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Canadian Nosocomial Infection Surveillance Program (CNISP)

2018 Surveillance Protocol for Methicillin-Resistant and Methicillin-Susceptible *Staphylococcus aureus* Bloodstream Infections in CNISP Hospitals

Revised January 29, 2018

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Please enter/upload case forms to www.cnphi-rcrsp.ca

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INTRODUCTION

Prior to 1995, national data describing the incidence and epidemiology of methicillin-resistant *Staphylococcus aureus* (MRSA) in Canada were not available. In 1995, national surveillance for MRSA was started in sentinel hospitals participating in the Canadian Nosocomial Infection Surveillance Program (CNISP) and has been ongoing.

The Canadian Nosocomial Infection Surveillance Program (CNISP) is a collaborative effort of the Canadian Hospital Epidemiology Committee (CHEC), a subcommittee of the Association of Medical Microbiologists and Infectious Disease (AMMI) and the Centre for Communicable Diseases and Infection Control (CCDIC) of the Public Health Agency of Canada.

Established in 1994, the objectives of CNISP are to provide rates and trends on healthcare-associated (nosocomial) infections at Canadian health care facilities thus enabling comparison of rates (benchmarks), and providing evidence-based data that can be used in the development of national guidelines on clinical issues related to healthcare-associated infections. As of January 2017, 62 sentinel hospitals including 8 stand-alone pediatric sites from 10 provinces and represented by 35 CHEC members participate in the CNISP network.

Data collected for the surveillance year 2018 will reflect all "newly-identified" methicillin-susceptible *Staphylococcus aureus* (MSSA) and/or MRSA bloodstream infections (BSIs) from participating CNISP hospitals. Since 2016, MRSA colonizations are no longer being reported to CNISP.

OBJECTIVES

The objectives of this surveillance project are to:

1. Describe MSSA and MRSA BSIs in Canadian acute-care hospitals, participating in CNISP;
2. Determine annual MSSA and/or MRSA bacteremia rates (as an indicator of the burden of disease) in Canadian hospitals, participating in CNISP;
3. Determine the proportion of *S. aureus* BSI that are MRSA
4. Characterize all bloodstream MSSA and/or MRSA isolates, from CNISP hospitals, by antimicrobial susceptibility testing and molecular typing.

METHODOLOGY

a) Surveillance Period

The surveillance period is from January 1, 2018 to December 31, 2018.

b) MSSA and MRSA infection surveillance inclusion criteria

Case definition	
MSSA	**MRSA**
• isolation of *Staphylococcus aureus* from blood AND • patient must be admitted to the hospital AND • is a "newly identified *S. aureus* infection" at a CNISP hospital at the time of hospital admission or identified during hospitalization.	• isolation of *Staphylococcus aureus* from blood AND • resistance of isolate to oxacillin and/or laboratory confirmation of *mec* (phenotypic or genotypic) AND • patient must be admitted to the hospital AND • is a "newly identified MRSA infection" at a CNISP hospital at the time of hospital admission or identified during hospitalization.

This includes:

- MSSA or MRSA BSIs identified for the first time during this current hospital admission.
- MSSA or MRSA BSIs that have already been identified at your site or another CNISP site but are new infections.

Criteria to determine if it is a new MSSA or MRSA BSI:
> 14 days since previously treated MSSA or MRSA BSI and in the judgement of Infection Control physicians and practitioners represents a new infection

c) MSSA and MRSA infection surveillance exclusion criteria

- Emergency, clinic, or other outpatient cases who are **NOT admitted** to the hospital.

Once the patient has been identified with a MSSA or MRSA BSI, they will be classified as Healthcare-associated any other healthcare exposure (HA-AOHE) or Healthcare-associated your acute-care facility (HA-YAF) based on the following criteria and the ***best clinical judgement*** of the healthcare and/or infection prevention and control practitioner (IPC):

HA-YAF case definition for a MSSA or MRSA BSI:

- Patient is on or beyond calendar day 3[1] of their hospitalization

OR

- Has been hospitalized in your facility in the last 7 days or up to 90 days[2] depending on the source of infection

OR

- Has had a healthcare exposure at your facility that would have resulted in this bacteremia (using best clinical judgement)

[1] Calendar day 1 is the day of hospital admission

[2] For example, a MSSA/MRSA bacteremia from a surgical wound that occurs 3 weeks after a surgical procedure completed in your facility should be considered HA-YAF (up to 90 days after procedure if implant). A MSSA/MRSA bacteremic pneumonia occurring >7 days after discharge from your facility should not be considered HA-YAF

Newborn HA-YAF case definition for a MSSA or MRSA BSI

I. The newborn is on or beyond calendar day 3[3] of their hospitalization
II. The mother was **NOT** known to have MRSA on admission and there is no epidemiological reason to suspect that the mother was colonized prior to admission, even if the newborn is < 48 hours of age.
III. In the case of a newborn transferred from another institution, MSSA or MRSA BSI may be classified as HA-YAF if the organism was NOT known to be present and there is no epidemiological reason to suspect that acquisition occurred prior to transfer

HA-AOHE case definition for a MSSA or MRSA BSI:

- Any patient who has a bacteremia not acquired at your facility that is thought to be associated with any other healthcare exposure (e.g. another acute-care facility, long-term care, rehabilitation facility, clinic, ER visit or exposure to a medical device).

Community-associated (CA) case definition for a MSSA or MRSA BSI**:**

- No exposure to healthcare that would have resulted in this bacteremia (using best clinical judgement[4]) and does not meet the criteria for a healthcare-associated BSI.

d) Data Collection

Please note: as of January 2018 only MSSA or MRSA BSIs should be reported

All data must be collected using the questionnaire for a blood isolate (Appendix 4)

Surveillance for MSSA or MRSA BSI is laboratory-based. Laboratory identification of MSSA or MRSA BSI is required for inclusion into the surveillance.

Blood Isolates (MSSA or MRSA must be recovered through positive blood culture).

As a patient may have more than one MSSA or MRSA BSI during the same calendar year, **NEW** infections are to be identified by entering as a new case and 'linking' to the patient's original *S. aureus* or MRSA BSI by entering the original case ID at the end of the questionnaire.

An algorithm (**Appendix 1**) has been provided to assist in surveillance activities.

[3] Calendar day 1 is the day of hospital admission

[4] Consideration should be given to the frequency and nature of exposure to a medical device and/or procedure. For example, pediatric patients with clinic visits for otitis media, asthma, well-baby etc., may or may not be considered as HA while pediatric patients with clinic visits that involved invasive procedures or day surgery may be more likely to be considered HA. Adult patients attending dialysis, receiving chemotherapy, outpatient visits involving invasive procedures or day surgery may be more likely to be considered HA compared to adult patients with occasional outpatient or community health clinic visits.

(C) Blood Culture Isolates

Routine MRSA surveillance – Data collection
For each MSSA or MRSA BSI case, please complete the '**Patient Questionnaire MSSA (*S. aureus*) or MRSA BLOOD ISOLATE'** (Appendix 4).

e) Electronic data entry or submission (email or fax) to the Agency

All MSSA or MRSA BSI patient questionnaire data should be submitted to the Agency online through the Canadian Network for Public Health Intelligence (CNPHI) at www.cnphi-rcrsp.ca. For technical assistance, questions or comments, please contact CNISP at cnisp-pcsin@phac-aspc.gc.ca.

f) Denominator data

To obtain the necessary denominator information for the calculation of national MSSA and/or MRSA bacteremia rates, each participating healthcare facility will complete a denominator (number of patient admissions and patient days) data collection form on a quarterly basis and submit to the Agency online through CNPHI at www.cnphi-rcrsp.ca no later than the end of the following quarter.

If your final year denominator (patient admission and/or patient days) total changes from those submitted through the quarterly submissions, this final calendar year total denominator will be required to be submitted by March 31 of the following calendar year (e.g. for 2018, annual total denominator data would be due March 31 2019).

If your hospital provides care to both adult and pediatric populations and is able to provide separate denominators for adult and pediatric patients, please submit quarterly, the adult and pediatric denominators separately. Pediatric cases are defined as less than 18 years of age.

g) Laboratory surveillance

Blood Isolates: One blood isolate is required for every eligible MSSA or MRSA BSI case. Each MSSA and MRSA BSI identified throughout the surveillance year are to be submitted to the NML (all year round). In the case of a new infection in the same patient if possible, please indicate the patient's previous unique ID on the shipping form

Mandatory Shipping Form: Each shipment of eligible MSSA or MRSA blood isolates must be accompanied by a standardized shipping form. Please complete the template found in Appendix 3 and ensure it is included in the shipment.

Isolates should be sent to the following address:	For questions regarding data collection, data submission forms, please contact:
Dr. George Golding National Microbiology Laboratory Public Health Agency of Canada 1015 Arlington St. Winnipeg, Manitoba R3E 3R2 Tel: 204-789-2133 **Use FedEx billing number: 2299-8435-7**	CNISP Healthcare-Associated Infections Section Public Health Agency of Canada 130 Colonnade Rd., PL 6503B Ottawa, Ontario K1A 0K9 E-mail: cnisp-pcsin@phac-aspc.gc.ca Fax: 613-946-0678

At the NML , *spa* typing and the detection of *mec* and PVL by PCR will) be conducted on all submitted isolates. A duplicate set of the isolate will be sent to Sunnybrook laboratory for antimicrobial susceptibility testing.

DATA ANALYSIS

Individual site-specific, regional and national rates (per 1,000 admissions and per 10,000 inpatient-days) will be calculated each year by Agency staff:

1) incidence rates of MSSA or MRSA bloodstream infections
2) incidence rates of HA & CA- MSSA or MRSA bloodstream infections

While individual site-specific rates will be kept confidential and may only be disclosed to the site's authorized contacts, regional and national rates will be reported via CNISP reports, presentations, publications, and published on the PHAC website.

ETHICS

While this surveillance project is observational and does not involve any alteration in patient care, ethics approval may be sought at some hospital sites. Surveillance for healthcare-associated infections is a routine component of quality assurance and patient care in Canadian healthcare institutions and therefore informed consent is not required. A unique identifier linked to patient name will only identify patients at the local CHEC site and is not transmitted to the Public Health Agency of Canada. All data submitted to the Agency is kept strictly confidential.

Attached Appendices:

Appendix 1 Algorithm for 2018 MSSA and MRSA Surveillance

Appendix 2 Sample Line List

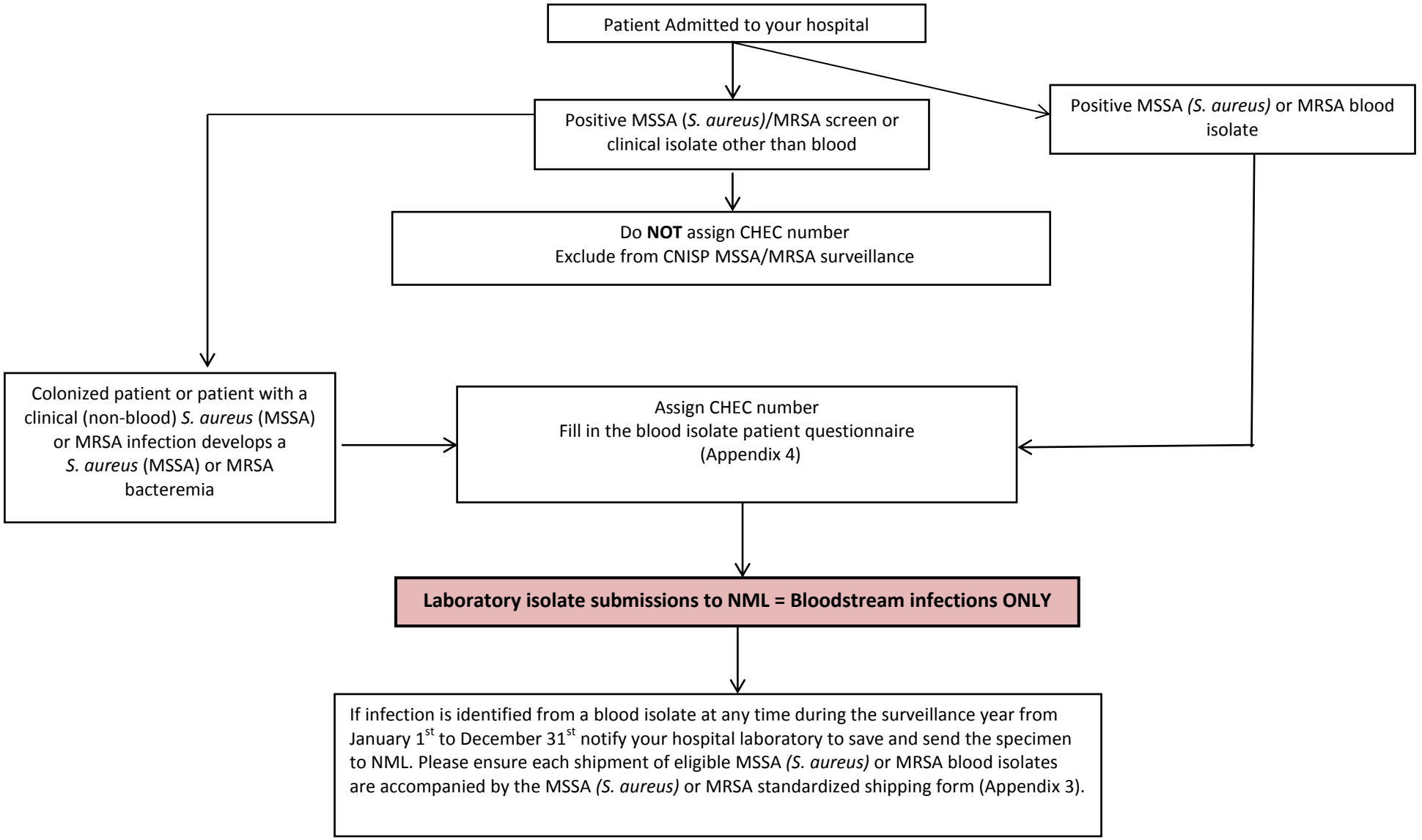
Appendix 3 Standardized Laboratory Shipping Form (Mandatory)

Appendix 4 Patient Questionnaire for MSSA or MRSA BSI surveillance

Appendix 5 Data dictionary & notes for MSSA or MRSA BSI patient questionnaire

Appendix 6 Protocol Revision History

APPENDIX 1- 2018 CNISP MSSA and MRSA SURVEILLANCE ALGORITHM



APPENDIX 2 - Sample line list

(Please do NOT submit this form to the Agency)

Patient name	Hospital ID #	CHEC ID # (unique patient ID)	BLOOD CULTURE ISOLATE		
			Date when blood culture was obtained	If this is a new infection in a patient previously identified with a *S. aureus* (MSSA) or MRSA BSI please enter the previous (original) unique patient ID	Notify the laboratory (NML)
					☐
					☐
					☐
					☐
					☐
					☐
					☐
					☐

APPENDIX 3 - CNISP MRSA 2018 Surveillance: Standardized Laboratory Shipping Form

Send to:

Dr. George Golding
National Microbiology Laboratory
1015 Arlington St., Winnipeg, Manitoba R3E 3R2
Tel: 204-789-2133
Use FedEx billing number: 2299-8435-7

Hospital Laboratory Number	**Assigned CHEC ID** *e.g.* 01C-18-001	***S. Aureus* (MSSA) or MRSA** Blood isolate	**Date Specimen Obtained** dd-mmm-yyyy *e.g.* 17-Jan-2018	**Optional Notes from Submitting Lab** Indicate if the sample is not available, or provide any important information about the isolate	If this is a new infection in a patient previously identified with a MSSA (S. aureus) or MRSA BSI in the same calendar year, please enter the previous (original) unique patient ID

Please ensure this form is included in your shipment

APPENDIX 4
PATIENT QUESTIONNAIRE
MSSA (*S. aureus*) or MRSA BLOOD ISOLATE

INSTRUCTIONS

Please complete for all new MSSA and/or MRSA bloodstream infections

- Please see data dictionary for explanations and notes (Appendix 5)

Summary of Laboratory Requirements

- Please notify the hospital laboratory to retain one blood specimen per questionnaire (each new infection)
- Label the isolate MSSA or MRSA and if a new infection in a patient previously identified with a MSSA or MRSA BSI in the same calendar year, please enter the previous (original) unique patient ID at the end of the questionnaire
- Forward isolates (all year) to the NML using the standardized laboratory shipping form provided in Appendix 3

1. Is this bloodstream infection laboratory confirmed as

☐ MSSA (*S. aureus*)

☐ MRSA

2. CHEC Site # _____

3. Unique Identifier Code _____ 18 _____
(CHEC site #) (surveillance year) (case #)

4. Date of birth _____ /_____/_____
dd mmm yyyy

In the absence of the actual date, please indicate age in years, months or days

Age _____ ☐ years ☐ months ☐ days

5. Sex ☐ Male ☐ Female

6. Date of admission _____ /_____/_____
dd mmm yyyy

7. Date first positive blood culture was obtained _____ /_____/_____
dd mmm yyyy

8. What was the probable source/site of the bacteremia? *Check one response only*

☐ IV catheter-associated

☐ Primary bacteraemia, (source unknown/can't determine)

☐ Skin/soft tissue/burn wound ➔if yes, is it a case of Necrotizing fasciitis? ☐ Yes ☐ No

☐ Surgical site/wound infection

☐ Lower respiratory[5] ➔if yes, is it a case of Necrotizing pneumonia? ☐ Yes ☐ No

☐ Endocarditis

☐ Osteomyelitis, septic arthritis, septic bursitis

[5] Lower respiratory includes sputum, bronchial washes, ETT aspirates, pleural fluid or lung tissue or abscess and associated with pneumonia , lung abscess or empyema.

☐ Pneumonia ➔if yes, is it a case of Necrotizing pneumonia? ☐ Yes ☐ No

☐ Meningitis

☐ Urinary tract infection/urosepsis

☐ Other, *specify:* _____

9. Where was this **bacteremia** (infection) acquired? *Check one response only*

☐ Healthcare-associated (acquired in your acute-care facility) [6]

☐ Healthcare- associated (acquired in any other healthcare facility or setting)[7]

☐ Community- associated[8]

☐ Unknown

10a. Was this patient previously known to have MRSA?[9]

☐ No

☐ Yes – if yes go to 10b

10b. If yes was it[10]:

☐ Healthcare-associated (acquired in your facility)[6]

☐ Healthcare- associated (acquired from any other healthcare facility or exposure)[7]

☐ Community- associated[8]

☐ Unknown

11. At the time the positive bloodstream culture was obtained, was the patient:

In an ICU [11] <u>or</u> discharged from an ICU within 48 hours

AND

In (or had been in) the ICU for 48 hours or more?

☐ Yes

☐ No

12. Was the patient receiving haemodialysis at the time the positive blood culture was obtained?

☐ Yes

☐ No

[6] Patient is on or beyond calendar day 3 of their hospitalization (Calendar day 1 is the day of hospital admission) OR has been hospitalized in your facility in the last 7 days or up to 90 days depending on the source of infection (for example, a MSSA/MRSA bacteremia from a surgical wound that occurs 3 weeks after a surgical procedure completed in your facility should be considered HA-YAF (up to 90 days after procedure if implant). A MSSA/MRSA bacteremic pneumonia occurring >7 days after discharge from your facility should not be considered HA-YAF) OR has had a healthcare exposure at your facility that would have resulted in this bacteremia (using best clinical judgement).

[7] Any patient who has a bacteremia not acquired at your facility that is thought to be associated with any other healthcare exposure (e.g. another acute-care facility, long-term care, rehabilitation facility, clinic, ER visit or exposure to a medical device).

[8] No exposure to healthcare that would have resulted in this bacteremia (using best clinical judgement) and does not meet the criteria for a healthcare-associated BSI. For example, pediatric patients with clinic visits for otitis media, asthma, well-baby etc., may or may not be considered as HA while pediatric patients with clinic visits that involved invasive procedures or day surgery may be more likely to be considered HA. Adult patients attending dialysis, receiving chemotherapy, outpatient visits involving invasive procedures or day surgery may be more likely to be considered HA compared to adult patients with occasional outpatient or community health clinic visits.

[9] MRSA identified through screening on admission does not apply – the MRSA must have been identified through a clinical (wound, surgical site, respiratory, bone, blood etc.) specimen. Colonizations identified through clinical specimens are acceptable.

[10] Please use the first known instance of MRSA (infection or colonization) in this patient to determine where acquired. This will depend on how far your hospital is able to look back. E.g if MRSA colonization from a clinical specimen was first identified in 2015, then a respiratory MRSA infection in 2016 – use the MRSA colonization identified in 2015 to determine where-acquired.

[11] ICU includes mixed ICUs (any combination of patient types e.g., medical/surgical, medical/neuro/burns, surgical/trauma etc.), medical, surgical, PICU, NICU, cardiovascular surgery, coronary, neurosurgery, burn, or step-down unit.

13. Is the patient known to use or inject him/herself with IV drugs?

☐ Yes

☐ No

14. After the blood culture was obtained, but **BEFORE** the results were available, please indicate which antibiotics the patient received: *Check ALL that apply*

☐ Vancomycin

☐ Linezolid

☐ Daptomycin

☐ Clindamycin

☐ Trimethoprim-sulfamethoxazole

☐ Cloxacillin

☐ Cefazolin

☐ Ceftriaxone

☐ Other_____

☐ No Antibiotics

15. In the 24 hours following the day the MSSA or MRSA was identified/reported, please indicate which antibiotic(s) the patient had received: *Check ALL that apply*

☐ Vancomycin

☐ Linezolid

☐ Daptomycin

☐ Clindamycin

☐ Trimethoprim-sulfamethoxazole

☐ Cloxacillin

☐ Cefazolin

☐ Ceftriaxone

☐ Other_____

☐ No Antibiotics

16a Was the patient in ICU[12] when the positive blood cultures were obtained?

☐ No ➔Go to Q16b

☐ Yes ➔Go to Q17

16b. Was the patient admitted or transferred to an ICU[12] within 30 days after the first positive blood culture?

☐ Yes ➔ *indicate date of admission to the ICU* _____/_____/_____
dd mmm yyyy

☐ No

☐ Unknown

[12] ICU includes medical, surgical mixed ICUs (any combination of patient types e.g. surgical/ trauma, medical surgical etc), cardiovascular, coronary, neurosurgery, burn, or step-down unit.

17. Within the 30-days[13] following the first positive blood culture, did the patient have:

(a) Persistent bacteremia (*Blood cultures continue to be* MSSA *or MRSA positive for 7 or more days following the start of appropriate antibiotic therapy[14], without any interim negative blood cultures.*

☐ Yes

☐ No

☐ Unknown

OR

(b) Recurrent bacteremia (*Recurrence of bacteremia =* MSSA *or MRSA positive blood culture(s) 14 days or more after documented negative blood cultures)*

☐ Yes

☐ No

☐ Unknown

18a. Outcome at 30 days from the date of first positive blood culture?

☐ Patient still in hospital (awaiting LTC[15])

☐ Patient still in hospital (acute care)

☐ Patient discharged alive, NO readmission ➔ *indicate date of discharge* _____/_____/_____
dd mmm yyyy

☐ Patient discharged alive and readmitted ➔*Go to question 18b*

☐ Patient died ➔ *indicate date of death* _____/_____/_____
dd mmm yyyy

18b. If the patient was discharged and readmitted within 30 days following the first positive blood culture, was it because of a recurrent MSSA or MRSA BSI?

☐ No ➔ *go to question 19*

☐ Yes ➔ *indicate date of* **discharge** for previous admission _____/_____/_____ ➔*Go to question 18c*
dd mmm yyyy

18c. If recurrent MSSA or MRSA **BSI** was the cause of readmission *(Q18b = yes)*, indicate the site of positive culture for the recurrent infection.

☐ IV catheter-associated

☐ Primary bacteremia, (source unknown/can't determine)

☐ Surgical site / wound infection

☐ Skin / soft tissue / burn wound

☐ Lower Respiratory[16]

☐ IV catheter exit site

☐ Urine

☐ Other, *specify* _____

19. Is this a NEW infection in a patient previously identified with a MSSA or MRSA BSI in this surveillance year

☐ No ☐ Yes please enter the original/previous unique patient ID _____ 18 _____
(CHEC site #) (surveillance year) (case #)

[13] Do NOT include if >30 days.

[14] Appropriate antibiotics for the treatment of MRSA bacteremia include: vancomycin, daptomcyin, or linezolid

[15] LTC = Long term care.

[16] Lower respiratory includes sputum, bronchial washes, ETT aspirates, pleural fluid or lung tissue or abscess and associated with pneumonia, lung abscess or empyema.

(Appendix 5)
Data dictionary & notes for MSSA or MRSA BSI patient questionnaire

1. Is this bloodstream infection laboratory confirmed as MSSA (*S. aureus*) or MRSA

Please check only one response MSSA or MRSA

2. **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/CNISP member (e.g., 07, 15) and a letter assigned by the CHEC/CNISP 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).

3. Unique identifier code

This 8 character code should consist of the 3 character CHEC site # (e.g., 09A), the surveillance year the infection occurred in (e.g., 18), 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 09A-18-001. An example of the thirty-fifth case would be 09A-18-035, and so on.

Note: Always label the laboratory isolate with this unique ID number.

4. Date of Birth

Please enter Day (06), Month (May) and Year (1973) in this order. If the date of birth is not available please enter the patient's Age (in years, months or days) at the time of positive culture.

5. Sex

Check male or female sex as appropriate.

6. Date of admission

Please indicate the date when the patient was admitted to the hospital. Please enter Day (08), Month (May) and Year (1973) in this order.

7. Date first positive blood culture was obtained:

For the current admission, please indicate when the first <u>blood isolate</u> that tested positive was sampled. Please enter Day (08), Month (May) and Year (2018) in this order.

8. What was the probable source/site of the bacteremia?

What infection most likely gave rise to the MSSA or MRSA bacteremia? Choose from the list provided or specify if not included in the list. Please select only **ONE** response.

9. Where was this bacteremia (infection) acquired?

Please indicate whether the BSI was acquired in a healthcare setting or in the community according to the following definitions. If the site of acquisition cannot be determined, the site of acquisition may be reported as "Unknown". Check only ONE response

Healthcare-associated your acute-care facility (HA-YAF)

- Patient is on or beyond calendar day 3[17] of their hospitalization

OR

- Has been hospitalized in your facility in the last 7 days or up to 90 days[18] depending on the source of infection

OR

- Has had a healthcare exposure at your facility that would have resulted in this bacteremia (using best clinical judgement)

Newborn HA-YAF case definition for a MSSA or MRSA BSI

I. The newborn is on or beyond calendar day 3[19] of their hospitalization

II. The mother was **NOT** known to have MRSA on admission and there is no epidemiological reason to suspect that the mother was colonized prior to admission, even if the newborn is < 48 hours of age.

III. In the case of a newborn transferred from another institution, MSSA or MRSA BSI may be classified as HA-YAF if the organism was NOT known to be present and there is no epidemiological reason to suspect that acquisition occurred prior to transfer

Healthcare-associated any other healthcare exposure (HA-AOHE)

- Any patient who has a bacteremia not acquired at your facility that is thought to be associated with any other healthcare exposure (e.g. another acute-care facility, long-term care, rehabilitation facility, clinic, ER visit or exposure to a medical device).

Community-associated (CA):

- No exposure to healthcare that would have resulted in this bacteremia (using best clinical judgement[20]) and does not meet the criteria for healthcare-associated BSI

[17] Calendar day 1 is the day of hospital admission

[18] For example, a MSSA/MRSA bacteremia from a surgical wound that occurs 3 weeks after a surgical procedure completed in your facility should be considered HA-YAF (up to 90 days after procedure if implant). A MSSA/MRSA bacteremic pneumonia occurring >7 days after discharge from your facility should not be considered HA-YAF

[19] Calendar day 1 is the day of hospital admission.

[20] Consideration should be given to the frequency and nature of exposure to a medical device and/or procedure. For example, pediatric patients with clinic visits for otitis media, asthma, well-baby etc., may or may not be considered as HA while pediatric patients with clinic visits that involved invasive procedures or day surgery may be more likely to be considered HA. Adult patients attending dialysis, receiving chemotherapy, outpatient visits involving invasive procedures or day surgery may be more likely to be considered HA compared to adult patients with occasional outpatient or community health clinic visits.

10a Was this patient previously known to have MRSA?

Please indicate yes or no if this patient was previously known to have MRSA. However, MRSA identified through screening on admission does **NOT** apply. The MRSA must have been identified through a clinical (wound, surgical site, respiratory, bone, blood etc.) specimen. Colonizations identified through clinical specimens are acceptable. If the patient was previously known to have MRSA please answer Q10b.

10b If yes, was it…

Healthcare-associated (acquired in your facility), Healthcare- associated (acquired from any other healthcare facility or exposure), Community- associated or Unknown

Please select one response from the list and refer to the definitions outlined in question 9. Please use the first known instance of MRSA (infection or colonization) in this patient to determine where acquired. This will depend on how far your hospital is able to look back. For example if a MRSA colonization from a clinical specimen was first identified in 2015, then a respiratory MRSA infection in 2016 – use the MRSA colonization identified in 2015 to determine where-acquired.

11. At the time the positive bloodstream culture was obtained, was the patient:

Please indicate if at the time the blood specimen that tested positive for MSSA or MRSA was obtained, the patient was in an ICU* or discharged from an ICU within 48 hours AND in (or had been in) the ICU for 48 hours or more.

The purpose of this question is to identify bloodstream infections attributable to the ICU.

**Intensive care unit (ICU) includes mixed ICUs (any combination of patient types e.g., medical/surgical, medical/neuro/burns, surgical/trauma etc.), medical, surgical, PICU, NICU, cardiovascular surgery, coronary, neurosurgery, burn, or step-down unit.*

12. Was the patient receiving haemodialysis at the time the positive blood culture was obtained?

Check the "Yes" box only if the patient was receiving haemodialysis.

13. Is the patient known to use or inject him/herself with IV drugs?

Is the patient a KNOWN drug user?

14. After the blood culture was obtained, but BEFORE the results were available, please indicate which antibiotics the patient received

During the time between blood sampling and results of the laboratory test, if the patient was administered antibiotics please select the antibiotic(s) from the list. If the patient was not administered antibiotics during this time, please select the 'No Antibiotics' response.

15. In the 24 hours following the day the MSSA or MRSA was identified/reported, please indicate which antibiotics the patient had received

Twenty-four (24) hours following the diagnosis of MSSA or MRSA bacteraemia, if the patient was administered antibiotics please select the antibiotic(s) from the list. If the patient was not administered antibiotics during this time, please select the 'No Antibiotics' response.

16a. Please indicate if the patient was already in an ICU* when the positive blood cultures for MRSA were obtained by checking either "Yes", or "No".

16b. If answered "No" to Q16a, please indicate if the patient was admitted to the ICU* from a non-ICU ward within 30 days of the date of positive culture.

*Intensive care unit (ICU) includes: medical, surgical combined medical-surgical, cardiovascular, coronary, neurosurgery, burn or step-down unit.

17. Within the 30-days following the first MSSA or MRSA positive blood culture, did the patient have:

Please indicate "Yes", "No" or "Unknown" for the following**:**

a. Persistent bacteremia. Persistent bacteremia means that the blood cultures continue to be positive with MSSA or MRSA for 7 or more days following the start of appropriate antibiotic therapy, without any interim negative blood cultures. (Appropriate antibiotics for the treatment of MRSA bacteremia include: vancomycin, daptomcyin, or linezolid).

b. Recurrent bacteremia. MSSA or MRSA positive blood culture(s) for 14 days after documented negative blood cultures.

If the 'persistent' or recurrent bacteremia occurs > 30 days after the first MSSA or MRSA blood culture, do **NOT** include.

18a. Outcome at 30 days from the date of first positive blood culture

Thirty days after the date of first positive blood culture, please select one of the options available. Please indicate the date if the patient was discharged and *not* readmitted or if the patient died.

18b. If the patient was discharged and readmitted within the 30 days following the first positive blood culture, was it because of a recurrent MSSA or MRSA infection?

Please indicate "Yes" or "No". If yes, please indicate the date of discharge for the previous admission and continue to question 18c. If no, skip question 18c and go to question 19.

18c. If recurrent MRSA infection was the cause of readmission (Q18b = yes), indicate the site of positive culture for the recurrent infection

Please indicate the anatomic site from which the positive culture for this recurrent MRSA infection was isolated.

19. Is this a NEW infection in a patient previously identified with a MSSA or MRSA BSI in this surveillance year?

Please indicate whether this is a new infection in a patient previously identified with a MSSA or MRSA BSI in this surveillance year by checking yes or no.

If yes, please enter the original/previous unique ID that was assigned to the previous/original infection

Appendix 6
Protocol Revision History

October 30, 2014
Changes made to homogenize CNISP protocol formatting.

November 12, 2014
'Unique identifier code 'edited in the data dictionaries.

December 30 2014
2015 MRSA protocol
Q14 revised to better identify whether patient was in ICU at time of positive MRSA culture or if not then was the patient transferred into an ICU within 30 days of the positive culture.
14a. Was the patient in ICU when the positive blood cultures for MRSA were obtained?
14b. Was the patient admitted or transferred to an ICU[21] within 30 days after the first positive blood culture?

November 2, 2015
2016 MRSA protocol
The reporting of MRSA colonizations (clinical and screening) to CNISP has been stopped. CNISP hospitals no longer will submit any colonization (clinical and screening) data to CNISP. All sections of the 2015 MRSA surveillance protocol relating to colonization (screening and clinical) data have been removed.

Objectives clarified
Case definition – admission to hospital and exclusion criteria clarified.

Examples of application of HA & CA definitions for clinical isolates clarified.

Clinical questionnaire
Q8 – Responses
Sputum/lower respiratory changed to lower respiratory
Bone/osteomyelitis response added
Joint/septic arthritis response added
Q9 clarified
Q10 Outcome responses revised to:
Patient still in hospital (awaiting LTC)
Patient still in hospital (acute care)
Patient discharged alive, indicate date of discharge
Patient died, indicate date of death
Unknown

[21] ICU includes medical, surgical combined medical-surgical, cardiovascular, coronary, neurosurgery, burn, or step-down unit.

Blood questionnaire
Q7 – Responses
Sputum/lower respiratory changed to lower respiratory
Q15
Clarified that if persistent or recurrent bacteremia is identified >30 days after first positive blood culture do NOT include
Q16a Outcome responses revised to:
Patient still in hospital (awaiting LTC)
Patient still in hospital (acute care)
Patient discharged alive, indicate date of discharge
Patient died, indicate date of death
Unknown
Q17a, 17b and 17c removed as data no longer relevant to surveillance

MDS questionnaire
Q8 – Responses
Sputum/lower respiratory changed to lower respiratory
Bone/osteomyelitis response added
Joint/septic arthritis response added

Q10 Outcome responses revised to:
Patient still in hospital (awaiting LTC)
Patient still in hospital (acute care)
Patient discharged alive, indicate date of discharge
Patient died, indicate date of death
Unknown

November 7, 2016
Case definition clarified.
The following added to inclusion criteria

- MRSA infection identified at a new site/source in a patient identified with a MRSA infection in a previous surveillance (calendar) year

The following added to exclusion criteria

- Infections re-admitted with MRSA (unless it is a different strain or a new/different site of MRSA infection).

December 18, 2017
Collection of MRSA clinical infections stopped and only data on bacteremias will be collected. A review of the data indicated MRSA clinical infections have remained relatively constant in relation to the proportion of those that are SKST, respiratory, SSI etc. In addition, MRSA BSI molecular data mirror that seen in clinical specimens. As a result, it was decided to collect only data on **ALL NEW** MRSA BSIs and add the collection of **ALL NEW** MSSA (S. aureus) BSIs. Please see surveillance definitions for HA, HA-YAF and CA .

January 18, 2018

Healthcare-associated and community-associated definitions updated.

Previously read as 'Adult patients attending dialysis, receiving chemotherapy, outpatient visits involving invasive procedures or day surgery may be more likely to be considered HA compared to adult patients with occasional outpatient or community health clinic visits.

Now reads 'Any patient who has a bacteremia not acquired at your facility that is thought to be associated with any other healthcare exposure (e.g. another acute-care facility, long term care, rehabilitation facility, clinic, ER visit or exposure to a medical device).'

This would capture those patients whose only healthcare exposure was a previous admission at your hospital or another hospital greater than 90 days before their current admission – using your best clinical judgement this patient's MRSA or MSSA BSI may be considered as CA or HA-AOHE

Q10b clarified – If the patient was previously known to have MRSA – where was it acquired (e.g., HA-YAF, HA-AOHE, CA)? Please use the first known instance of MRSA (infection or colonization) in this patient to determine where acquired. This will depend on how far your hospital is able to look back. For example if a MRSA colonization from a clinical specimen was first identified in 2015, then a respiratory MRSA infection in 2016 – use the MRSA colonization identified in 2015 to determine where-acquired.

January 29, 2018
Healthcare-associated and community-associated definitions revised due to feedback

HA-YAF
Have added 'Has had a healthcare exposure at your facility that would have resulted in this bacteremia (using best clinical judgement)'
This is intended to capture those patients who in the clinician's best judgement could only have contracted the MSSA/MRSA at their hospital even though may have been admitted <3 calendar days or had been hospitalized in your facility >90 days ago (depending on the source of infection)

HA-OHE
Reworded to try and ensure that this MSSA/MRSA BSI is NOT attributed to your facility

CA
Reworded to allow discretion by the clinician who in using their best judgement attributes this MSSA/MRSA BSI to the community