Please batch and send patient questionnaires and denominator data (using the ‘core quarterly denominator submission form), quarterly, by e-mail, mail or fax to:

Katie Cassidy  
CNISP Surveillance Officer  
Phone: 613-954-1718  
Fax: 613-946-0678  
E-mail: katie.cassidy@phac-aspc.gc.ca  
BSSHCAID Division  
1408-100 Eglantine Driveway, P.L. 0601E2  
Ottawa, Ontario  K1A 0K9
# TABLE OF CONTENTS

I. INTRODUCTION 3

II. BACKGROUND 3

III. OBJECTIVE 5

IV. METHODS 5
   A. Eligibility to participate 5
   B. Patient population 6
   C. Surveillance period 6
   D. Numerators 6
      1. BSI case definition 6
      2. Relapse vs. new infection 6
      3. ICU-associated BSI 6
      4. CVC-associated BSI 6
   E. Case descriptive data 7
   F. Case-finding 7
   G. Denominators 8
      CVC-days 8
      Patient-Days 8
   H. Rate calculations 9

V. ETHICS 9

VI. PUBLIC ACCESS TO INDIVIDUAL CNISP SITE DATA 10

VII. WORKLOAD 10

Appendix 1 Patient questionnaire 11
Appendix 2 Data dictionary for patient questionnaire 13
Appendix 3 Daily adult ICU & paediatric ICU denominator data collection form (Example) 16
Appendix 4 Daily neonatal denominator data collection form (Example) 17
Algorithm for CVC-BSI Surveillance 18

REFERENCES 19

WORKING GROUP

Dorothy Moore (Co-Chair), Lynn Johnston (Co-Chair), Elizabeth Henderson, Michael John, Joanne Langley, Kathy Suh, Geoff Taylor, Camille Lemieux, Sarah Forgie, Alice Newman, Karen Olekson, Jun Chen Collet, Laurie O’Neil, Kathy Dunn

PHAC Epi Leads: Linda Pelude and Jayson Shurgold
I. INTRODUCTION

Healthcare associated and nosocomial bloodstream infections (BSI) are an important cause of morbidity and mortality in severely ill patients, and a significant proportion of these infections are associated with the presence of central venous catheters (CVC). As several potentially modifiable factors influence the risk of developing a catheter-associated BSI, appropriate infection prevention and control activities have an important impact on infection rates (1-3).

Surveillance is an essential component of infection prevention and control. If carried out in a uniform manner, surveillance provides a measure of the burden of illness, establishes benchmark rates for internal and external comparison, identifies potential risk factors, and allows assessment of specific interventions. Surveillance for CVC-associated BSI (CVC-BSI) is considered an important measure of quality of care.

II. BACKGROUND

Although the majority of healthcare associated BSIs are associated with the use of a CVC, these devices have become essential to the care of patients with complex severe illnesses, especially those in intensive care units (ICU). Highest rates are reported in neonatal, pediatric, trauma and burn ICUs (4). Infection rates vary by type of catheter. Other risk factors include catheter insertion and care practices, products administered through the line, frequency of manipulation, age group, underlying disease, and severity of illness of the patient (1).

The skin is the main source of microorganisms causing CVC-BSI. Infection may occur as a result of migration of microorganisms from the insertion site along the percutaneous tract. This may occur during insertion or later, especially if the catheter is manipulated. Microorganisms may also be introduced into the catheter lumen from the external surface of the catheter or administration tubing at junction sites, especially when these are disconnected, or through cracks in the external portion of the catheter or some component of the administration set. The catheter hub is an important source of infection of tunnelled catheters in place for more than 30 days.

The types of microorganisms most frequently involved in CVC-BSI are coagulase negative staphylococci, Staphylococcus aureus, enterococci, Candida spp and Gram negative bacilli. Antibiotic-resistant strains are frequently encountered. Administration of intravenous lipid is an independent risk factor for BSI with coagulase negative staphylococci and with Candida in patients in neonatal intensive care units (1).

An estimated 80,000 CVC-associated BSI occur each year in the United States. The National Nosocomial Infections Surveillance System (NNIS) monitored hospital-acquired infections from 1970 to 2004 in approximately 300 US hospitals and reported rates of CVC-BSI per 1000 CVC days by ICU type. In NNIS hospitals rates of CVC-BSI decreased between 1990 and 1999 by 44% in medical ICU, 43% in coronary ICU, 32% in pediatric ICU and 31% in surgical ICU. This was attributed, at least in part, to feedback of infection rates to individual institutions (8). For 2002-2004, pooled mean rates ranged from 2.7 for cardiothoracic surgery ICU to 7.4 for trauma ICU. The rate for adult mixed medical/surgical ICU in major teaching hospitals was 4.0/1000 CVC days, for paediatric ICU was 6.6/1000 CVC days and in neonatal ICU ranged from 3.5 to 9.1/1000 CVC days according to birth weight group (4).

NNIS was replaced by the National Healthcare Safety Network (NHSN) in 2006. Surveillance for CVC-BSI continued but with significant changes. In adult and pediatric ICU, only laboratory-confirmed infections are now reported, whereas NNIS had included clinical sepsis in the rate calculations. CVC-associated clinical sepsis (without laboratory confirmation) was retained for neonatal ICUs but there were several changes: Neonates are now stratified by 5 birth weight groups (NNIS had used 4); BSI...
associated with CVC are reported separately from those associated with umbilical catheters (NNIS had combined these); and rates for level III and level II/III neonatal ICUs are reported separately. NHSN pooled mean rates of CVC-BSI per 1000 CVC days for 2006 in adult ICU ranged from 1.5 for cardiothoracic surgery ICU to 6.8 for burn ICU with a rate of 2.4 for mixed medical/surgical ICU in major teaching hospitals. Paediatric ICU rates were 5.3. Neonatal ICU rates for CVC and umbilical catheters in level III neonatal ICU ranged from 3.1 to 6.4 and 0.9 to 6.9 respectively for different birth weight groups (9). The attributable mortality for these infections remains unclear. The attributable cost is substantial at an estimated $34,000-56,000 per infection (1).

Ongoing surveillance for CVC-BSI is also carried out in England. From 1997-2001, 73 hospitals reported a total of 1888 CVC-BSI. In teaching hospitals, the largest numbers of infections and highest rates per 1000 patients at risk were noted in ICU, oncology, hematology, nephrology and special care baby units while in non-teaching hospitals, general medicine, general surgery and geriatric wards accounted for a large percentage of infections (10).

Data from 1997-2001 from 212 ICU participating in the German nosocomial infection surveillance program showed lower rates of infection than reported by NNIS. Pooled mean rates per 1000 CVC-days ranged from 1.1 in neurosurgical ICU to 4.7 in pediatric ICU. During this surveillance period an overall decrease in rate from 2.1 to 1.6 was observed (7).

An international study in 1998-2000 using NNIS methods reported rates of 3.82 ± 0.38 per 1000 CVC-days for ICU in 41 US hospitals and 5.02 ± 0.75 for ICU in 15 hospitals in Europe, Asia, Middle East and South America (11).

A 6 month study of laboratory-confirmed CVC-BSI in 43 ICU in 21 hospitals in Quebec in 2001 reported 92 infections. Pooled mean rates were 2.5, 2.1 and 8.6 per 1000 CVC-days for adult, paediatric and neonatal ICU respectively (12, 13). Ongoing surveillance for CVC-BSI is now being carried out in 38 ICU in 28 hospitals in the province. Median rates per 1000 CVC-days for the first 18 months of surveillance were 1.73, 2.16, 2.32 and 4.23 for adult university, adult non-university, paediatric and neonatal ICU (14).

In 2006, CNISP carried out CVC-BSI surveillance for 13 months in 68 ICUs in 28 hospitals across Canada. A total of 710 CVC-BSI were reported. Mean rates per 1000 CVC-days for adult, paediatric and neonatal ICU were lower than rates observed during a six month CNISP study conducted in 1996 in which 41 ICU in 19 hospitals reported a total of 182 CVC-BSI. Pooled mean rates per 1000 CVC-days for adult, paediatric and neonatal ICU in 2006 were 2.32, 2.96 and 5.69 respectively compared to the 1996 rates of 6.9, 5.0 and 6.8 (15).

Ongoing CNISP CVC-BSI surveillance from 2006 to 2009 has shown an overall decline in adult ICU CVC-BSI rates over this 4 year period. Overall adult rates have declined from 2.30 per 1,000 CVC-days in 2006 to 1.30 in 2009; paediatric rates have increased from 2.88 to 3.98 and neonatal rates have remained relatively stable, 5.39 (2006) and 5.37 (2009) (Figure 1).
A CDC statement regarding public disclosure of hospital-associated adverse events suggests that the rate of CVC-associated BSI in ICU be considered as one outcome measure to be monitored and CVC insertion practices as a process measure (16, 17).

III. OBJECTIVE:

The objective of this CNISP initiative is to determine mean and percentile CVC-BSI rates that hospitals may use as benchmarks for external comparison.

A secondary objective is to reduce the rates of CVC-BSI in ICU. The literature suggests that the performance of surveillance for BSI and feedback of data to caregivers results in reduction in infection rates (7, 8). Routine standardized collection of data on infection rates also permits individual centres to evaluate specific infection prevention and control interventions.

IV. METHODS:

A. Eligibility to participate:

1. Hospitals that are part of the CNISP network
2. Able to perform year-round surveillance for CVC-BSI in at least one ICU
3. Able to document ICU specific CVC-days and ICU specific patient-days for each participating

1 ICU is defined as a nursing care area in an acute care hospital that provides intensive observation, diagnostic and supportive care to critically ill patients including, but not limited to, invasive intravascular hemodynamic monitoring, endotracheal intubation and mechanical ventilation. The type of ICU is determined by the service designation of the majority (e.g. >80%) of patients cared for by the unit. Bone marrow transplant units and units that provide step-down care, intermediate care or telemetry only are excluded (17, 18).

2 CVC is a venous access device that terminates at or close to the heart or one of the great vessels (18). The CDC National Healthcare Safety Network (NHSN) defines great vessels as: aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic, internal jugular, subclavian, external iliac and common femoral veins, and umbilical artery and vein (19).

CVC include non-tunnelled (standard) CVC, whether coated or not, peripherally inserted CVC (PICC), tunnelled devices (e.g. Broviac, Hickman, tunnelled haemodialysis line, etc) and umbilical artery and vein catheters. Totally implanted devices such as Ports are NOT included. Pulmonary artery catheters are included as these are inserted via a central vein. Other arterial catheters are NOT included. Pacemaker leads and other non-infusion devices inserted into central blood vessels or the heart are NOT included (17, 19).
ICU. For neonatal ICU, ability to stratify CVC and umbilical catheter ³ days by birth weight group. Only level III and II/III NICU are included.

4. Able to collect and submit the above data on a quarterly basis.

B. Patient population:

All ICU patients in at least ONE of the ICUs in the participating CNISP hospital.

C. Surveillance period:

The 2011-2012 CVC-BSI surveillance period will begin April 1, 2011 and continue to March 31, 2012 inclusive.

D. Numerators:

ONLY CVC-associated BSIs related to an ICU admission are to be reported.

1. BSI case definition:

   Criterion 1. Recognized pathogen cultured from at least one blood culture, unrelated to infection at another site.
   
   OR

   Criterion 2. At least one of: fever (>38°C), chills, hypotension (if aged < 1 yr: fever, hypothermia, apnea, or bradycardia) or signs of infection of insertion site or catheter tunnel

   AND common skin contaminant⁴ cultured from ≥ 2 blood cultures drawn on separate occasions ⁵.

2. CVC-associated BSI:

   CVC-associated if catheter in place at onset of BSI or within the 48 hours before the onset of BSI (if CVC removed >48 hours before onset there must be compelling evidence that the infection was associated with the CVC, e.g. purulent thrombophlebitis) (18, 19)

3. ICU-related:

   CVC-BSI onset during ICU stay or within 48 hours of leaving ICU (18,19)

Exclusions:

- Infection already present on admission to ICU
- BSI in neonate < 48 hours old, unless epidemiologic evidence indicates acquisition in the neonatal ICU (e.g., procedure-associated; known endemic neonatal ICU strain)

³ Umbilical catheters are defined as catheters inserted through the umbilical artery or vein in neonates (19)

⁴ i.e., diphtheroids, Corynebacterium spp., Bacillus spp, Propionibacterium spp., coagulase-negative staphylococci, viridans group streptococci, Aerococcus spp., Micrococcus spp. (20)

⁵ Different sites may include peripheral veins, CVCs, or separate lumens of a multi-lumen catheter. Different times include cultures taken via separate venipunctures or catheter entries, but within 48 hours of each other. Two positive blood culture bottles filled at the same venipuncture or catheter entry constitute only one positive blood culture (20).
4. **Relapse vs. new infection:**
   Same microorganism (as best as can be determined by the data available – e.g. species, antibiotic sensitivity, etc) isolated from a subsequent blood culture:
   - If **less** than 10 days from a negative culture **OR less** than 10 days from completion of appropriate antibiotic therapy, consider as a relapse and **DO NOT REPORT**.
   - If **more** than 10 days from a negative culture (if culture was done) **AND more** than 10 days from completion of appropriate antibiotic therapy, **REPORT** as a NEW infection.

E. **Case descriptive data:**

Cases are to be identified by a multiple-character number that includes the CHEC identification number (3-character alphanumeric number, e.g., 09A), the surveillance year (2011-2012) and the CVC-BSI case sequential number (three-digit number starting from 001) and continuing on with each additional case. As a patient may have more than one episode of CVC-associated BSI during the same ICU admission, **sequential** episodes are to be identified by the same multiple-character unique number followed by a letter (a, b, etc)

**Minimum dataset:**
- Birth date
- Gender
- Date of admission to hospital
- Date of admission to ICU
- Date of first positive blood culture
- Type of ICU (e.g., adult medical, surgical, coronary, mixed, pediatric, neonatal, other)
- Number of positive blood cultures (1 or ≥2)
- Criteria for diagnosis of CVC-associated BSI
- Microorganism(s) isolated
- Antibiotic resistance: identify if MRSA, VRE, ESBL
- Types of catheters in place at time of BSI or in the preceding 48 hours
- Outcome at 30 days: discharged alive, alive in ICU, alive in hospital and out of ICU, deceased*, unknown. (*If deceased, relation to BSI: direct or indirect (contributing), unrelated, or unable to determine
- For neonatal ICU: Birth weight

F. **Case-finding:**

Identification of patients with BSI:
- Daily (or, at a minimum, three times weekly) review of microbiology laboratory results.
- For each positive blood culture: determine if patient is in ICU or was in ICU within the 48 hours prior to the time the positive specimen was obtained.
  - If so, review patient’s chart to determine if a CVC was present at the time the specimen was obtained or within the preceding 48 hours.
  - If so, determine if case definition for CVC-associated BSI is met
  - If so, fill in the patient questionnaire
G. Denominators:

1. CVC-days:

   a. All ICU except neonatal ICU:
      For each ICU, count and record the number of patients with one or more CVC at approximately the same time each day (“patients with CVC” are counted, NOT the total number of “CVCs”; i.e. a patient with more than one CVC simultaneously counts as only one CVC day). Sum the totals quarterly. (See example of daily Adult ICU and Paediatric ICU denominator data collection sheet in Appendix 2; these are examples ONLY and are NOT to be submitted; quarterly aggregate denominator data should be submitted on the ‘core quarterly denominator submission forms’. Centres may choose to use alternative methods of daily data collection).

   b. Neonatal ICU:
      Neonatal ICU CVC-BSI rates will be stratified by 5 birth weight groups (< 750g, 750 -1000g, 1001-1500g, 1501-2500g, >2500g) and by type of catheter (CVC or umbilical catheter)\(^6\)
      CVC days: Count and record the number of patients of each birth weight group with one or more CVC and the number with one or more umbilical catheters at approximately the same time each day. If a patient has both umbilical catheters and CVCs, count as an umbilical catheter day. Sum the totals quarterly. (See sample daily NICU denominator data collection sheet in Appendix 3; this is an example ONLY and is NOT to be submitted; quarterly aggregate denominator data should be submitted on the ‘core quarterly denominator submission forms’. Centres may choose to use alternative methods of daily data collection).

2. Patient-days:\(^7\)

   a. All ICU except NICU
      For each ICU, count and record the number of patients in the ICU at approximately the same time each day. Sum the totals quarterly. (See sample adult ICU and paediatric ICU denominator data collection sheet in Appendix 2; this is an example ONLY and is NOT to be submitted; quarterly aggregate denominator data should be submitted on the ‘core quarterly denominator submission forms’. Centres may choose to use alternative methods of daily data collection).

   b. Neonatal ICUs (NICU)
      Count and record the number of patients of each birth weight group at approximately the same time each day. Sum the totals quarterly (see sample NICU denominator data collection sheet in Appendix 3; this is an example ONLY and is NOT to be submitted; quarterly aggregate denominator data should be submitted on the ‘core quarterly denominator submission forms’. Centres may choose to use or already use alternative methods of daily data collection).

---

\(^6\) Because of differing infection risks among neonates, rates will be stratified by type of catheter (CVC or umbilical catheter) (19). Stratifying denominator data by birthweight should be done now where feasible for centres able to produce these data, and should be phased in elsewhere. Centres currently unable to separate CVC and umbilical catheter days should continue to report combined CVC-umbilical days (as in the past) for 2011 and 2012, but continue their efforts to separate CVC and umbilical catheter days.

\(^7\) This information is not required for calculation of infection rates but is used for calculation of rate of CVC utilization per ICU (see calculations below).
For centres unable to supply NICU patient-days by birth weight group, please supply total NICU patient-days. CVC utilization rates will be calculated for the NICU but not stratified for birth weight).

Denominator data will be cumulated and sent quarterly (using the ‘core quarterly denominator submission forms’, by mail, fax or e-mail to PHAC within 3 months of the end of the quarter (now included in core surveillance quarterly denominator data submission)

H. Rate Calculations:

Rates will be calculated at the end of each surveillance year.

Overall, for each ICU and by criterion 1 & 2:

<table>
<thead>
<tr>
<th>Infection rate: CVC-associated BSI rate</th>
<th>= Number of CVC-associated BSIs ( \times 1000 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of CVC-days</td>
</tr>
<tr>
<td>Device utilization rate: CVC-utilization rate</td>
<td>= Number of CVC-days</td>
</tr>
<tr>
<td></td>
<td>Number of patient-days</td>
</tr>
</tbody>
</table>

For each type of ICU (depending on data collected):

- Data (numerators and denominators) from participating centres will be pooled to determine pooled mean infection rates.
- Individual rates for participating centres will be used to calculate median, percentile and mean infection and device utilization rates.

Adult ICU:

- Numbers of specific types of adult ICU types may be insufficient to permit calculation of meaningful percentiles. If so, data from all adult ICUs will be pooled for calculation of percentiles. If numbers permit, percentiles will be calculated for specific types of adult ICU.

Neonatal ICU:

- Pooled mean, median, percentile and mean infection rates will be calculated for birth weight groups.
- Device utilization rates by birth weight group will be calculated for those centres submitting patient-days stratified by birth weight group. For those able to only submit total neonatal ICU patient days, individual device utilization rates will be calculated for the total neonatal ICU population.
- Pooled mean, median, percentile and mean device utilization rates will be calculated for birth weight groups and for the total neonatal ICU population.

V. 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.
VI. **Public access to individual CNISP site data:**

There is current demand for public disclosure of hospital-associated adverse events. Any data released by CNISP will be in summary format and will not identify individual hospitals. CNISP participants should anticipate that they may be approached to release hospital specific data, especially if the results of this surveillance are published. Hospital administrators should be made aware that national reporting will be occurring.

VII. **WORKLOAD:**

**Cases:**
- Review of microbiology laboratory blood culture results
- Determining location of patients with positive cultures
- Chart review to determine if patient fulfills criteria for CVC-BSI
- Filling of the case data collection form
- Assessing outcome at 30 days
- Submission of questionnaires (paper or on-line) quarterly within 3 months of the end of the quarter (e.g., data from the first quarter Jan 1 – March 31, 2010 will be due by June 30, 2010)

**Denominators:**
- Daily collection of CVC days
- Collation of data on CVC days
- Collection and collation of data on patient-days quarterly

**For neonatal ICU:**
- Daily collection of data on CVC and umbilical catheter days and patients-days by birth weight group
- Collation of data on CVC days and umbilical catheter days (or combined CVC-umbilical catheter days) and patient-days by birth weight group

**CVC-BSI Denominator Information Form**
- Filled in and submitted quarterly within 3 months of the end of the quarter. **Now** included in core surveillance quarterly denominator data submission

**Hospital Profile**
- Filled in and submitted annually. **Now** included in core surveillance annual hospital profile submission)

*Please batch and send* the completed questionnaires and core quarterly denominator submission forms, *quarterly*, by mail, fax, or email to:

**Katie Cassidy**
Surveillance Officer
BSSHCAID Division, Public Health Agency of Canada
100 Eglantine Driveway, A.L. 0601E2
Tunney’s Pasture
Ottawa, Ontario K1A 0K9

Phone: (613) 954-1718
Fax: (613) 946-0678
Email: Katie.Cassidy@phac-aspc.gc.ca
Appendix 1
2011-2012 SURVEILLANCE FOR CVC-ASSOCIATED BSI (CVC-BSI) IN INTENSIVE CARE UNITS

Patient Questionnaire

1. CHEC site #: ______________

2. Unique patient identifier ______ 2011-2012 ______
   (CHEC site #) (year) (case number)
   (must include CHEC site #, year and three digit consecutive code, e.g., 07A 2011-2012 001. Use the same number with letter at the end if a patient has >1 episode of BSI during the same hospitalization e.g., 07A2011-2012 001a)

3. Date of birth: ______/______/______ (e.g., 17 Jan 1978)
   If unable to provide DOB, indicate age in years, months or days Age ______ □ days □ months □ years

4. NICUs only: Birth weight* (grams) ___________
   (*refers to the weight of the infant at the time of birth and should NOT be changed as the infant gains weight)

5. Gender: □ male □ female

6. Date of admission to hospital: ______/______/______

7. Date of admission to ICU: ______/______/______

8. This patient meets which criteria for a CVC-BSI?
   ONLY CVC-associated BSIs related to an ICU admission are to be reported.
   Case Definition:
   A CVC must be present at the time of the BSI or removed within the 48 hours prior to onset, unless clinical evidence links the BSI to a catheter removed > 48 before onset (e.g., purulent thrombophlebitis).
   AND
   Absence of other focus of infection as a source of the BSI
   Exclusions:
   CVC-BSI already present on admission to ICU.
   BSI in neonate < 48 hours old, unless epidemiologic evidence indicates acquisition in the ICU (e.g., procedure-associated; known endemic neonatal ICU strain)
   Criteria for diagnosis of CVC-associated BSI in this patient: Check only ONE of the following 2 options:
   □ Criterion 1. Recognised pathogen cultured from one or more blood cultures, unrelated to infection at another site.
   □ Criterion 2. At least one of: fever (>38°C), chills, hypotension (if aged < 1 yr: fever, hypothermia, apnea, or bradycardia) or signs of infection of catheter insertion site or tunnel
   AND
   Common skin contaminant (e.g. diphtheroids, Bacillus spp, Propionibacterium spp, coagulase negative staphylococci, and micrococci) cultured from two or more blood cultures drawn on separate occasions.
9. Date of first positive blood culture: ______/_____/______  
   DD      MMM      YYYY

10. Number of positive blood cultures (for this episode of BSI, taken at different sites or different times within 48 hours of the first positive culture and growing the same microorganism or microorganisms): ☐ 1 ☐ 2 or more

11. Microorganism(s) Isolated
   1. ______________________________________________________
   2. ______________________________________________________
   3. ______________________________________________________
   4. ______________________________________________________
   5. ______________________________________________________

   MRSA ☐ No ☐ Yes
   VRE   ☐ No ☐ Yes
   ESBL  ☐ No ☐ Yes

12. Type of ICU where BSI acquired: (Check one only)  
   ☐ Adult Medical ☐ Adult Cardiovascular surgery
   ☐ Adult Surgical ☐ Pediatric (PICU)
   ☐ Adult Coronary ☐ Neonatal (NICU)
   ☐ Adult Medical/Surgical ☐ Other (specify____________________________)

13. CVC devices at time of BSI or within the previous 48 hours (check ALL that apply)
   ☐ Non-tunnelled pulmonary artery catheter
   ☐ Non-tunnelled, other (specify____________________________)
   ☐ Tunnelled
   ☐ Umbilical (artery)
   ☐ Umbilical (vein)
   ☐ ECMO
   ☐ PICC
   ☐ Other (specify____________________________)

14. Was there infection of:
   CVC insertion site: ☐ No ☐ Yes
   Tunnel: ☐ No ☐ Yes

15. Outcome 30 days after date of first positive blood culture (Check ONLY ONE of the following):
   ☐ alive in your ICU ☐ alive in your hospital, out of ICU
   ☐ discharged alive ☐ deceased (in hospital) ☐ unknown

---

8 Please ensure that the type of ICU where the BSI was acquired (e.g., Adult medical ICU) you are submitting the case for, matches the type of ICU you will be submitting denominator data for in this quarter using the ‘core quarterly denominator data submission form’.
Appendix 2. Data Dictionary for patient questionnaire- definitions and notes

1. **CHEC Site #**:
   This is 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., 07, 15, and 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., 07A, 15A.

2. **Unique patient identifier**:
   Multiple-character number that includes the CHEC identification number (3-character alphanumeric number, e.g., 09A), the surveillance year (2011-2012) and the CVC-BSI case sequential number (three-digit number starting from 001) and continuing on with each additional case. An example of the thirty-fifth case would be 09A 2011-2012 035, and so on. Use the same number with a lower case letter at the end if the patient has had >1 BSI episode during the same hospitalization e.g., 09A 2011-2012 001 a. This surveillance project runs on a fiscal year (April-March).

3. **Date of Birth**:
   Please enter Day (17), Month (Aug) (i.e. first three letters of month) and Year (2011) in this order (e.g., 17 Aug 1978). If unable to provide date of birth, indicate age in years, months or days. Ensure that the appropriate box (Age is in days, months, years) is checked.

4. **Birth weight (NICU)**:
   Birth weight is a risk stratifier for events in the NICU. It refers to the weight of the infant at the time of birth and should NOT be changed as the infant gains weight. For example, if a neonate weighs 1006 grams at birth but remains in the NICU for two months and has a body weight of 1650 grams when it develops a CVC-BSI, the recorded birth weight should still be 1006 grams on the patient questionnaire.

5. **Gender**:
   Check male or female gender as appropriate.

6. **Date of admission to hospital**
   Date of admission is the admission that relates to this episode of CVC-BSI. Please enter Day (17), Month (Aug) (i.e. first three letters of month) and Year (2011) in this order (e.g., 17 Aug 2011).

7. **Date of admission to ICU**
   Please enter Day (18), Month (Aug) (i.e. first three letters of month) and Year (2011) in this order (e.g., 18 Aug 2011).

8. **Does this patient have or meet criteria for a CVC-BSI?**
   The blood culture was obtained because a physician ordered the culture as a result of some clinical indication or suspicion of infection and is reported positive. Are the criteria listed on the questionnaire met? Please check only ONE of the two options available (e.g. criterion 1 OR criterion 2).

9. **Date of first positive blood culture**
   Please enter Day (20), Month (Aug) (i.e. first three letters of month) and Year (2011) in this order (e.g., 20 Aug 2011).
10. **Number of positive blood cultures** with the same microorganism or microorganisms (taken at different sites or different times):

Please check only **ONE** response, check 1 if there was only one positive blood culture and if more than one positive culture (for this episode), check 2 or more.

Different sites may include peripheral veins, CVC, or separate lumens of a multilumen catheter. Different times include cultures taken via separate venipunctures or catheter entries, but within 48 hours of each other. Two positive blood culture bottles filled at the same venipuncture or catheter entry constitute only **ONE** positive blood culture.

11. **Microorganism(s) Isolated**

Please list all microorganisms isolated for the BSI as reported by the laboratory and check the appropriate box for antimicrobial resistant organisms including MRSA, VRE and ESBL.

12. **Type of ICU where BSI acquired.**

Check the box that identifies the type of ICU where the BSI was acquired. (i.e. an Adult medical ICU, adult coronary unit (CCU). If the intensive care unit is a mixed unit that includes neurosurgical, trauma, and burn patients as part of its surgical or medical/surgical patient mix, call it a surgical ICU or medical/surgical ICU. If none of these identifies the type of ICU, then the ‘other’ box should be checked and the type of ICU described under ‘specify’. Please ensure that all submitted BSI cases are attributable to an ICU for which you will be submitting denominator data for in this quarter using the ‘Core quarterly denominator collection form’.

13. **CVC devices at time of BSI or within the previous 48 hours:**

Please check all of the boxes that apply to the CVC device(s) in place. If none of these identifies the CVC device, then the ‘other’ box should be checked and the CVC device described under ‘specify’.

14. **Was there infection of the CVC insertion site or tunnel?**

CVC insertion site: Please check this box if there is:

- purulent discharge either spontaneous or expressed upon palpation of the site **OR**
- erythema, tenderness, induration (any two of the three) at the exit site with serous or serosanguinous discharge, either spontaneous or expressed upon palpation **OR**
- erythema, tenderness, induration (any two of the three) at the exit without any discharge with no clinical data to suggest an alternative cause (i.e., extravasation, allergy, contact dermatitis)

Tunnel refers to the subcutaneous tract of a tunneled catheter (e.g. Hickman or Broviac). Please check this box if there is:

- purulent discharge, either spontaneous or expressed, from a draining sinus, or aspirated from the subcutaneous tract and not contiguous with the exit site **OR**
- erythema, tenderness, induration (any two of the three) or necrosis of the skin with serous or serosanguinous discharge, either spontaneous or expressed or aspirated from the subcutaneous track and not contiguous with the exit site **OR**

---

9 From reference 21(definitions for definite or probable infection)
• erythema, tenderness and induration (any two of the three) or necrosis of the skin along the path of the subcutaneously tunnelled catheter without drainage and with no clinical data to suggest an alternative cause, i.e., extravasation, allergy, contact dermatitis.

15. Outcome 30 days after date of first positive blood culture:
Please check only ONE of the options available: whether the patient was alive in your ICU OR alive in your hospital and out of ICU OR discharged alive OR discharged deceased OR unknown at 30 days after the date of the first positive blood culture as it relates to this episode of CVC-BSI.
Appendix 3. Example* of daily denominator collection form for Adult ICU & PICU

*This is an example ONLY and is NOT to be submitted; quarterly aggregate denominator data should be submitted on the 'core quarterly denominator submission forms'. Centres may choose to use or already use alternative methods of daily data collection.

<table>
<thead>
<tr>
<th>Date</th>
<th># Patients</th>
<th># Patients with one or more CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Patient days =</td>
<td>CVC days =</td>
</tr>
</tbody>
</table>

1 Type of ICU: specify e.g., Adult medical, Adult surgical, Adult Mixed, PICU, etc.
2 In some hospitals this data may be more easily obtained by administrative period from hospital administrative databases than by noting number of patients each day.
3 Number of patients with one or more CVC. Only count **ONE** CVC day per patient even if patient has > one CVC.
Appendix 4. Example* of daily denominator collection form for Neonatal Intensive Care Unit (NICU)

*This is an example ONLY and is NOT to be submitted; quarterly aggregate denominator data should be submitted on the 'core quarterly denominator submission forms'. Centres may choose to use or already use alternative methods of daily data collection.

Daily denominator collection form for Neonatal Intensive Care Unit (NICU)

CHEC site_________ Month ________ Year________________

<table>
<thead>
<tr>
<th>Date</th>
<th>Birth weight ≤ 750 gms</th>
<th>Birth weight 751-1000 gms</th>
<th>Birth weight 1001-1500 gms</th>
<th>Birth weight 1501-2500 gms</th>
<th>Birth weight &gt;2500 gms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Pts # UC # CVC</td>
<td># Pts # UC # CVC</td>
<td># Pts # UC # CVC</td>
<td># Pts # UC # CVC</td>
<td># Pts # UC # CVC</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** = number of infants
# UC = number of infants with umbilical catheter
# CVC = number of infants with 1 or more central venous lines

If infant has both a UC & CVC, count as UC day
ALGORITHM FOR CNISP CENTRAL VENOUS CATHETER-ASSOCIATED BLOODSTREAM INFECTIONS (CVC-BSI) SURVEILLANCE

ONLY CVC-associated BSIs related to an ICU admission are to be reported

CVC-associated BSI:
Case Definition
A CVC must be present at the time of the BSI or removed within the 48 hours prior to onset, unless clinical evidence links the BSI to a catheter removed > 48 before onset (e.g., purulent thrombophlebitis) AND Absence of other focus of infection as a source of the BSI

ICU – related:
CVC-BSI onset during ICU stay or within 48 hrs of leaving ICU

Patient admitted in the ICUs selected for surveillance

Lab / clinical presentation meets surveillance case definition & a diagnosis criterion?

New infection

YES

YES

Relapse

NO

NO

Exclude from CVC-BSI surveillance

Exclude from CVC-BSI surveillance

Is BSI CVC-associated?

YES

1. Assign CHEC Identification number
2. and fill the patient questionnaire

Criteria for diagnosis of CVC-associated BSI
1) Recognized pathogen cultured from at least one blood culture, unrelated to infection at another site OR
2) At least one off: fever (>38°C), chills, hypotension (if aged < 1 year: fever, hypothermia, apnea, or bradycardia) or signs of infection of insertion site or catheter tunnel AND common skin contaminant* cultured from ≥ 2 blood cultures drawn on separate occasions.

NEW INFECTION:
Same microorganism (using available data) isolated from a subsequent blood culture; if more than 10 days from a negative culture OR less than 10 days from completion of appropriate antibiotic therapy, it is a NEW infection. Complete another questionnaire.

RELAPSE:
Same microorganism (using available data – e.g. species, antibiotic sensitivity, etc) isolated from a subsequent blood culture; if less than 10 days from a negative culture OR less than 10 days from completion of appropriate antibiotic therapy, it is a relapse. Do not complete another questionnaire.

18
REFERENCES


