Canadian Nosocomial Infection Surveillance Program

2019 Antimicrobial Utilization Protocol
(Collects 2018 AMU data)

Data collection period = January 1st, 2018 to December 31st, 2018

Please send data by email to phac.cnisp-pcsin.aspc@canada.ca

Direct questions to:

CNISP generic email account**:** phac.cnisp-pcsin.aspc@canada.ca

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BACKGROUND

There is a well-documented association between antimicrobial (or antibiotic) use and the emergence of antimicrobial resistant pathogens (AMR) (Canton R 2011). Antimicrobial stewardship, which includes the appropriate selection, dosing, route, and duration of antimicrobial therapy, is an important component of infection control and patient safety. Effective antimicrobial stewardship and comprehensive infection prevention and control programs have been shown to limit the emergence and transmission of AMR including, but not limited to, Methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin-resistant Enterococcus (VRE) and Carbapenem-resistant Gram-negative organisms (Lawes T 2016, Molina 2017).

Information on antimicrobial usage (AMU) in Canadian hospitals is limited. Currently, the only data that roughly capture the quantity of antimicrobials used in the hospital sector are the data collected in the Canadian Drug Store and Hospital Purchases (CDH) Dataset. These data are obtained from the manufacturer or wholesale warehouses that distribute the antimicrobials purchased by the hospital sector, which includes acute care, long term care, government redistribution centers and government facilities. There are several limitations to the CDH dataset and interpretation of the data is quite difficult. Subsequently, the CDH data provides limited insight into the AMU and AMR situation in Canada

To address this knowledge gap, the Canadian Nosocomial Infection Surveillance Program (CNISP) antimicrobial usage study collects AMU data from participating sentinel sites. Since CNISP collects AMU data directly from CNISP hospital pharmacies, CNISP AMU data is more robust than other sources of AMU information representing consumption in acute care hospitals. These data are analyzed using Defined Daily Doses (DDDs) or days-of-therapy (DOTs) for pediatrics as per the World Health Organization's guidelines, allowing for comparisons within Canada and internationally.

Since CNISP collects data on both AMU and AMR, by linking the AMU and AMR data, CNISP will be able to estimate the magnitude and impact of AMU and AMR in tertiary acute care hospitals in Canada. CNISP uses these data to monitor trends and provide valuable information to health care providers and policy makers to aid in the control of AMR and the promotion of appropriate antimicrobial use.

OBJECTIVES

1. Estimate national and regional antimicrobial utilization (AMU) and provide benchmarks based on data received through participating CNISP hospitals.
2. Estimate rates of antimicrobial utilization by specific ward-type (including ICU and non-ICU wards; medical, surgical, combined, ICU and other ward types)
3. Evaluate trends and patterns of AMR across Canada and identify whether a correlation between CNISP AMU data and CNISP AMR data can be established.

METHODOLOGY

A. Surveillance design

AMU surveillance is ongoing and optional for hospitals participating in CNISP.

CNISP collects annual AMU data for all inpatients at participating hospitals. The AMU data may be separated by individual hospital ward or by groups of wards. For each hospital ward or group of wards that are used to submit AMU data to CNISP, participating hospitals must also provide an associated patient-day denominator for that ward or group of wards.

CNISP collects information on antibiotic use among acute adult and pediatric inpatients. This surveillance includes the following antimicrobials:

- All systemic antibacterials (all 'J01' ATC codes)
- Metronidazole oral ('P01AB01' ATC code)
- Vancomycin oral ('A07AA10' ATC code)

A full list of the included ATC codes is found in **Appendix 1**.

Surveillance period

The 2019 surveillance period includes antibiotic usage and patient days from January 1st, 2018 to December 31, 2018.

B. Mandatory and Requested Data Elements

Please see **Table 1** for a description of the mandatory and requested data elements. The mandatory data elements include:

1) **Inpatient antimicrobial usage**, separated by adult and pediatric populations, by parenteral and oral administration routes, and by ICU vs non-ICU wards. Please note that

   a. ER patients that are admitted as inpatients are to be included in the 'other' or 'Non-ICU' category (depending on your data submission format) for both the AMU and patient days data.

   b. Units/wards designated as Long-term Care (LTC) units should not be included in the AMU or patient days data.

2) **Patient-day denominators** for all ward/ward groups used for submitting the above AMU data

To meet the objectives of the study, AMU data separated by specific ward-type (see **Table 1** for list of mandatory and requested data elements) and the associated patient-day data are requested.

There are a variety of formats that sites may use to submit their data. See **Appendix 3** for examples of submission templates. If another submission format is easier for your hospital site, please contact CNISP (phac.cnisp-pcsin.aspc@canada.ca) to confirm that the format contains the necessary data elements.

For sites that submit ward-level information, please provide us with a data dictionary for your wards so that we can identify the type of ward (for example, indicating whether 6E is a medical or surgical ward). This data dictionary may be included as a variable in the dataset (preferred) or may be provided as a separate document.

C. Data Collection and submission

All data will be submitted to CNISP by email. Excel format is preferred. AMU and patient-day data for January 1, 2018 to December 31, 2018 are to be submitted to CNISP by June 30, 2019 using the CNISP generic email account (phac.cnisp-pcsin.aspc@canada.ca).

Table 1: Mandatory and requested data elements for adult and/or pediatric inpatient populations

	Variable	Adults	Pediatrics	Description of variable	Notes
Antimicrobial usage	**Drug name**	MANDATORY	MANDATORY	Generic drug name for drugs meeting **inclusion criteria:** - All systemic antibacterials (all 'J01' ATC codes excl. inhaled powders/solutions) OR - Metronidazole oral ('P01AB01' ATC code) OR Vancomycin oral ('A07AA10' ATC code)	
	ATC code	REQUESTED	REQUESTED	ATC code	
	Dose form or route	MANDATORY	MANDATORY	Identify dose form or route: *Parenteral, or oral*	
	Defined Daily Doses (DDDs) OR **Quantity of antimicrobial used**	MANDATORY		**Defined Daily Doses (DDDs):** • The assumed average maintenance dose per day for a drug used for its main indication in adults" as specified by the WHO[1] **Quantity of antimicrobial used:** Weight of drug used (grams, mgs, or million units)	• If providing DDDs, please use **Appendix 1** for consistency. • If providing DDDs is not feasible, strength and quantity information can be provided instead (eg. Provide quantity of antimicrobial used).
	Unit of measure	MANDATORY		Unit used for antimicrobial usage measure (*DDDs, grams, milligrams, or million units*)	If number of 'tablets' is provided, include dosage information.
	Days of Therapy (DOTs)	REQUESTED	MANDATORY	The duration of antimicrobial usage. The number of days that a patient receives an antimicrobial agent (regardless of dose). Any antibiotic dose that is received during a 24-hour period represents 1 DOT. The DOT for a given patient on multiple antibiotics will be the sum of DOT for each antibiotic that the patient is receiving.	
	Length of Therapy (LOTs)		REQUESTED	The number of days that a patient receives systemic antimicrobial agents, irrespective of the number of different drugs.	- LOT will be lower than or equal to DOT because each antibiotic received is its own DOT.
	Antimicrobial Free-Days		REQUESTED	The number of days that antimicrobial agents were NOT received during a given period on a given hospital unit.	- AFD is calculated irrespective of the number of antimicrobial agents received.
Population	**Age group**	MANDETORY	MANDETORY	*Adult or Pediatric* • Where possible to separate individual patients by age, adults are defined as patients ≥18 yrs of age and pediatric patients are those < 18 yrs of age. • Where not possible to separate individual patients by age, wards may be separated based on the age group of the majority of patients.	
Ward information	**ICU vs Non-ICU**	MANDATORY	MANDATORY	Identify ward type: *Non-ICU, ICU, CCU, PICU, or NICU* ICU includes stand-alone medical, surgical or any ICUs with a combination of patient types e.g. med/surg; trauma/surgical; neuro, surgical, trauma, burn etc.	- Please provide data for CCU separately from ICU data. - Ward categories must be mutually exclusive.
	Ward type[2]	REQUESTED	REQUESTED	Identify ward type where available and applicable for your institution: • *Medical ward* (excluding obstetrics/psychiatry) • *Surgical ward* • *Combined (medical/surgical) ward* • *Hematology-Oncology Unit** • *Transplant Unit* (if possible separate bone marrow transplant and solid organ transplant units)* • *Burn Unit** • *ICU, NICU, PICU,* or *CCU* • *Other* [2] - Obstetrics - Psychiatry and mental health units - Emergency (if inpatient/i.e., admitted) - Other not listed above	**- Ward categories must be mutually exclusive.** *If not possible to separate antimicrobial usage and/or patient denominator data for the Hematology-Oncology Unit, Transplant Unit, or Burn Unit at your site, please include these units under the appropriate medical, surgical, or combined category.
	Patient-Days	MANDATORY	MANDATORY	Sites will provide patient days for January 1, 2018 to December 31, 2018 separated into adult and pediatric, and ward-type specific patient-days.	For each ward type the site is able to calculate antimicrobial usage, a ward type denominator must be provided

[1] Source: PHO ASP Metrics Examples

[2] Please note that 1. ER patients that are admitted as inpatients are to be included in the 'other' or 'Non-ICU' category depending on your data submission for both the AMU and patient days. 2. Units/wards designated as Long-term Care (LTC) units should not be included in the AMU or patient days.

DATA ANALYSIS

PHAC will be responsible for converting data files into a common platform and merging files for analysis. Individual site-specific as well as ICU vs non-ICU, oral vs. parental, regional and national adult rates will be calculated and standardized by 1000 patient days.

If sites have not submitted DDDs, PHAC will convert quantities to WHO DDDs (see Table 2). The following drugs are special cases:

- For benzylpenicillin (J01ECE01), also known as penicillin G, and benzathine benzylpenicillin (J01CE08), data received in million units (MU) will be converted to grams (where 0.6 g = 1 MU), which can then be converted to DDDs using WHO values.
- Methenamine (J01XX05) is further divided into mandelate and hippurate, which have different DDDs: 3 g per DDD and 2 g per DDD, respectively.
- Erythromycin (J01FA01) can also be categorized as either erythromycin and erythromycin ethylsuccinate, both of which have different DDDs: 1 g per DDD and 2 g per DDD, respectively.

Data analysis for pediatric patients will be addressed differently as the dose given to pediatrics is adjusted by weight and there is no single DDD; thus, WHO suggests DOT as the appropriate measure to monitor trends of antimicrobials in children. The rates will be adjusted by the number of patient days in pediatrics sites.

ETHICS

While this surveillance project does not involve any alteration in patient care, ethics approval may be sought at some hospital sites. There are no patient identifiers in this data and data is aggregated with the lowest level of aggregation being at the hospital ward. All data submitted to PHAC is kept strictly confidential.

Attached Appendices:

Appendix 1 Example templates for submitting total antimicrobial usage

Appendix 2 ATC codes and DDDs for all systemic antibacterials by WHO

APPENDIX 1: EXAMPLE TEMPLATES FOR SUBMITTING TOTAL ANTIBACTERIAL USAGE

Sites may submit data in a variety of formats. Some examples of possible submission formats are below. It is preferred that sites submit data in similar formats each year.

Table 2: Example submission format for adult data – hospital calculating DDDs

Ward type	Drug Name	Route	DDD	DOT (optional)	Patient-days for the ward-type
Medical	Ciprofloxacin	P	165		1992
Medical	Ciprofloxacin	O	117		1992
Surgical	Ciprofloxacin	P	195		3941
Surgical	Ciprofloxacin	O	54		3941
ICU	Ciprofloxacin	O	175		545
CCU	Ciprofloxacin	O	175		345
Combined (Medical/Surgical)	Ciprofloxacin	O	180		654
Other - BMT	Ciprofloxacin	O	123		212
Other - Psychiatry	Ciprofloxacin	O	12		697

Table 3: Example submission format for adult data – hospital providing quantity and units

Ward type	Drug Name	Route	Quantity	Units	DOT (optional)	Patient-days for the ward-type
Medical	Amoxicillin	P	455	Gr		1992
Medical	Amoxicillin	O	375	Gr		1992
Surgical	Amoxicillin	P	295	Gr		3941
ICU	Amoxicillin	O	155	Gr		545
CCU	Amoxicillin	O	17500	Mg		345
Combined (Medical/Surgical)	Amoxicillin	O	180	Gr		654
Other - BMT	Amoxicillin	O	123	Gr		212

Table 4: Example submission format for pediatric data – hospital providing DOTS

Ward type	Drug Name	Route	DDD (optional)	DOT	Patient-days for the ward-type
Medical	Pip-tazo	P		512	1605
Medical	Pip-tazo	O		125	1605
Surgical	Pip-tazo	P		454	3941
Other - Transplant	Pip-tazo	O		545	345
PICU	Pip-tazo	O		455	654
NICU	Pip-tazo	O		212	212
Other - Psychiatry	Pip-tazo	O		24	343

APPENDIX 2: ATC CODES AND DDDS FOR ALL SYSTEMIC ANTIBACTERIALS BY WHO

Table 5: WHO DDD values

WHO Name	ATC code	Route	WHO DDD	WHO DDD Unit
Vancomycin	A07AA09	O	2	g
Demeclocycline	J01AA01	O	0.6	g
Doxycycline	J01AA02	O	0.1	g
Doxycycline	J01AA02	P	0.1	g
Tetracycline	J01AA07	O	1	g
Tetracycline	J01AA07	P	1	g
Minocycline	J01AA08	O	0.2	g
Minocycline	J01AA08	P	0.2	g
Tigecycline	J01AA12	P	0.1	g
Chloramphenicol	J01BA01	O	3	g
Chloramphenicol	J01BA01	P	3	g
Ampicillin	J01CA01	O	2	g
Ampicillin	J01CA01	P	2	g
Ampicillin	J01CA01	R	2	g
Amoxicillin	J01CA04	O	1	g
Amoxicillin	J01CA04	P	1	g
Piperacillin	J01CA12	P	14	g
Ticarcillin	J01CA13	P	15	g
Benzylpenicillin (Penicillin G Sodium)	J01CE01	P	3.6	g
Phenoxymethylpenicillin (Penicillin V Potassium)	J01CE02	O	2	g
Penicillin Benzathine	J01CE08	P	3.6	g
Penicillin, Combination with other Antibacterials	J01CE30	N/A	N/A	N/A
Cloxacillin	J01CF02	O	2	g
Cloxacillin	J01CF02	P	2	g
Amoxicillin/ K Clavulanate (Clavulin)	J01CR02	O	1	g
Amoxicillin/ K Clavulanate (Clavulin)	J01CR02	P	3	g
Ticarcillin/ K Clavulanate (Timentin)	J01CR03	P	15	g
Piperacillin/ Tazobactam (Tazocin)	J01CR05	P	14	g
Cefalexin	J01DB01	O	2	g
Cefazolin	J01DB04	P	3	g
Cefadroxil	J01DB05	O	2	g
Cefoxitin	J01DC01	P	6	g
Cefuroxime	J01DC02	O	0.5	g
Cefuroxime	J01DC02	P	3	g
Cefaclor	J01DC04	O	1	g
Cefotetan	J01DC05	P	4	g

WHO Name	ATC code	Route	WHO DDD	WHO DDD Unit
Cefprozil	J01DC10	O	1	g
Cefotaxime	J01DD01	P	4	g
Ceftazidime	J01DD02	P	4	g
Ceftriaxone	J01DD04	P	2	g
Cefixime	J01DD08	O	0.4	g
Cefepime	J01DE01	P	2	g
Ceftobiprole medocaril	J01DI01	P	1.5	g
Aztreonam	J01DF01	P	4	g
Meropenem	J01DH02	P	2	g
Ertapenem	J01DH03	P	1	g
Doripenem	J01DH04	P	1.5	g
Imipenem	J01DH51	P	2	g
Trimethoprim	J01EA01	O	0.4	g
Trimethoprim	J01EA01	P	0.4	g
Sulfadiazine	J01EC02	O	0.6	g
Trimethoprim/ Sulfamethoxazole (Co-trimoxazole)	J01EE01	P	1.92	g
Trimethoprim/ Sulfamethoxazole (Co-trimoxazole)	J01EE01	O	1.92	g
Erythromycin	J01FA01	O	1	g
Erythromycin ethylsuccinate tablets	J01FA01	O	2	g
Erythromycin	J01FA01	P	1	g
Clarithromycin	J01FA09	O	0.5	g
Clarithromycin	J01FA09	P	1	g
Azithromycin	J01FA10	O	0.3	g
Azithromycin	J01FA10	P	0.5	g
Clindamycin	J01FF01	O	1.2	g
Clindamycin	J01FF01	P	1.8	g
Lincomycin	J01FF02	O	1.6	g
Lincomycin	J01FF02	P	1.6	g
Quinupristin/ Dalfopristin (Synercid)	J01FG02	P	1.5	g
Streptomycin	J01GA01	P	1	g
Tobramycin	J01GB01	P	0.24	g
Gentamicin	J01GB03	P	0.24	g
Neomycin	J01GB05	O	1	g
Amikacin	J01GB06	P	1	g
Ofloxacin	J01MA01	O	0.4	g
Ofloxacin	J01MA01	P	0.4	g
Ciprofloxacin	J01MA02	O	1	g
Ciprofloxacin	J01MA02	P	0.5	g
Norfloxacin	J01MA06	O	0.8	g

WHO Name	ATC code	Route	WHO DDD	WHO DDD Unit
Levofloxacin	J01MA12	O	0.5	g
Levofloxacin	J01MA12	P	0.5	g
Moxifloxacin	J01MA14	O	0.4	g
Moxifloxacin	J01MA14	P	0.4	g
Vancomycin	J01XA01	P	2	g
Colistin	J01XB01	P	3	MU
Fusidic acid	J01XC01	O	1.5	g
Fusidic acid	J01XC01	P	1.5	g
Metronidazole	J01XD01	P	1.5	g
Nitrofurantoin	J01XE01	O	0.2	g
Fosfomycin	J01XX01	O	3	g
Fosfomycin	J01XX01	P	8	g
Methenamine mandelate	J01XX05	O	3	g
Methenamine hippurate	J01XX05	O	2	g
Linezolid	J01XX08	O	1.2	g
Linezolid	J01XX08	P	1.2	g
Daptomycin	J01XX09	P	0.28	g
Metronidazole	P01AB01	O	2	g
Metronidazole	P01AB01	R	2	g

Table 3: List of acronyms

Acronym	Definition
O	Oral
P	Parenteral
R	Rectal

References

Canton R, Morosini MI. Emergence and spread of antibiotic resistance following exposure to antibiotics. FEMS Microbiol Rev 2011;35:977-991.

Lawes T, et al. Effects of national antibiotic stewardship and infection control strategies on hospital-associated and community-associated meticillin-resistant Staphylococcus aureus infections across Scotland: a non-linear time-series study. Lancet Infect Dis 2015;15(12):1438-49.

Molina J, et al. Long-Term Impact of an Educational Antimicrobial Stewardship Program on Hospital-Acquired Candidemia and Multidrug-Resistant Bloodstream Infections: A Quasi-Experimental Study of Interrupted Time-Series Analysis. Clin Infect Dis 2017;(Epub)

Revision History

May 2018

1. Will only accept AMU data as dispensed or administered (not purchased) – have removed this as an option from Appendix 3 – pt-days submission form (p. 11) and clarified it in the numerator data (p. 3)
1. Have asked that CCU data be separated (as an optional variable) (p.4, Appendices 2 & 3)
2. Have asked that type of ICU(s) be specified (if possible) (p.4, Appendices 2 & 3)
3. For co-trimoxazole (J01EE01) WHO does provide the DDD – so have removed this comment (p.4)
4. Have corrected the WHO DDD unit for Trimethoprim/ Sulfamethoxazole (Co-trimoxazole) (parenteral & oral) (p. 7)
5. As the inclusion criteria specified the collection of only systemic antibacterials (J01) the following inhaled powders and solutions have been removed from both the protocol and the data collection form (excel) and the data are no longer required to be submitted

Aztreonam	J01DF01	Inhaled solution
Tobramycin	J01GB01	Inhaled solution
Tobramycin	J01GB01	Inhaled powder
Colistin	J01XB01	Inhaled solution

October 2018

1. Added hem/onc, transplant, bone marrow transplant, solid organ transplant separations to the other category.
2. Clarified age break point for adults/peds
3. Created table of requested and mandatory variables.

December 2018

1. Added references
2. Removed Appendix 3 and created new example templates