Surgical Site Infections following Peripheral Vascular Bypass Procedures

(Vascular SSIs) Protocol

Approved by Provincial IPC Surveillance Committee: September 2015
Revised: April 2025

Alberta Health Services
Infection Prevention & Control

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Introduction

Hospital-acquired infections are infections that are an adverse event resulting from an admission to an acute care setting (Klevens et al., 2007). About 20% of hospital-acquired infections are surgical site infections (SSIs) (Leaper, 2010). Rates vary between surgeons, by facility and between countries (Leaper et al., 2004). They are costly to the healthcare system, and many can be prevented through surveillance activities (Plowman et al., 2001). The National Healthcare Safety Network (NHSN) most recently published data for 2006-2008 reported a 3.2% to 6.7% infection rate (Edwards et al., 2009).Other studies show much higher SSI rates: up to 31% for patients with peripheral vascular bypass procedures (Kuy et al., 2014).

Surveillance for SSIs that involve Infection Control Professionals (ICPs) and feedback to stakeholders have been shown to be associated with reductions in rates of SSIs (Gaynes et al., 2001; Brandt et al., 2006).

In conjunction with the peripheral vascular bypass (PVBY) surveillance protocol, there are five supporting documents to assist in the interpretation and practical use of this protocol:

- General Surveillance Definitions (Appendix A)
- A list of included procedures (Appendix B)
- Casefinding process (Appendix C)
- ICD-10-CA code used in the casefinding process (Appendix D)
- SSI User Guide (Alberta Health Services [AHS], 2018).

Goal

To decrease rates of SSIs following peripheral vascular bypass procedures in AHS and Covenant Health facilities.

Objectives

1. To determine provincial and facility SSI rates for PVBY procedures performed in Alberta.
2. To provide useable data leading to interventions aimed at reducing the rate of SSIs for patients undergoing PVBY procedures.
3. To investigate increases or significant SSI rates for patients undergoing PVBY procedures.
4. To establish semi-annual and annual SSI incidence rates following PVBY procedures for trend analysis over time and to compare with internal and external benchmarks.

Methodology

Patient population

All hospitalized patients of AHS/Covenant Health acute care facilities, where inpatient care is provided 24 hours/day, 7 days a week, and where PVBY procedures are performed. Acute and acute tertiary rehabilitation facilities will be referred as the “facilities under surveillance” in this protocol for simplicity. Please refer to Appendix A: General Surveillance Definitions for facilities that would be included under this term.

Case definition

According to the Centers for Disease Control/National Healthcare Safety Network (2024), SSIs are divided into three categories:

1. Superficial incisional SSI
2. Deep incisional SSI
3. Organ/Space SSI.

Surveillance for PVBY surgical site infections will be performed for **only deep or organ/space infections** and for all included procedures and will be based on timelines recommended by NHSN: 90 days for PVBY surgeries, even if the patient has been discharged. Once a possible case is detected, the ICP will review the case and determine whether the case meets the criteria for either a **deep or organ/space infection**.

Inclusion criteria

- Surgeries that include selected PVBY procedures, ending in a lower extremity – see Appendix B
- Deep incisional or organ/space SSI
- Reoperations.

Exclusion criteria

- Procedures in which the patient died within 24 hours from the procedure.
- Reoperations vias same incision within 24 hours are excluded from the denominator; however, the initial procedure is still followed for the development of an SSI.
- Infections classified as superficial incisional SSIs.
- Laparoscopic procedures.
- Infections identified at the donor site.
- Infection from procedures that were classified as clean-contaminated, contaminated, or dirty/infected.

Other considerations - Identifying SSIs

Possible cases may be detected at these three points in time, but are not limited to:

1. While admitted in an AHS/Covenant Health facility following an eligible PVBY procedure - see Appendix B).
2. When seen in the emergency department or readmitted to any AHS/Covenant Health facility in the 90 days following discharge from the surgical stay.
3. Vascular surgeon operative (OR) reports following PVBY procedures.

Case detection while in an AHS/Covenant Health facility can involve review of any of the following:

- Microbiology laboratory results
- Patient charts (including observation of the incision, physician record and pharmacy data)
- Vascular surgeon operative (OR) reports following PVBY procedures
- Re-operation records
- Readmissions
- Emergency visit records
- Clinic visit records
- Discharge summaries
- Administrative discharge data review of patients who had a PVBY procedure and were coded as having an infection following their surgery.

Data collection and data entry

Mandatory data entry

- Deep incisional or organ/space SSIs meeting the Centre for Disease Control/National Healthcare Safety Network SSI definition following a clean or clean-contaminated PVBY procedures are mandatory data entry.
- Each Infection Control Professional, or IPC designate will be responsible for timely entry of the surveillance data into the provincial surveillance platform. It is expected that the minimum data set is collected and entered in a timely manner after factoring in follow-up time, initial case detection, work-up and distribution to (ICPs s and/or IPC offices. As a recommendation, data entry should be completed within 1-2 weeks of identifying an SSI or within 4 weeks of being provided a case for review following the administrative casefinding process.

Minimum case information

Basic demographic, facility and possible microbiological data will be collected for cases and must include:

- Name (first, middle and last)
- Date of birth
- Gender
- Alberta Personal Healthcare Number (PHN) (or other Universal Life Insurance (ULI) e.g., another provincial medical number, military number, federal penitentiary)
- Connect Care Medical Record Number (MRN)
- Admission date to reporting facility
- Reporting Zone and facility name
- Culture date, laboratory name, accession number and cultured site (if applicable)
- Date of surgery and facility where procedure performed
- Type of surgery (i.e. PVBY)
- Infection type (deep incisional or organ/space)
- Classification (wound status)
- American Society of Anesthesiologists (ASA) score (if known) (Daabiss, 2011)
- Antibiotic prophylaxis information (if known).

Denominator data

Surveillance team will request routine data extracts from AHS Analytics including:

- A list of patients from Discharge Abstract Database (DAD) who have an eligible procedure code – see Appendix B.
- Patients with multiple eligible procedure codes over the same admission are counted as multiple procedures in the denominator.
- Patients discharged due to death in the operating room (or within 24 hours) following eligible procedures will be excluded from denominator calculations.

Rate calculation

Rates	Calculations
Infection rates (per 100 procedures)	$\frac{\text{Number of infections}}{\text{Number of procedures}}$ x 100 procedures

Note: Only complex SSI (deep incisional and organ/space) will be reported.

Comparator rates

Internal and external surveillance rates are used as Comparators. The internal rates are the historical rates for the province or zone from the previous fiscal year.

Reporting

Communication and dissemination of surveillance reports is an integral part of surveillance to inform IPC practice within AHS and Covenant Health facilities and provide support for interventions that improve the quality of patient care delivered. Responsibility for compiling, reporting, and disseminating data and reports is shared between provincial IPC Surveillance and Standards and the provincial IPC program. Formal reports are generated quarterly using reconciled and validated data, although data from the most recent reporting quarter should be interpreted with caution as case validation using administrative data has a one-quarter delay. The reports contain information on the facility, zone and province and are presented to the provincial IPC Surveillance, Evaluation, Quality Improvement and Research committee for approval (AHS, 2023). Operational reports are created by local ICPs or their designate and may or may not consist of reconciled and validated data, as they are often created with real-time, as is, data.

Data quality

The purpose of evaluating the quality of data is to ensure that SSI-related events are monitored efficiently and effectively. The evaluation should involve the assessment of the program (i.e. the protocol, and reporting) and system (i.e. electronic data collection tool) attributes, including relevance, simplicity, flexibility, data quality, acceptability, consistency, representativeness, timeliness and stability. Additionally, with increasing use of technology, informatics concerns for surveillance systems need to be addressed. These include evaluating hardware and software, using a standard user interface, applying standard data formatting and coding, performing quality checks and adhering to confidentiality and security standards.

A standardized approach is used to reconcile and validate the data provincially. The first component of data reconciliation and validation of data in the provincial surveillance platform ensures that demographic data are valid and reliable. The second component entails ensuring that the SSI-related events are entered in a manner that is consistent with the protocol definitions. At this latter stage, outliers are identified, and requests are sent to the infection control professional to verify that the data were correctly entered, and definitions were consistently applied according to the provincial surveillance protocol. Final designation of cases is a collaborative effort between the facility-based ICPs and the epidemiologists/analysts of the IPC Surveillance and Standards team.

Further use of statistical software for validating records is still in development. Algorithms are continuously being updated and added to ensure capture of as many discrepancies as possible. In addition to this current process of data review, there will be data audits using external data sources to determine the validity and reliability of the data in the provincial surveillance platform - see Appendix C. The data will also serve to inform

decisions made by the IPC Surveillance and Standards team to improve surveillance processes and methodologies.

Data quality working group

The IPC Surveillance Data Quality Working Group reports to the IPC Surveillance, Evaluation, Quality Improvement and Research committee and is responsible to develop, review and update indicator protocols to include the precise methodology for data collection to ensure consistency. Decisions from the Data Quality Working Group on specific protocol questions are communicated to provincial ICPs through the Data Quality Forum and will be included in the protocol User Guide. These decisions will be supplemental to the protocol and will be incorporated into the protocol, when revised.

For more information contact ipcsurvstdadmin@ahs.ca

Protocol revision history

Date	Details
September 2015	Protocol approved by Surveillance Committee.
April 2016	
November 2018	
March 2019	Protocol style updated; reference style changed to APA.
Spring 2020	Updated to new template and reposted to web page.
August 2021	Removed AAA procedures from denominator. Removed bypasses terminating in an upper limb. Case-finding will now include all facilities that patients are re-admitted to and will include cases identified between 0 and 90 days.
April 2022	Updated references
August 2022	Updated Table of Contents
April 2023	• Added Bypass abdominal aorta (1.KA.76) as included procedure – this was a miss when protocol was relaunched in 2021, so performed case finding to include this in denominator and numerator for entire surveillance period • Clarified that reoperations are included in reporting • Aligned exclusion criteria with the CABG/Cardiac protocol by clarifying that infections identified at the donor site, reoperations via same incision within 24 hours, and infections from procedures that were classified as dirty/infected are excluded from reporting • Updated case-finding to reflect quarterly review cycles • Changed reporting process from IPC Surveillance Committee to IPC Surveillance, Evaluation, Quality Improvement and Research Committee • Updated long-term care definition • Updated references.
April 2024	• Updated exclusion criteria to exclude infections from procedures classified as clean-contaminated, contaminated or dirty-infected • In methodology, clarified that the vascular surgeon reports would be the operative (OR) reports • Clarified relevant encounter types in Appendix B • Removed reference to ProvSurv – used “provincial surveillance platform” • Reference to supporting documentation in the “Introduction” changed to a bulleted list • Updated references • Removed definition for infection window period from General surveillance definitions • Added code 1.KG.76.MI-XX-A to denominator as noticed it was missing from protocol but included in data analytics process for obtaining denominator.
April 2025	• Removed reference to LTC and replaced with Continuing Care Home Type A – updated definition and added link to continuing care website for source of truth • Updated definition for patient admissions denominator

	• Added the following to clarify the administrative discharge data review in "Other considerations for data entry": Administrative discharge data review of patients who had a PVBY procedure and were coded as having an infection following their surgery • Updated the mandatory data entry section to include a statement around timeframe for entering cases identified from casefinding (bold added for emphasis): As a recommendation, data entry should be completed by an ICP or IPC designate within 1-2 weeks of identifying an SSI **or within 4 weeks of being provided a case for review following the administrative casefinding process** • Added clarity to the timeline in Appendix C: Casefinding process • Added the following statement to the "Data Reports" section: Formal reports are generated routinely (usually quarterly) using reconciled and validated data, **although data from the most recent reporting quarter should be interpreted with caution as case validation using administrative data has a one-quarter delay**.

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Appendix A: General surveillance definitions

Terms	Definitions
Encounter types	Type of AHS/Covenant Health healthcare location or facility where the patient is located at the time of identification. The following encounter types are referred to in acute care surveillance protocols (Government of Alberta, 2008; Government of Alberta, 2025). • **Inpatient acute care:** Refers to a General Hospital: According to the Hospitals Act, a general hospital is defined as a "hospital providing diagnostic services and facilities for medical or surgical treatment in the acute phase for adults and children and obstetrical care" (Government of Alberta, 2025). General hospitals have several functional centres. Each functional centre is associated with inpatient, outpatient, or diagnostic and therapeutic services. • **Inpatient mental health/rehab**: A designated mental health facility providing diagnosis and treatment for mental illness and addiction in the acute phase for adults and children. Inpatient services refer to a person admitted to and assigned a bed in a facility by order of a physician for provision of diagnostic and/or treatment services. They would have a patient/group room in which inpatient services are provided within the patient's room or within a common group room within the designated mental health facility. AHS facility examples include Glenrose Rehabilitation Hospital, Centennial Centre for Mental Health and Brain Injury.
Infection prevention and control baseline	A comparator rate created for each acute care facility in the IPC Surveillance on-line dashboards and reporting modules, to guide efforts to reduce healthcare-associated infections. The IPC baseline is based on reported monthly rates for the previous fiscal year. The calculation excludes the monthly rates higher than 1 Standard Deviation above the 12-month average but includes all rates where the site had optimal performance. This calculation method biases the IPC baseline rate towards zero, to focus on the best patient safety outcomes.
Continuing Care Home (CCH) Type A (formerly Long Term Care)	This environment provides onsite RN and/or registered psychiatric nurse (RPN) care, assessment and/or treatment 24-hours a day. Licensed practical nurses (LPNs) may also be onsite in addition to onsite personal care and support provided by health care aides (HCAs). CCH Type A may also have a secure space. Some sites may have specialized programs and services available for residents with complex clinical or complex functional care requirements (e.g., rehabilitation) (Alberta Health Services, 2025). To identify if a facility has CCH Type A beds refer to this website: https://www.albertahealthservices.ca/cc/page15328.aspx where you can search by Name and identify what type of beds the facility has.
Patient admission (aka inpatient admission)	A person admitted to and assigned a bed in a hospital by the order of a physician, for the provision of diagnostic or treatment services or both. Includes a person who spends any time in the emergency department if assigned a bed in hospital, regardless of whether the patient was transferred to an inpatient unit and patients who are directly admitted to an inpatient unit. This is the denominator used for non-hospital-acquired rates (see Rate Calculation Section) (Government of Alberta, 2025).
Patient days (aka inpatient days)	As defined by AHS, this is used to create the denominator for hospital-acquired or hospital-identified cases. The total is equal to midnight census with patients admitted and discharged on the same day counted as a one day stay. It includes patients out on a pass. Day of admission is counted but the day of separation (discharge, death or transfer out of hospital) is

Terms	Definitions
	not counted. Patient-days are included for inpatient encounters where discharge date is not recorded in the data source. Inpatient totals exclude the time patients are waiting in the emergency department for an inpatient bed (time from decision to admit to discharge from emergency department).
Emergency department inpatient days (EDIP)	As defined by AHS, denominators for provincial surveillance modules include these figures in the total patient-days. Includes the number of acute care inpatient patient-days utilized in the emergency department during the reporting period. The figures reflect the time from emergency department discharge (i.e. decision to admit) to emergency department departure for patients admitted to an acute care hospital. It is calculated as [(emergency department departure date and time – emergency department discharge date and time) ÷ 60 ÷ 24]. Figures exclude cases where the emergency department discharge date and time or emergency department departure date and time were not provided, or the value has a negative number.

Appendix B: Included PVBY procedures

Procedure	Description	CCI
Bypass, abdominal aorta (1.KA.76.^^) **Includes:** Graft, aorto bi iliac bypass Repair (aneurysm) by bypass Shunt, originating at abdominal aorta (e.g., aortobifemoral bypass graft) that with profundoplasty **Excludes:** Axillobifemoral graft (see 1.JM.76.^^) Note: Profundoplasty is reconstruction of the profunda orifice and is sometimes required when completing an aortofemoral bypass graft.	bypass terminating at lower limb vessels [e.g. iliac, femoral, popliteal, tibial]	1.KA.76.MZ-XX-A (using autograft [e.g. saphenous vein]) 1.KA.76.MZ-XX-Q (using combined sources of tissue) 1.KA.76.MZ-XX-K (using homograft) 1.KA.76.MZ-XX-N (using synthetic material)
Bypass, arteries of arm NEC (1.JM.76.^^) **Includes**: Shunt, (e.g. for aneurysm or atherosclerosis) **Excludes**: Creation of hemodialysis fistula (see 1.KY.76.^^) Insertion, arteriovenous shunt (see 1.KY.76.^^)	Bypass terminating in lower limb artery [e.g. axillofemoral bypass], using autograft	1.JM.76.MI-XX-A
	Bypass terminating in lower limb artery [e.g. axillofemoral bypass], using synthetic material	1.JM.76.MI-XX-N

Procedure	Description	CCI
Bypass, arteries of leg NEC (1.KG.76.^^) **Includes**: Bypass originating in lower limb artery Graft, femoral to femoral Graft, femoropopliteal arteries [with saphenous vein] Graft, femorotibial arteries [with saphenous vein] Graft, popliteal Shunt, femoropopliteal (arterial) that with profundoplasty **Excludes:** Creation, hemodialysis fistula (see 1.KY.76.^^) Graft, external iliac artery to femoral artery (see 1.KT.76.^^) Graft, iliofemoral (common iliac artery to femoral artery) (see 1.KE.76.^^) **Code Also:** any associated extracorporeal blood warming (see 1.ZX.07.^^)	Bypass terminating in lower limb artery [e.g. femoropopliteal], using autograft [e.g. saphenous vein]	1.KG.76.MI-XX-A
	Bypass terminating in lower limb artery [e.g. femoropopliteal], using synthetic material [e.g. Dacron]	1.KG.76.MI-XX-N
	Bypass terminating in lower limb artery [e.g. femoropopliteal], using combined sources of tissue [e.g. autograft and synthetic material]	1.KG.76.MI-XX-Q
	Bypass terminating in lower limb vein [e.g. femoral artery to saphenous vein for long term hemodialysis], using autograft [e.g. saphenous vein]	1.KG.76.MZ-XX-A
	Bypass terminating in lower limb vein [e.g. femoral artery to saphenous vein for long term hemodialysis], using synthetic material [e.g. Dacron]	1.KG.76.MZ-XX-N
Bypass, veins of leg NEC (1.KR.76.^^) **Includes**: Bypass, iliac or superficial femoral Graft, lower limb vein Venovenostomy, lower limb **Excludes:** Creation, temporary arteriovenous fistula (see 1.KG.76.^^)	Bypass terminating in lower limb vein [e.g. femoral to femoral cross over bypass], using autograft [e.g. saphenous vein]	1.KR.76.MZ-XX-A
	Bypass terminating in lower limb vein [e.g. femoral to femoral cross over bypass], using synthetic material [e.g. Dacron]	1.KR.76.MZ-XX-N

(Canadian Institute for Health Information [CIHI], 2015a)

Appendix C: Casefinding process

Procedure codes are used to identify PVBY procedures and diagnosis codes for 90 days following PVBY procedures are used to identify potential SSI cases. This case-finding process repeats every 90-days. Medical charts of patients with potential SSIs are reviewed by an infection control professional at the acute care facility where the patient was identified with a procedure and a diagnosis code as well as acute care facilities where the diagnosis code may have indicated an infection on readmission.

Types	Steps	Timelines for Quarter 3 procedures
Surveillance data range	Casefinding processes will review three months of procedures and repeat review for last quarter.	Jul to Dec 2024
Data request to analytics	Analytics query – link denominator to ICD-10-CA diagnosis codes - see Appendix D and CCI procedure codes – see Appendix B for 90 days following last procedure date.	May 2025
Surveillance analysis	Run pre-written R code; compare results to provincial surveillance platform (known SSI cases). Exclude records reviewed in the previous casefinding cycle	May 2025
Results to infection control professionals	Send patients with suspicious readmissions to infection control professionals, cc directors for additional casefinding;	(5 months following end of surveillance quarter) June 2025
Casefinding back from infection control professionals	Responses required indicating investigation and response for all patients	(4 weeks after receiving cases for review) June 2025
Data entry into provincial surveillance platform	Infection control professionals to enter confirmed SSI cases into the provincial surveillance platform. For SSI cases identified by infection control professionals at a facility that did not perform the original PVBY procedure, the infection control professional identifying the SSI must contact a procedure facility infection control professional prior to entering the case.	June 2025
Surveillance SSI report date	Update SSI rates based on new numerator information.	(7 months following end of surveillance quarter) July 2025 (or next report date)

Appendix D: ICD-10-CA code used in casefinding process

ICD-10-CA	Description
T81.4	Infection following a procedure, not elsewhere classified **Includes** Abscess: • intra-abdominal post procedural • stitch post procedural • subphrenic post procedural • wound post procedural • sepsis post procedural **Excludes** Infection due to: • infusion, transfusion and therapeutic injection (T80.2) • prosthetic devices, implants and grafts (T82.6-T82.7) (T83.5-T83.6) (T84.5-T84.7) (T85.7) • obstetric surgical wound infection (O86.0) Specified infections classified elsewhere, such as: • cholangitis (K83.02) • pneumonia (J12-J18) • surgical wound infection of amputation stump or reattached body part (T87.0-, T87.1-, T87.201), (T87.4-)
T82.79	Infection and inflammatory reaction due to other cardiac and vascular devices, implants and grafts
T85.7	Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts
Y83 (excludes Y83.2)	Surgical operation and other surgical procedures as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure **Includes** Y83.0 Surgical operation with transplant of whole organ or tissue Y83.1 Surgical operation with implant of artificial internal device Y83.3 Surgical operation with formation of external stoma Y83.4 Other reconstructive surgery Y83.5 Amputation of limb(s) Y83.6 Removal of other organ (partial) (total) Y83.8 Other surgical procedures Y83.9 Surgical procedure, unspecified **Excludes** Y83.2 Surgical operation with anastomosis, bypass or graft

(CIHI, 2015b)