial program will coordinate and support the systems operating at the facility and Health Authority level.
4. Any publicly released results should be accompanied by a detailed interpretation in order to prevent misinterpretation.
5. Public release of information will only be at the authorization of the individual Health Authorities
6. The provincial program will only release information based on the pooling of the Health Authority results.
7. The provincial program will not provide institutional or surgeon-specific rates for comparison.

Surveillance Requirements

Surveillance should be focused on a few frequently performed surgical procedures with a significant SSI rate. The accurate information obtained can then be used as indicators for assessing the system.

Requirements for useful results

The selected surgical procedures need to:

- be of sufficient numbers
- have a minimum of technical variations
- have a clinically important and statistically significant infection rate to justify surveillance (e.g. hip replacement surgeries and complications arising from infections after hip replacement)

The surveillance system should be able to:

- report findings back to the individual facilities

- have processes in place for the interpretation of results
- make constructive recommendations on improvements

No single system will work on a province-wide basis. The provincial program will need to be individualized for each institution according to the variety and number of surgical procedures done and the financial and professional resources available.

External Benchmarks [11, 27, 38, 39]

External benchmarks may be of value in certain situations. The program must use the same methods, definitions and data management as those that were used to produce the benchmark. Often, individual facilities may not perform sufficient numbers of the procedure to create statistically significant results for comparison. Data such as patient risk factors (American Society of Anesthesiologists –ASA score) must be readily available. In many instances, rather than using external benchmarks, hospitals will have to compare current SSI surveillance results with those they had obtained in previous periods.

Organization

The Provincial Administrative Group

We recommend that a central organization (Surveillance of Healthcare Associated Infection Program of British Columbia (SHAIP-BC) be created to coordinate the activities involved in surgical site infection surveillance in the province. SHAIP-BC will be responsible for developing the system, providing the necessary education and training and providing ongoing support. This provincial program will require a permanent status with consistent funding in order to achieve its goals. The long term goal will be to expand surveillance to survey other Healthcare Associated Infections (HAI) of importance in BC such as: central-line associated bloodstream infections, ventilator-associated pneumonias, *Clostridium difficile*-associated diarrhea, antibiotic-resistant organisms, and other areas as appropriate for each facility.

Structure

1. Multidisciplinary Team:
   ICPs, Hospital Epidemiologists, Statisticians, Surgeons, OR Nurses, Administrators, Medical Microbiologists, and others interested or concerned with the prevention of surgical wound infections, as needed.
2. Administration
   SHAIP-BC will function as an independent, neutral entity in the province and will report to PICNet through the PMSC to the Ministry of Health. Data sharing agreement will be in place with BCCDC and Patient Safety Task Force who are key collaborators in this project. Reports will acknowledge the contributions of all collaborators.

Function

1. Coordinate all provincial groups involved in the surveillance of surgical site infections.
2. Develop surveillance methodology that will yield consistent data collection, interpretation, and analysis.
3. Design SSI surveillance model programs that can be adapted for use by the Health Authorities
4. Designate core or desirable surgical procedures to be monitored.
5. Assist in investigating clusters or other unusual results
6. Assist the Health Authorities in setting up and maintaining programs by providing training and other resources.

Coordinating with Other Quality Improvement Programs

Several other groups in BC and Canada are involved in efforts to reduce surgical site infections. (British Columbian Reproductive Care Program, (BCRCP), Safer Healthcare Now, (SHN), Patient Safety Task Force, Canadian Nosocomial Infection Surveillance Project (CNISP).

The *Surveillance of Healthcare Associated Infection Program* (SHAIP-BC) will coordinate with these other groups in order to prevent overlap and duplication of efforts. SHAIP-BC will also function as the central agency for the

voluntary compilation of pooled results obtained by the Health Authorities and will calculate provincial infection rates. It will share data with BCCDC.

SHAIP-BC

Two coordinated but separate surveillance techniques may be required to meet the desired goals.

i. Programs Designed In Conjunction With Provincial Databases.

One option is to work in conjunction with established surgical databases to determine the incidence of post surgical site infections in selected surgeries.

Examples:

- knee and hip replacement
- Cesarean section in conjunction with the British Columbian Reproductive Care Program (BCRCP).
  - ⇒ SHAIP-BC will create the standardized system and assist in training key personnel in the surveillance methods. Health Authorities will be responsible for data collection, and for interpreting and making recommendations on improving their performance.
  - ⇒ SHAIP-BC, with the consent of the Heath Authorities, will make an anonymous province-wide surgical infection rate available for public accountability without revealing specific Health Authority or facility data.

ii. Health Authority and Facility Programs

The second surveillance program would operate at the Health Authority level for estimating the infection rates in their facilities where databases are not currently available. It would use a variety of methods to study a wide range of surgical procedures.

Structure

- An SSI Surveillance group will be formed within each Health Authority to implement and operate a SSI program for its facilities.
- Programs will be flexible to allow for different approaches, including audits, suited to the type of hospital.
- Data analysis will take place at either Health Authority or facility level.

Responsibilities

- Investigating surveillance results.
- Releasing information to appropriate authorities within both the facilities and the Health Authorities.
- Adhering to confidentiality standards

Facility Role

- Perform surveillance.
- Process the data and send reports to facility programs and the Health Authority.
  Smaller facilities can send raw data to HA for analysis and interpretation.

Criteria for Selecting and Prioritizing Surgical Procedures

Standard surveillance systems focus on only a few procedures in their data gathering. Therefore the procedures must be selected carefully in order to produce useful results.

In small facilities it may be impossible to find procedures that meet the necessary criteria. Infection Control audits would be the preferred approach for smaller facilities.

The major criteria for selecting procedures are:

A. Well-defined surgical procedure.

It is best to study procedures with the fewest variations in technique. SHAIP-BC should determine whether there will be core procedures to be studied and/or how many surgical procedures will be required for surveillance by the Health Authority as part of the program.

B. Adequate numbers per year in order to result in statistically significant rates.
This is a major limiting factor as collecting information on a small number of procedures is generally not useful.

C. A reasonable number of infections associated with the procedure must occur.
If the infection rate is only one in several thousand then it will probably be of little value in collecting data. An infection arising in such a procedure will be so rare that it will usually be considered a sentinel event and be reviewed by the infection control and surgical teams.

D. Accurate information is available for use as the denominator in calculating infection rates.

E. Data collection must be relatively easy and accurate.
This requirement has led to the use of existing databases for determining the number of procedures done and in some instances the occurrence of post operative infection. While these sources are necessary they must be evaluated before acceptance. Many existing systems use the International Classification of Diseases (versions 9 or 10).

F. Adequate resources available for data collection

Data Interpretation [11, 27, 38, 39]

It is necessary to have an accepted method of interpreting the data. Benchmark figures are found in the literature but are only of value if the same methods of surveillance are followed exactly. Even when this is attempted there are significant errors related to the subjective assessment of wounds and other activities. The program must determine how the data will be processed and interpreted before starting the surveillance system.

Post Discharge Surveillance [3, 32, 33, 37]

Shorter hospitalization after surgery means thorough SSI surveillance requires both hospital based and outpatient surveillance for most procedures. Post discharge surveillance can be done by:

- patient questionnaire
- phone surveys
- information from outpatient visits or doctor's offices
- lab culture results
- Selective data mining (for example MSP fee codes)

Post discharge surveillance has limitations and problems. These include:

- the large number of individuals assessing the patient,
- the lack of complete information and
- the amount of resources to perform it properly.

Most post discharge surveillance will capture more SSIs but many may be superficial infections that are of unknown clinical significance.

Audits

Infection Control audits are now considered as essential tools. [19] The audit gives an assessment of the infection control practices and if conducted properly is a valuable educational process.

Audits can be used as an alternate method of assessment in small facilities where surveillance of surgical site infections is not applicable because of the low frequency of procedures.

Audits should:

- be part of all surveillance programs
- be performed in all facilities on a regular basis at a frequency that resources allow
- vary with the type of institution and the resources available
- be used in a judicious manner
- Include recommendations to address deficits
- Include follow-up at scheduled intervals to assess progress

A questionnaire collecting information on the policy, practices and resources of the surgical suite is the simplest form of audit. The Health Authority could perform this audit with limited expense and it would give the facilities some idea of what is expected of them and the Health Authority some idea of what practices are actually occurring.

A complete audit conducted by a team of experts should be considered as an alternate method of assessment. This would be a process similar to an accreditation survey and if possible should include participants from outside the facility and/or the Health Authority.

Use of Surveillance [4, 10,]
A process must be in place to assist facilities in decreasing the rates of SSI. There is little use in collecting and processing the data unless there is some method of assessing the results and taking action on them to lower the SSI rate. The audit process may often help assess and identify areas for improvement.

Surveillance Methodology
Currently available methods can be grouped into three types.

1. **The US Centers for Disease Control NNIS system.** [5,6,8,9,14,15,17,20,21,27].
   NNIS (National Nosocomial Infection Surveillance System) is widely utilized. It consists of a standardized set of definitions and methods. Results from an enrolled group of facilities submit their data to the central group for analysis and on the basis of this benchmark information is generated for anyone wishing to use the system. Criticisms of the system usually are based on the classification of surgeries, the assessment of influencing factors, or difficulties in implementing the methodology.

2. **Adaptations or modifications of the CDC NNIS system.** [7,2,]

   Many of these are found in different countries in Europe:
   - HELICS *(Hospitals in Europe Link for Infection Control through Surveillance)* is a well-organized system in Europe covering many countries http://helics.univ-lyon1.fr/helicshome.htm
   - SSHAIP *(Scottish Surveillance of Healthcare Associated Infection Programme)* Scotland - *http://www.hps.scot.nhs.uk/haiic/sshaip*

3. **Use of existing hospital computer programs to calculate the rates.** [23, 26, 35, 36, 40, 41, 42, 43]
   Recently there have been attempts to create methods that are less time intensive and costly than the standard techniques used in the other two groups. They have had mixed results in regards to accurate data capture.

Templates for BC Program
The recently established healthcare associated infections surveillance system in Scotland: Scottish Surveillance of Healthcare Associated Infections Program (SSHAIP http://www.hps.scot.nhs.uk/haiic/sshaip); and/or the program in Victoria State in Australia: Victoria Hospital Acquired Infection Surveillance System (VICNISS http://www.vicniss.org.au/) may serve as program delivery models for BC. Both systems have robust methodologies that have been adapted from the U.S. NNIS system. The Scottish system's mandate to place emphasis on creating local ownership of surveillance data matches the framework outlined by PICNet's Surgical Site Infection Surveillance Working Group. The two-tiered surveillance approach from Victoria State in Australia acknowledges the different surveillance needs for small and large hospitals.

Both programs have done extensive groundwork and either of these well-outlined frameworks could be adapted to our needs.

The provincial group (SHAIP-BC) will be expected to provide detailed information on the various methods of performing SSI to the Health Authorities. This cannot be done by the current PICNet working group. Health Authorities will need to work with the Provincial group (SHAIP-BC) to design specific programs that can be adapted for each facility while understanding and respecting the need for a consistent surveillance methodology across the province.

Implementation
This is a proposal for the creation of a new provincial healthcare-associated infection surveillance system that uses standardized methodology and produces a voluntary province-wide SSI database. The goal of the new program is to reduce the incidence of surgical site healthcare-associated infections. Its implementation will require funding, cooperation of those involved and a considerable amount of time.

Surgical site infection surveillance is the first step – the plan is that once the program is established, surveillance will expand to include other significant healthcare associated infections.

Recommendations

We recommend that the *BC Ministry of Health* authorize funding to create a hospital associated infections surveillance program (SHAIP-BC) with a mandate to:

1. Review existing surveillance methodologies and select those that would be appropriate.
2. Begin training of individuals in the appropriate surveillance methodologies.
3. Start coordinating and planning with Provincial Registers and other groups involved in surgical site infection prevention – British Columbian Reproductive Care Program (BCRCP), Safer Healthcare Now! (SHN), Canadian Nosocomial Infection Surveillance Project (CNISP).
4. Assist the Health Authorities by:
   - helping to select which surgical procedures to survey
   - training personnel in surveillance methods
   - providing tools to support data collection and analysis
5. Create pilot projects to begin implementation and assessment of key SSI surveillance program areas.

Strategic Plan and Options Paper Report - *PART II*

Introduction

In this proposal The PICNet Surgical Site Infection Surveillance Working Group will outline its goals, rationale, options, plans, and estimated costs for the design and implementation of a Surveillance of Hospital Associated Infections Program in the Province of British Columbia: (SHAIP-BC) that will *initially* focus on surgical site infections.

We propose the creation of a new provincial healthcare-associated infection surveillance system that uses standardized methodology and produces a province wide surgical site infection (SSI) database as its first deliverable. The long term goal of SHAIP-BC will be to ensure consistent identification and reporting of healthcare associated infections.

Goals

The goals of the Surgical Site Infection Surveillance System are to reduce the incidence of surgical site healthcare-associated infections and to allow early recognition of significant clusters of infections.

Rationale

Infection rate monitoring is a necessary component to meet the Canadian Council on Health Services Accreditation's (CCHSA) Patient Safety Goals and Required Organizational Practices. Surveillance of surgical site infections is a key activity of any acute care hospital infection control program and is an expected part of risk management. SSIs cost $169,900,000 per year in Canada; (Shirley Paton, Public Health Agency of Canada, May 2005) and many are preventable. Despite this, PICNet's Assessment of Infection Control Activities across the Province of British Columbia [45] found that many BC hospitals are not performing the required surgical site infection surveillance.

Present Status of Surgical Site Surveillance in BC Hospitals: November 2005 to March 2006 Key Survey Results: (An Assessment of Infection Control Activities across the Province of British Columbia 2006**,** Provincial Infection Control Network) [45]

- Twenty percent of the responding facilities do not conduct any surgical site infection surveillance.
- Methodological variation exists in the sites that do surveillance.
- The quality of the surveillance is not consistent.
- The hospital infection control practitioners require additional education and training in surveillance and additional resources to do the job effectively.

PICNet's Assessment of Infection Control Activities across the Province of British Columbia [45] found three areas in the present infection control system in BC that have major drawbacks:

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.

Options

The SSI Surveillance Working Group looked at four options to address these findings as they pertain to surgical site infection surveillance:

1. No change to current surveillance system

2. Increase resources to Health Authorities

3. Increase resources at provincial level

4. Increase resources at both the provincial and Health Authority level in order to create a province-wide surgical site infection surveillance system as the *first step* in a province-wide heath care associated infection surveillance system.

The four options were evaluated in terms of:

- Cost
- Effectiveness
- Practicality
- Implementation Time
- Best Practices
- Accountability
- Patient Safety/Risk Management

Using these criteria, the SSI Surveillance Working Group decided that options one and two would be the least effective.

1. No change to current surveillance system:

Fiscal constraints may not permit the development of a province–wide consistent approach to SSI surveillance. If this is the case, the status quo will continue---some limited reporting by individual facilities and Health Authorities, depending on the resources. No change may be the only feasible option given the current fiscal constraints.

However, it must be understood that this limited surveillance will be unacceptable by CCHSA standards for accreditation. No improvement in the current system may also add to the healthcare burden because the number of surgical procedures is increasing annually in BC. Increased surgeries will likely result in increased infections – many of which are preventable with an effective surgical site infection surveillance program.

2. Increase resources to Health Authorities

Increasing resources to Health Authorities without support from the province will permit the individual Health Authorities to select the surgical procedures they will follow and allow them to develop individual surveillance methodologies. It will permit some training at the front-line level, may allow trending over time for each facility; and possibly some limited benchmarking with comparable facilities (if they exist) within that particular HA. This option will fulfill accreditation requirements.

However, this program will result in data that will not be correlated or standardized in any way between the Health Authorities. The other major drawback is it will not permit

enhanced reporting across Health Authorities boundaries --- important in this age of cross-jurisdictional healthcare.

3. Increase resources at provincial level

This option will provide the infrastructure for a provincial resource team that will develop consistent methodology (e.g. case identification methodology, forms, surveillance definitions, and reporting strategies) for facilities to use on a voluntary basis. The resource team will also assist with the introduction of surveillance programs by providing these surveillance tools along with training.

With this approach, facilities can work towards achieving accreditation goals using a provincial template for SSI surveillance. However, there will be no oversight at the HA level to ensure that consistency and quality is achieved, and no resources to ensure that surveillance occurs.

The limitation with this option is that, due to lack of personnel, the Health Authorities will not be able to implement the surveillance tools and training resources supplied by the provincial team As a consequence, the Health Authorities may not have a sense of "ownership and control" over their data. In the long run this may lead to the Health Authorities having doubts about the way the data is interpreted and may result in their unwillingness to participate in a provincial process.

4. Increase resources at both the Provincial and Health Authority level in order to create a province-wide surgical site infection surveillance system.

The PICNet SSI Surveillance Working Group report recommends option four: a phased in two – tiered approach that would result in a centralized surveillance provincial resource team that facilitates Health Authorities with standardized local surveillance.

Although options two and three are useful first steps as stand-alone initiatives, they lack the scope and the ability to plan for future surveillance projects at both the provincial and Health Authority level. Either option alone would create inequality in the system and will fail to achieve the goal of consistency in surveillance methodology on a province-wide basis.

Proposal

Phase One: Establish a province-wide surgical site infection surveillance system – SHAIP-BC

Using a phased-in approach to build a complete surveillance system will allow for the development of initial pilot sites, training, recruitment and retention strategies, evaluation and reassessment before expanding to full surveillance.

i. The surveillance program can begin with consensus between the Health Authorities and the Provincial SSI team on one or two surgical procedures for surveillance – these will likely be based on the information provided in the document Assessment of Infection Control Activities across The Province Of British Columbia [45], regarding existing SSI programs, frequency of surgeries performed and perceived urgency by both groups. Hip and knee surgery and cesarean section deliveries might be procedures on which consensus could be achieved. Those facilities with existing programs could agree to participating in consistent

reporting of a minimal dataset while facilities with no SSI surveillance could use the selected procedures as the foundation upon which their program will be developed. Together the Health Authorities and provincial administrative group will develop the methodology that will meet the needs for both groups.

ii. Summary of the PICNet SSI Surveillance Working Group proposal: Option Four:

A. The Provincial Administrative Group Level
We recommend that a central organization -- *Surveillance of Healthcare Associated Infections Program of British Columbia* (SHAIP-BC) -- be created to coordinate the activities involved in surgical site infection surveillance in the province. SHAIP-BC will report to PICNet and will be a neutral, independent body that will be responsible for developing the SSI surveillance system, providing the necessary education and training and providing ongoing support. This provincial program will require a permanent status with consistent funding in order to achieve its goals and permit its future expansion to survey other healthcare associated infections. An essential part of this new program will be involving content experts --surgeons, wound care specialists, epidemiologists - across the various Health Authorities as well as coordinating with other provincial programs.

B. Health Authority Level
The complementary surveillance group will operate at the Health Authority level. A SSI Surveillance group will be formed by each Health Authority to implement and operate a SSI Surveillance program for its facilities. Programs will be flexible to allow for different approaches suited to the type of hospital and range of surgical procedures but will include a minimal dataset with standardized provincial definitions and methods of case identification. The Health Authority will provide their facilities with the tools to allow intraregional trending and benchmarking with similar facilities but each Health Authority will decide how this will be implemented.

Strategic Importance

The United States, Western Europe, and Australia all have national surveillance programs in place to monitor rates of healthcare associated infections. Other groups in Canada are in various stages of looking at ways to reduce surgical site infections. The *Surveillance of Healthcare Associated Infection Program* (SHAIP-BC) will coordinate with these other groups in order to prevent overlap and duplication of efforts. (British Columbian Reproductive Care Program (BCRCP), Safer Healthcare Now! (SHN), Canadian Nosocomial Infection Surveillance Project (CNISP).

This provincial program will place BC on par with or even as a leader in SSI surveillance among other parts of Canada, the United States, Australia, and Europe.

Timeline for phased in approach

i. Consultation Phase
Consultation will begin as soon as possible. It will include the development of the surveillance methodology and will include case definition, denominators, case finding, minimal data set, case report from. Consultation will be done collaboratively across specialties and jurisdictions.

ii. Implementation and Training Phase
Once the methodology is agreed upon, SHAIP-BC will design SSI surveillance model programs including development of the database that can be adapted for use by the Health

Authorities. SHAIP-BC will then assist the Health Authorities in setting up and maintaining programs by providing training and other resources.

iii. Evaluation Phase

Evaluations will include data validation and analysis of the first set of data in conjunction with feedback, identifying problems, and revision as necessary.

iv. Full SSI Surveillance

Once the surgical site surveillance systems are established, training programs are in place, and the initial evaluation and revision of the data analysis and reporting systems is complete, the SSI system will be expanded to all areas of the province.

v. Expanded HAI Surveillance

The surveillance systems already in place will expand to survey other Healthcare Associated Infections (HAI) of importance in BC such as: central-line associated bloodstream infections, ventilator-associated pneumonias, antibiotic-resistant organisms, and other areas as appropriate for each facility.

Workflow in Phase One through Four Implementation

Activity
1. Obtain initial funding
2. Develop data sharing agreements with Health Authorities and BCCDC
3. Establish SSI surveillance program
4. Develop methodology
5. Develop informational web site
6. Decide on surveillance system
7. Hire any necessary new personnel (use as many existing personnel as possible to contain costs)
8. Hold informational sessions throughout province
9. Set up planning meetings with Health Authorities
10. Begin training of personnel involved in pilot projects
11. Set up demonstration/pilot projects throughout province.
12. Begin surveillance at pilot projects.
13. Collect and analyze data.
14. Produce report from pilot projects
15. Analyze report, identify problems
16. Address problems
17. Expand SSI surveillance program through province

Recommendations

The PICNet SSI Surveillance Working Group recommends that:

1. A capital and operating budget of $425,423 be identified at the provincial level to develop and implement a province-wide surveillance for healthcare associated infection program: SHAIP-BC which would begin with surveillance of surgical site infections.
2. An operating budget of $400,000 be identified at the Health Authority level to hire Epidemiology Assistants to assist and support the facilities in healthcare associated infection surveillance.
3. The planning process begins as soon as possible so that pilot SSI surveillance sites can be in place before the end of 2007.

Conclusion

Surgical Site Infection Surveillance is an essential component in any patient safety initiative. The *PICNet Assessment of Infection Control Activities across the Province of British Columbia*[45] has found that many BC hospitals do not have adequate surveillance systems in place and that the province as a whole is lacking in a standardized surveillance system. A standardized system is necessary in order to obtain facility specific benchmark rates which will provide the information required to set reasonable goals for lowering infection rates at each facility.

The *Surveillance of Health Care Associated Infection Program for British Columbia* (SHAIP-BC) will fulfill this need. It will serve as the provincial resource team starting with the surveillance of surgical site infections and expanding to include other important healthcare associated infections. It will be a multidisciplinary group that will report through the Provincial Medical Services Committee (PMSC) to the Ministry of Health.

In order for BC to maintain standards of excellence in surgical procedures an upgrade of surgical site infection surveillance systems is necessary. This proposal for a centralized surveillance program keeps costs in a realistic range by adapting surveillance systems already developed in other parts of the world, and giving additional training to BC's human resources and infection control expertise that is currently in place.

A state of the art standardized healthcare associated infection surveillance system adapted to the unique needs of BC's health care system will enhance BC's status as a leader in providing excellent, safe and cost effective health care to all its citizens

APPENDIX A - Summary of Costs

TABLE 1 - Summary of Costs of a Provincial Infection Surveillance Program

Summary of Costs	Description	Yearly Operational Costs[1]	Capital Costs 2007
Provincial Level			
Personnel	• Physician Epidemiologist (0.5 FTE) • Infection Control Coordinator (1.0 FTE) • Educator/Curriculum development FTE) • Administrative support (1.0 FTE) • Information Technologists (1.0 FTE) • Program development, data analysis, maintain web site	*$135,000** $84,183 $60,000 $50,240 $80,000	
Training/ Information technology	• 2 day province wide Workshop • Travel • CD self learning modules, develop software for surveillance database	$50,000 $20,000	$50,000
Space lease	• Office 3.5 @ $9,000/staff		$31,000
Total Provincial		**$344,423**	**$81,000**
Health Authority (HA) and Facility Level Description **Yearly Operational Costs**			
Personnel [2] • In order for the necessary SSI surveillance to take place we assume that there will be an adequate infection control team in place consisting of Epidemiologists (0.5 FTE per HA), ICP's (supervisory and practical), and clerical staff. [3] • Additional budget:			
• EPI assistants (10.0 FTE) [3]	10 @ 40,000 = $400,000		
Health Authority Level Costs	**400,000**		
Provincial Level Costs **Total**	**Operating:** **Capital:**		**$344,423** **$81,000** **425,423**
Total Provincial and Health Authority:			**$825,423**

* Value in kind provided by BCCDC Epidemiology Services and therefore not counted in total budget costs as a new expenditure.

(1) Source: A VCHA regional Business Case for improving Infection Control resources, Feb. 4, 2004

(2) Assumes supervisory and practicing Infection Control Practitioner/bed ratio is in place per provincial and national guidelines

(3) EPI Assistants can be practical nurses, have medical technology or other suitable training – they can assist with chart review and phone call follow-up of discharged post-op patients

APPENDIX B - Estimated Cost Savings

TABLE 2
Estimated Cost Savings
Using rounded figure of 100,000 surgeries/year in BC [1]

Estimated costs of surgical site infections in BC in 2006 assuming a 5 percent infection rate at a cost of $3700 per SSI; [2]
and
Estimated cost savings with enhanced surveillance program assuming a 10 % to 15% reduction in the SSI infection rate [3]

Estimated total surgeries in BC in 2006(1)	**Estimated Number of Infections in 2006**	**Present estimated annual SSI Costs ($3700/SSI)**	**Reduced number of infections with improved surveillance program demonstrating cost savings (assuming 10% -15% reduction in infections at cost of $3700/SSI) ***				**Estimated cost savings with provincial surveillance system bringing a 10% -15% reduction ($3700/SSI)**	
100,000 surgeries	5% infection rate	5% infection rate	10% reduction in SSI'		15% reduction in SSIs		Reduce Surgical Site infections by 10%	Reduce Surgical Site infections by 15%
	5,000 infections	**Present Cost $18,500,000**	4,500 infections	**Cost $16,650,000**	4,250 infections	**Cost $15,725,000**	**Save $1,850,000**	**Save $2,775,000**

**** This is a conservative estimate as Haley's studies found that a strong infection surveillance program can reduce SSI rates by up to 35% for all surgical categories***

1. *Source: Canadian Institute for Health Information, 2004/05.*
2. *Zoutman D, McDonald S, Vethanayagan D. Total and attributable costs of surgical-wound infections at a Canadian tertiary-care center. Infect Control Hosp Epidemiol. 1998 Apr;19(4):254-9.*
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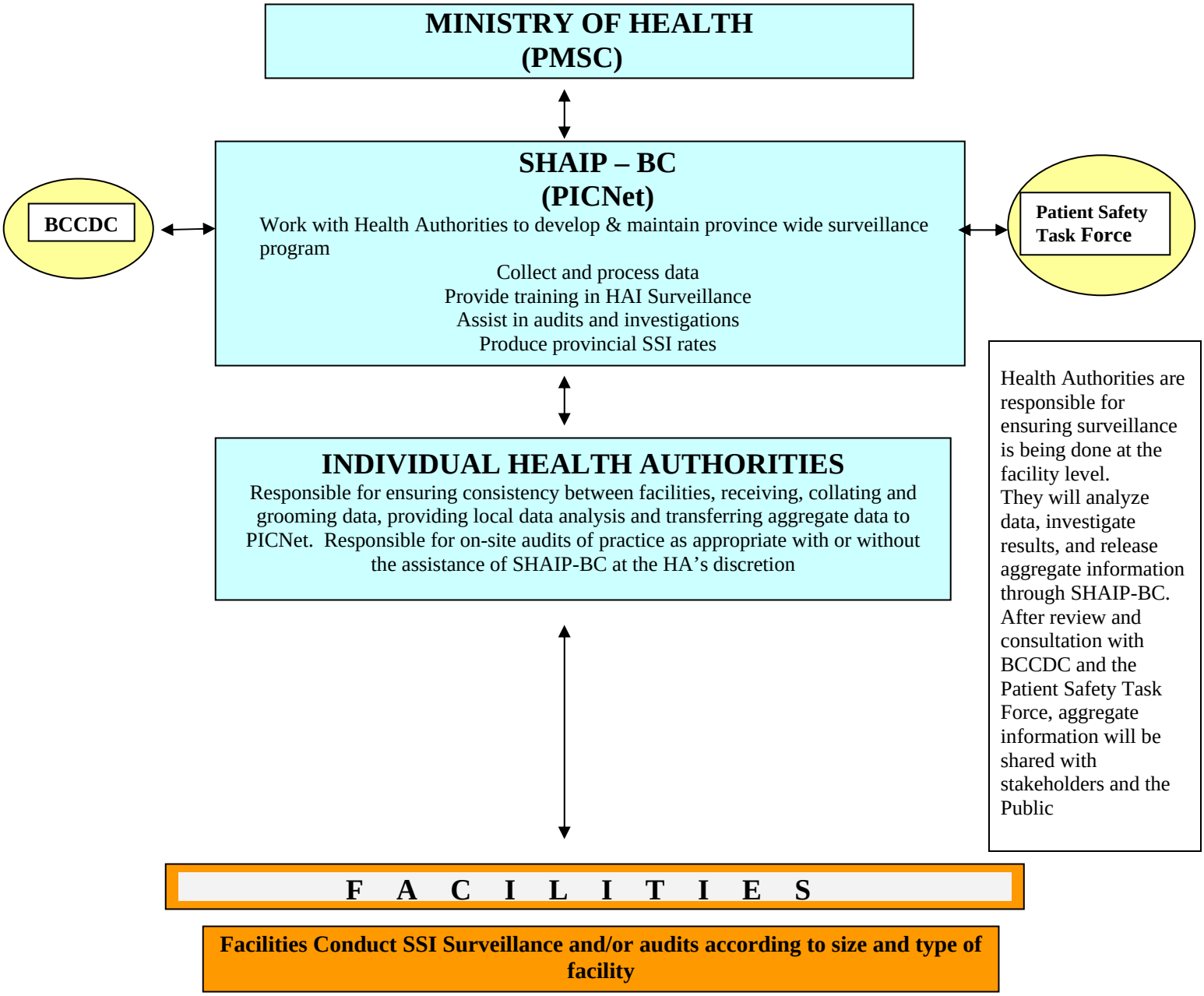
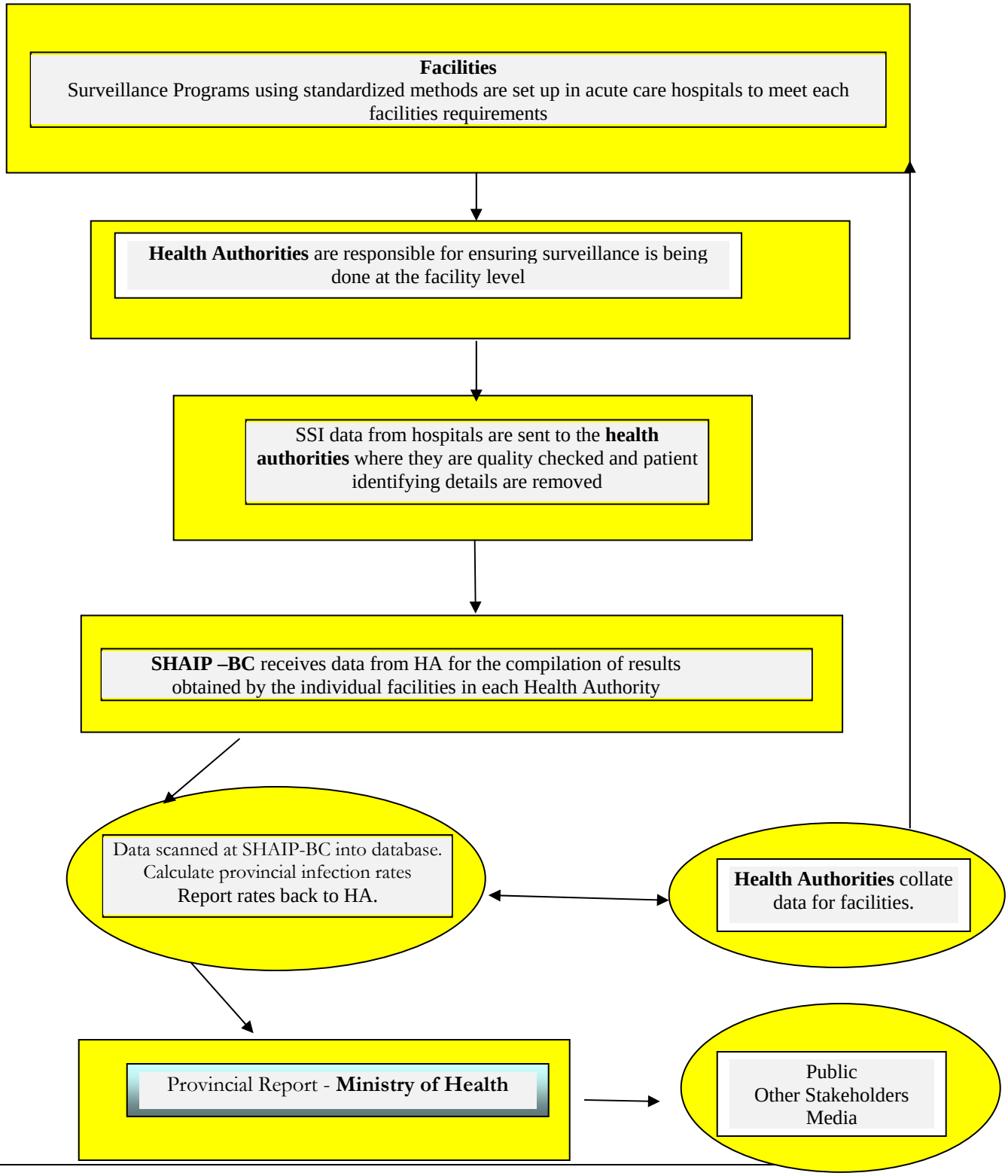
APPENDIX C - Flow Charts

SUGGESTED ADMINISTRATIVE STRUCTURE



APPENDIX D - Data Collection

SUGGESTED SHAIP – BC DATA COLLECTION PROCESS



APPENDIX E - Examples of Surveillance Programs

Examples of Current Surveillance Programs

There are several systems in use throughout the world. One of the first was the **NNIS** (National Nosocomial Infection Surveillance System) created by the CDC (Centers for Disease Control and Prevention) in the United States. Most of the other systems are adaptations of this in attempts to overcome some of its limitations. A brief description of these is given with websites and references where further information can be found. All of the systems survey a limited number of surgical procedures. Therefore, if one of these systems were adopted in BC it would result in many of our smaller hospitals that perform surgery being unable to participate.

1.NNIS

This system was the result of epidemiologic studies performed by the *Study on the Efficacy of Nosocomial Infection Control (SENIC)*. It is voluntary in nature and consists of a central data processing group in the CDC.

Recently many states are in the process of enacting legislation that will make the reporting of of surgical wound surveillance mandatory (McKibben et al. Guidance on Public reporting of Health-Care Associated Infections) AJIC May 2005, Vol 33 P217-226). Surgical procedures for study are selected using the ICD (International Classification of Disease) system. Procedures are selected that are considered to be commonly used and that have a significant rate of infection.

An enrolled group of hospitals conduct their surveillance in a standardized manner, produce hospital reports, and also submit their results to the central group.

The collection of data includes the use of three factors (designation of surgery as clean or dirty, ASA score and duration of surgery) to help account for factors that may influence the results. The data is processed and the results returned to the individual hospital. All of the data from all of the participating facilities is then processed and benchmark figures published on a regular basis. Others wishing to use this system should implement the definitions and methods and then compare their results with those published. The system is currently under redesign to become a web-based knowledge management and adverse events reporting system.

The major criticisms of this system can be summarized as:

- The use of the ICD classification aids in the identification of procedures because of its use in operating room and medical records databases. However the classification itself often clumps together a wide range of surgical procedures. For example the category of spinal fusion can include everything from procedures utilizing only bone chips to those requiring the insertion of considerable amounts of foreign body material.
- The three correcting factors are not sufficient to correct for the differences seen with surgical procedures.
- Not all hospitals are able to collect information concerning the three correcting factors easily depending on the information found in their databases.
- The selection of referral hospitals is biased in including an inappropriate number of tertiary care facilities.
- There is a limited number of procedures followed restricting the use in some facilities.
- Difficulties are often found in using the current definitions of superficial and deep infections and the practice of not reporting the infection rates of these separately.
- There has been some confusion as to the methods of post discharge surveillance that may be included in the benchmark figures.

2. Adaptations of the NNIS System

There have been many systems developed for use in different countries that are based on the NNIS system. They accept the definitions and classification systems used but vary in the number and types of surgical procedures monitored and some of the data collecting and processing methods. In most instances the institutional results are considered confidential and not released publicly while the group results may be published. Involvement in the systems is voluntary but in Australia is an accreditation requirement. These systems are primarily concerned with in hospital surveillance and are

only now attempting to develop methods and standards for post discharge surveillance.

These include:
Scotland
SSHAIP http://www.hps.scot.nhs.uk/haiic/sshaip/index.aspx

Australia
The Australian Council on healthcare standards ACHS Performance Indicator reporting tool.

Germany
KISS - German Nosocomial Infection Surveillance System

Britain
NINSS
Surveillance of Surgical Site Infection -
Surgical Site Infection Surveillance service is part of the Nosocomial Infection National Surveillance Study (NINSS)
http://www.hpa.org.uk/infections/topics_az/hai/SSI_Protocol.pdf

Netherlands
PREZIES: The Netherlands Surveillance system

European Union HELICS network
(Hospitals in Europe Link for Infection Control through Surveillance)
The creation of a database intended for the comparative analysis of the rates of hospital-acquired infections in the 15 countries of the European Union.
HELICS (Version 9.1 Sept 2004); 3 levels of objectives at the hospital, regional or national, and the International level.
http://helics.univ-lyon1.fr/helicshome.htm

3. Computer Based Methods
In the past few years there have been attempts to replace the standard method of collecting data using patient reviews by interfacing databases to detect infections. There have been varying reports of the effectiveness of this approach and to date there it is not clear that these methods will be effective. Currently they may be of value as a screening technique to detect possible infections for further study and investigation. These techniques have usually used information from the discharge codes on patients in their electronic files, laboratory data on file and pharmacy computer information.

APPENDIX F - Resources

Surveillance Forms and Information:

There are a number of resources available for those wishing to obtain detailed information.

Safer Health Care Now
"http://www.saferhealthcarenow.ca/" http://www.saferhealthcarenow.ca/
SSI Getting Started Kit

US Centers for Disease Control and Prevention
http://www.cdc.gov/epiinfo/
A free program that can be downloaded and used and modified for surveillance needs.

Commercial packages
1) AICE http://www.icpa.net/aice-millennium.html,
2) Epiquest http://www.epiquest.com/about/
3) ClinTrac http://www.softmed.com/products/cdm/clintrac_qm.aspx

Audits
CHICA
Audit forms available in http://www.chica.org/links_surveillance.html

APPENDIX G - Education

Educational Recommendations

Any program of *Surgical Site Infection Surveillance* will require extensive educational opportunities for those involved. The participants need a basic knowledge of the principles involved so that the information collected will be both accurate and useful.

The instruction could include the use of conferences, workshops, lectures and a website.

Consideration should be given to the following suggestions.

1. Basic Surveillance Principles and Practices.

This could best be done as part of a conference or workshop. It would not have to be specifically for Surgical site Surveillance and could be used to train individuals in other areas of surveillance such as nosocomial respiratory or urinary tract infections and vascular access related infection. It would include information on;

2. The definition and purpose of surveillance
3. The limitations and problems in conducting surveillance
4. Methods of data collecting and analysis
5. Role of audits.
6. Application of information to clinical practices.

An example of the information to be included in this area can be found in Practical Handbook for Healthcare Epidemiologists, 2nd edition published by SLACK incorporated 2004, Chapter Six Pages 45-68

7. Surgical site Infection Surveillance

This would be specifically for those involved in this type of surveillance including administrators, infection prevention and control practitioners, microbiologists etc. It would include information on;

a) The vision and terms of reference of the surveillance program
b) Current models in the world
c) Creating an administrative group for a program
d) Selecting appropriate surgical procedures for surveillance
e) Selecting appropriate methods of surveillance including audits.
f) Selecting data analysis methods
g) Creating reporting mechanisms and methods of introducing improvements in surgical practices

Detailed Instruction in Selected Methods

This would be instructional sessions developed and given by the Health Authority to train their participants in the detailed methods and definitions to be used in their specific program

Better and Safer Surgical Practices.

As part of the overall program it is essential that methods for introducing specific information on the prevention of infections be transmitted to the surgical staff. This should be done in conjunction with other organization if possible such as Surgical Societies, the Association of Operating Room Nurses and organizations responsible for disinfection and sterilization of hospital and surgical equipment.

APPENDIX H - Glossary of Terms

American Society of Anesthesiologists (ASA) score. A subjective score given by the anesthesiologist at the time of surgery on the physical status of the patient.

1. Normally healthy patient
2. Patient with mild systemic disease
3. Patient with severe systemic disease
4. Patient with incapacitating systemic disease that is a constant treat of life
5. Moribund patient who is not expected to survive for 24 hours with or without operation.

Benchmark: Originally a management term, now widely used in healthcare quality management. It is usually a measurement taken at the outset of a series of measurements of the same variable, sometimes meaning the best or most desirable value of the variable. It is a standard by which something can be measured or judged:

Best Practices: Best Practice is a management idea now used in most industries, including health care, which asserts that there is a technique, method, process, activity, or incentive that is more effective at delivering a particular outcome than any other technique, method, process, etc.It is not a new idea: "Among the various methods and implements used in each element of each trade there is always one method and one implement which is quicker and better than any of the rest" (Taylor, 1919).

ICD coding: The International Statistical Classification of Diseases and Related Health Problems (commonly known by the abbreviation ICD) is a detailed description of known diseases and injuries. Every disease (or group of related diseases) is described with its diagnosis and given a unique code, up to six characters long.
ICD is published by the World Health Organization (WHO) and is used world-wide for morbidity and mortality
statistics, reimbursement systems and automated decision support in medicine. The system is designed to promote international comparability in the collection, processing, classification, and presentation of these statistics ICD is revised periodically and is currently in its tenth edition. The **ICD-10**, as it is known, was developed in 1992 to track mortality statistics. Annual minor updates and 3 yearly major updates are published by WHO.

Infection: The successful transmission of a microorganism to the host with subsequent multiplication, colonization, and invasion. Infection may be clinical or subclinical and may not produce identifiable disease. However, it is usually accompanied by measured host response(s), either through the appearance of specific antibodies or through cell-mediated reaction(s) (e.g. positive tuberculin test results). An infectious disease may be caused by the intrinsic properties of the agent (invasion and cell destruction, release of toxins) or by associated immune response in the host (cell-mediated destruction of infected cells, immune responses to host antigens similar to antigens in the agent). (Source: Mayhall)

Nosocomial Infection: Healthcare-associated Infection: An infection originating in a medical facility, eg., occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. Includes infections acquired in the hospital but appearing after discharge. (Source:Last

NNIS Risk Index: An index which predicts the likelihood of a SSI. It is operation-specific. The index ranges in value from 0 - 3 points and are defined by three independent and equally weighted variable. one point is scored for each of the following when present:
(1) ASA Status classification >2,
(2) either a contaminated (Class III) or dirty/infected wound classification (Class IV) wound classification
(3) length of operation >T hours, where T is the approximate 75th percentile of the duration of the specific operation being performed.The specific time cut points are listed in the National Nosocomial Infections Surveillance(NNIS) System reports.

Rate: A measure of the frequency of occurrence of a phenomenon. In epidemiology, demography, and vital statistics, a rate is an expression of the frequency with which an event occurs in a defined population in a specified period of time.

The components of a rate are the numerator, the denominator, the specified time in which events occur, and usually a multiplier, a power of 10, that converts the rate from an awkward fraction or decimal to a whole number. (Source: Last)

Rate = Number of events in a specified period divided by the number of persons at risk

Example: SSI rate:

Number of wound infections arising from a defined surgical procedure in a given time frame x 100
Number of the defined surgical procedure performed in the same period of time

Incidence rate: the number of new cases divided by the number of people at risk divided by the unit of time

Prevalence rate: the number of new and old (but still active) cases at a specific time divided by the number surveyed. Relationship between incidence and prevalence: In general prevalence equals incidence times average duration of disease

Numerator: The upper portion of a fraction. In calculating a rate the numerator is generally the number of occurrences of an event in a population for a specific time. (Source:Teutsch)

Denominator: The lower portion of a fraction. In determining a rate it is usually the size of the population in which the event occurs.(Source:Teutsch)

Secular trend: Profile of the changes in measurable events or in the incidence rate of infection or disease over an extended period of time: also called a temporal trend (Source: Mayhall).

Stratification: The process of or result of separating a sample into several subsamples according to specified criteria, such as age groups, socioeconomic status, etc. (Source: Last) See the NNIS Risk Index as an example of stratification by degree of risk.

Surgical Site Definitions (NNIS)

Superficial Incisional SSI

Infection occurs within 30 days after the operation and
Involves only skin and subcutaneous tissue of the incision and
at least one of the following:
1. Purulent drainage, with or without laboratory confirmation, from the superficial incision
2. Organism isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately open by surgeon, unless incision is culture-negative.
4. Diagnosis of a superficial incisional SSI by the surgeon or the attending physician.

Deep Incisional SSI

Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation and
Infection involves deep soft tissues (e.g. fascial and muscle layers) of the incision and at least one of the following:
1. Purulent discharge from the deep incision but not from the organ?space component of the surgical site.
2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms:fever(>38C), localized pain, or tenderness, unless site is culture-negative.
3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.

4. Diagnosis of a deep incisional SSI by a surgeon or attending physician

Organ/Space SSI

Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation. and

Infection involves any part of the anatomy (eg organs or spaces), other than the incision, which was opened or manipulated during an operation and

At least one of the following

1. Purulent drainage from a drain that is placed through a stab wound into the organ/space.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of an organ/space SSI by a surgeon or attending physician.

Surgical Wound Classification: CDC Guidelines for prevention of SSI

Class 1/Clean: An uninfected operative wound in which no inflammation is encountered and the respiratory, or alimentary,or genital, or uninfected urinary tract(s) is (are) not entered. In addition, clean wounds are primarily closed an, if necessary, are drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria. examples include, herniorrhaphy, mammaoplasty (augmentation or reduction) Mastectomy, neurosurgery, orthopedic reconstructive procedures, plastic surgery, splenectomy, thyroidectomy, Vascular grafts.

Class II/Clean-contaminated :

An operative wound in which the respiratory, alimentary, genital or urinary tract(s) are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category provided no evidence of infection or major break in technique is encountered. Examples include Abdominal perineal resection, Appendectomy, Bowel resection, Cesarean section, cholecystectomy, Gastrectomy, Hysterectomy (vaginal or abdominal), tracheostomy, Tubal ligation, TUPR, ENT procedures.

Class III/Contaminated :

Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g.., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions made in which acute, nonpurulent inflammation is encountered. Examples include Appendectomy (inflamed, no rupture, no pus) Bowel surgery (without bowel preparation) compound frqactures, Burr holes following trauma with scalp lacerations, removal of any prosthesis as a result of infection, Traumatic amputation

Class IV/Dirty-infected :

old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing the post-operative infection were present in the operative field before the operation. Examples include Abscess drainage, Bowel resection with perforation/peritionitis, ruptured appendix, traumatic wounds more than 12 hours old from a dirty source.

Surveillance: The ongoing, systematic collection , analysis. and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. Center for Disease Control and Prevention. CDC surveillance update Atlanta: Center For Disease Control and Prevention 1988

In general there are four objectives to surveillance:

1. Detect and monitor adverse events
2. Assess risk and protective factors
3. Evaluate preventive interventions
4. Provide information to event reporters and stakeholders and partner with them to implement effective prevention strategies

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