Canadian Nosocomial Infection Surveillance Program

Surveillance of Cerebrospinal Fluid (CSF) Shunt Associated Surgical Site Infections (SSIs)

Surveillance Protocol

2024

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† IPAC Canada
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**OBJECTIVES**

The objective of this Canadian Nosocomial Infection Surveillance Program (CNISP) initiative is to conduct ongoing surveillance for Cerebrospinal Fluid (CSF) Shunt associated surgical site infections (CSF shunt SSI) within the CNISP hospital network and provide national benchmark rates that hospitals may use for internal and external comparison. Specifically, this CNISP initiative seeks to

1. Determine the incidence of CSF shunt SSI in patients of all ages admitted to Canadian hospitals participating in the CNISP.
2. Describe the microbiology and epidemiology of CSF shunt SSI in all patients with:
   a. New shunts and/or;
   b. Revisions to an existent internalized shunt.

**METHODS**

**Site Eligibility**

1. Able to perform year-round surveillance for CSF shunt SSI
2. Able to document the number of surgical placements and revisions of shunts

**Patient population**

**Patient Inclusions:**
Person of any age admitted to a CNISP hospital who undergoes placement or revision of a CSF shunting device AND has an infection that occurs within **90 days** (3 months) of surgery.

- **Adult patients:** Aged 18 years and older
- **Pediatric patients:** Aged less than 18 years

**Patient Exclusions:**
- Patients with transcutaneous or external shunting devices or non-shunting devices (e.g. Ommaya reservoir).
- Patients whose CSF was culture positive (bacterial or fungal) at the time of placement of the shunt.
- Infections in which the device associated with the positive organism was **not** placed at the hospital where the infection was identified, i.e. the hospital should not report the infection.

**Surveillance period**
CSF shunt-associated Infections that develop within **90 days** (3 months) of the shunt procedure will be included and reported retrospectively **based on the date of procedure**.

**NOTE:** *The surveillance year of a CSF shunt SSI case is determined by the date of procedure NOT the date of infection.*

**Numerator**

**CSF Shunt-associated Surgical Site Infection case definition**
A patient is identified as having CSF shunt SSI if the patient meets the following criteria:

**Criterion 1:** An internalized CSF shunting device is in place
- **AND**

**Criterion 2:** A bacterial or fungal pathogen(s) is identified from the cerebrospinal fluid
- **AND**

**Criterion 3:** **ONE** of the following conditions present:
1. fever (temperature $\geq 38^\circ C$);  
   OR  
2. neurological signs or symptoms;  
   OR  
3. abdominal signs or symptoms;  
   OR  
4. signs or symptoms of shunt malfunction or obstruction.

Re-infection case definition
Re-infection of a shunt is an infectious episode occurring after diagnosis of a CSF shunt infection and/or completion of antibiotic therapy, with a CSF bacterial or fungal isolate different from the previous infection. Such a patient would be eligible to be counted as a new CSF shunt-associated infection.

**NOTE:** Relapse of a shunt infection is an infectious episode occurring within 1 month of completion of therapy with an isolate of the same genus. This event is **NOT** eligible to be counted as a new CSF shunt SSI.

Denominators
The denominator for the CSF shunt SSI rate is the number of shunt surgeries at the site.

Each participating hospital will submit the following via the Shunt Denominator Form (Appendix 3 - CSF Shunt Denominator and Zero Report Form):

- The number of surgical placements for new CSF shunts for pediatric (< 18 years) and adult (≥ 18 years) cases.
- The number of surgical revisions to existing CSF shunts for pediatric (< 18 years) and adult (≥ 18 years) cases.

Data Submission

**What forms need to be completed?** Each time an infection is identified, complete a Shunt Patient Questionnaire (Appendix 1 - CSF Shunt Patient Questionnaire). Each year a facility has captured CSF shunt data, complete Appendix 3 - CSF Shunt Denominator and Zero Report Form. For instructions on how to access Web Data forms under CNPHI’s Collaboration Center see Appendix 5 - Web Data Form Submission CNPHI.

**Where to submit data?** Please enter both the Shunt Patient Questionnaire and the Denominator Data and Zero Report Form on the Canadian Network for Public Health Intelligence (CNPHI) web form (Collaboration > Web Data > CSF Shunt SSI Patient Questionnaire & CSF Shunt Denominator and Zero Report Form).

**When to submit data?** Please see CNISP CSF Shunt Data SSI submission Timeline below.

**Cases**
How are patients identified? Patients with a CSF shunt SSI will be identified through review of positive CSF organisms from the microbiology laboratory. Once a positive organism is identified, a chart (health record) review will be conducted to determine if the device associated with that organism was placed at the hospital where the infection was identified and that the surgery occurred in the previous 90 days (3 months).

**Zero Report**
For no cases at your site, a zero report must be submitted so that zero counts can be differentiated from missing data. If no cases are submitted and you are missing zero reports for a surveillance year, your hospital data will not be included in rates.
Denominators
The number of CSF shunts in your facility is collected annually based on the calendar year.

**NOTE:** When entering data into CNPHI, please ensure that the case is entered in the correct surveillance year based on the date of procedure and NOT the date the infection was identified (e.g. procedure Dec 20, 2019; infection identified Jan 17, 2020 – this is a 2019 case).

For technical assistance, questions or comments, please contact CNISP at cnisp-pcsin@phac-aspc.gc.ca

**ETHICS**
This surveillance project is observational and does not involve any alteration in patient care. Surveillance for healthcare associated infections is a routine component of quality assurance and patient care in Canadian healthcare institutions and therefore informed consent will not be required. All data submitted to the Public Health Agency of Canada are kept strictly confidential. Each questionnaire will be identified by a unique number and no personal identifiers will be transmitted to the Public Health Agency of Canada. This unique number will be linked to the patient’s name or hospital number only at the local CHEC site and will be kept strictly confidential under secure conditions.

**PRIVACY**
There is current demand for public disclosure of hospital-associated infections. Any data released by CNISP will be in summary format and will not identify individual hospitals. Hospital administrators should be made aware that national reporting of aggregate data will occur.
Appendix 1 - CSF Shunt Patient Questionnaire

Please complete for all cases of CSF Shunt-associated infections. Please see Data Dictionary [Appendix 2 - DATA dictionary] for definitions and notes.

1. **CHEC Site**: __________________________

2. **Date of birth**: _____ / _____ / _______ OR Age _________ □ Years □ Months □ Days

3. **Unique Patient ID**: __________ YY __________ (e.g. 99Z19001)
   (CHEC site #) (year) (case number)

4. **Sex**: □ Male □ Female

5. **Pathogen(s) isolated from CSF. Please check all that apply:**
   - □ Coagulase negative *Staphylococcus* (CONS)
   - □ *Corynebacterium* species
   - □ *Cutibacterium acnes* (*Propionibacterium acnes*)
   - □ *Enterococcus* species (*please indicate VRE/VSE below*)
     - □ Vancomycin-resistant *enterococcus* species (VRE)
     - □ Vancomycin-resistant *enterococcus* species (VSE)
   - □ *Escherichia coli*
   - □ *Pseudomonas aeruginosa*
   - □ *Haemophilus influenza* type B
   - □ *Staphylococcus aureus* (*please indicate MRSA/MSSA below*)
     - □ Methicillin resistant *Staphylococcus aureus* (MRSA)
     - □ Methicillin susceptible *Staphylococcus aureus* (MSSA)
   - □ *Viridans Streptococci* (formerly listed as Alpha-hemolytic *Streptococcus*)
   - □ Other, please specify (Genus and species) ____________________________________________

6. **a. Method of identification:**
   - □ Culture
   - □ Molecular *if molecular method used, also complete 6b*

   **b. If molecular method, please specify type:**
   ________________________________

7. **Date of CSF shunt procedure**: _____ / _____ / _______

8. **Date organism was obtained from CSF**: _____ / _____ / _______

9. **Type of shunt surgery. Please check ONE of the following:**
   - □ revision of an existing internal shunt
7

- □ placement of an entirely new shunt

10. Type of CSF shunt inserted. Please check **ONE** of the following:
- □ VP (ventriculoperitoneal)
- □ LB (lumbo-peritoneal)
- □ VA (ventriculoatrial)
- □ Other, please specify: ________________________________

11. Please indicate the organism(s) AND their susceptibility/resistance for any of the following antimicrobials/anti-fungals listed below: (R for resistant, S for susceptible, I for intermediate):

<table>
<thead>
<tr>
<th>Please specify the organism:</th>
<th>Organism 1: _____________</th>
<th>Organism 2: _____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Amphotericin B</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Amoxicillin-clavulanic acid</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Caspofungin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Cefazolin (Ancef)</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Cephalexin (Keflex)</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Cefepime</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Cloxacillin / Oxacillin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Fluconazole</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Imipenem</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
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<tr>
<td>Linezolid</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
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<tr>
<td>Meropenem</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Micafungin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Penicillin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Piperacillin-tazobactam</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Rifampin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Ticarcillin-clavulanic acid</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Trimethoprim-sulfamethoxazole</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
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<tr>
<td>Vancomycin</td>
<td>□ R □ I □ S</td>
<td>□ R □ I □ S</td>
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<tr>
<td>Voriconazole</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Other, specify:</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
Appendix 2 - Data dictionary
Definitions and notes for completing Patient Questionnaire (see Appendix 1 - CSF Shunt Patient Questionnaire)

1. CHEC Site #
   This will be the 3-character alphanumeric number assigned to your institution. It will always begin with the two digit number assigned to your CHEC member e.g., 99, a letter assigned by the CHEC member for that specific institution e.g., A, B, C, etc. The CHEC site # for each institution should always be the same for all the CHEC/CNISP surveillance projects and will always have all three alphanumeric digits reported as the CHEC site #, e.g., 99A.

2. Unique patient identifier
   This number should never be longer than 10 characters. The 10 characters should consist of the 3 character CHEC site # (e.g., 99A), the surveillance year the infection occurred in (e.g., 15), and a consecutive number starting at 001 and continuing on with each additional case. An example of the first case in an institution would be 99A-15-001. An example of the thirty-fifth case would be 99A-15-035, and so on.

   Please DO NOT include dashes as separators in between the sets of characters

3. Date of Birth (DOB) or age
   Please enter Day (##), Month (May) and Year (1947) in this order. If the date of birth is not available, please enter the patient’s age (in years, months or days).

4. Sex
   Check male or female.

5. Pathogen (isolated)
   Please list all microorganisms isolated from the CSF as reported by the laboratory. If ‘other’ pathogen is checked, please specify the organism in the text field.

6. Methods
   a. Method of identification: Please indicate if the organism was identified by culture or a molecular method
   b. Molecular method: if identified by molecular method, please indicate the method used (e.g. PCR)

7. Date of shunt procedure
   Please enter Day (##), Month (May) and Year (2018) in this order.

8. Date organism was obtained
   Please enter the date the positive CSF organism was obtained Day (##), Month (May) and Year (2018).
9. Type of shunt surgery

Please indicate whether the surgery was for the revision of an existing internal shunt or the placement of an entirely new shunt. If an existing shunt is completely removed and a new device is placed at the same time, please check placement of a new shunt. Please check only ONE box.

10. Type of shunt inserted

Please indicate the type of CSF shunt system inserted (i.e. ventriculoperitoneal, ventriculoatrial, lumbo-peritoneal shunt or other). If other, please specify in the text field.

⚠️ Patients with transcutaneous or external shunting devices or non-shunting devices (e.g. Ommaya reservoir) are excluded from CSF Shunt SSI surveillance

11. Antibiogram results

Please indicate the organism(s) AND their susceptibility/resistance to the antibiotics tested (S = Susceptible, I = Intermediate or R = Resistant).
Appendix 3 - CSF Shunt Denominator and Zero Report Form

Please submit the Denominator data to Web Data Form on CNPHI (via Collaboration Centre > Web Data) by March 31st of the following surveillance year.

1. CHEC site #: ________________________________
2. Surveillance period: January 1 – December 31: ________________________________ 
   (surveillance year)
3. Please provide the following number of surgical placements for the surveillance period year:

<table>
<thead>
<tr>
<th></th>
<th>&lt; 18 years of age</th>
<th>≥ 18 years of age</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of surgical placements of new CSF shunts</td>
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<td></td>
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<tr>
<td>Number of surgical revisions to existing CSF shunts placements</td>
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<td></td>
<td></td>
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<tr>
<td>Total</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

4. For the surveillance year specified above, were there zero (0) cases reported for your site?

□ Yes    □ No
# Appendix 4 - CNISP CSF shunt-associated SSI record

**Note:** This is a resource/tool for sites to assist with record keeping. It is not a requirement for sites to use this table. Please feel free to modify as needed. Please do **NOT** send to CNISP.

<table>
<thead>
<tr>
<th>Patient unique identifier</th>
<th>Sex (M/F)</th>
<th>Date of Birth (DD/MM/YYYY)</th>
<th>Procedure Date (DD/MM/YYYY)</th>
<th>Date positive organism (DD/MM/YYYY)</th>
<th>Date patient questionnaire sent to CNISP</th>
<th>Recorder initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>...........YY..............</td>
<td>□ Male</td>
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<td>CHEC# case#</td>
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</tbody>
</table>
Appendix 5 - Web Data Form Submission CNPHI

Under Collaboration select Canadian Nosocomial Infection Surveillance Program

Select Web Data
(Patient questionnaires and denominator forms are kept here)

Scroll to find the patient questionnaire or denominator form you're looking for

Additional Functions
Add new record
## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revisions Made</th>
</tr>
</thead>
</table>
| November 2017    | - Question regarding method of identification (e.g. culture or molecular) was added  
- Option to indicate zero cases reported on denominator form  
- Included a tool to assist sites with record keeping [APPENDIX 4 - CNISP CSF SHUNT-ASSOCIATED SSI record] |
| December 2017    | - Removed surveillance year as protocol will no longer be updated annually                                                                    |
| December 2019    | - Changed surgery follow period from 1 year to 3 months  
- Updated formatting  
- Added Appendix 5 (Instructions on how to access the new form on the Collaboration center of CNPHI under Web Data) |
| December 2020    | - A new question added: During this admission or in the 14 days prior to this admission, did this patient test COVID-19 positive for the first time? |
| January 2022     | - Updated the working group list and email address for CNISP                                                                                |
| December 2022    | - Updated the working group list  
- COVID-19 question removed: During this admission or in the 14 days prior to this admission, did this patient test COVID-19 positive for the first time? |
| November 2023    | - Updated the working group list  
- Updated the organism list:  
  - Replaced Alpha hemolytic streptococci with Viridans Streptococci  
  - Replaced Propionbacterium species with Cutibacterium acnes  
  - Added Pseudomonas aeruginosa |