Public Health Ontario | Santé publique Ontario

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TECHNICAL NOTES

Ontario Antibiogram

Background

Antibiograms are a summary of the cumulative susceptibility of bacterial isolates to specific antibiotics in a given hospital or region. Antibiograms are an antimicrobial stewardship strategy used to guide choice of empiric therapy and track resistance patterns.

Aggregate, cumulative susceptibility data at a regional level is required for improved surveillance of antimicrobial resistance and is necessary to support the development of regional empiric antibiotic prescribing guidelines, particularly for smaller facilities with low numbers of isolates. In Ontario, antimicrobial susceptibility data from hospitalized patients is currently housed at several laboratories across the province, with no centrally accessible repository of data. Antibiogram data is available from the private laboratory, LifeLabs, for outpatients and long-term care (LTC) residents stratified by Local Health Integration Network (LHIN), but has previously been lacking for hospitals.

The Ontario Antibiogram consists of the Ontario Hospital Antibiogram and the Ontario Urinary Antibiogram. The **Ontario Hospital Antibiogram** provides provincial and regional (i.e., by LHIN) cumulative antimicrobial susceptibility data for a range of organisms for all clinical specimen types in the hospital setting. The **Ontario Urinary Antibiogram** provides provincial and regional (i.e., by LHIN) susceptibility data for urinary specimens by setting (hospital, LTC, and outpatient) and age group.

Data Source

Ontario Hospital Antibiogram

The Public Health Ontario (PHO) Antimicrobial Stewardship Program (ASP) Landscape Survey is a voluntary online survey of ASPs in acute care, inpatient rehabilitation, oncology and complex continuing care facilities in Ontario. Initially launched in 2016, the survey aims to understand how hospital ASPs are evolving over time. In 2018, the landscape survey requested antibiogram and antibiotic use data in addition to information about ASP structural and strategic elements.

In 2018, survey respondents were asked to upload the most recent hospital antibiogram developed in their institution from 2013 and onward. The Ontario Hospital Antibiogram represents about 65% of inpatient beds in the province. An antibiogram was requested for each hospital site within multi-site corporations. Respondents were asked to seek input from their microbiologist to help respond to antibiogram related questions.

Ontario Urinary Antibiogram

The Ontario Laboratory Information System (OLIS) provides hospital inpatient, LTC, and outpatient laboratory urine culture results for over 95% of clinical microbiology laboratories in Ontario.

Data Limitations

Due to variations in antibiogram formatting and laboratory reporting practices, there is heterogeneity in the data PHO and OLIS receive from hospitals and laboratories. In the **Ontario Hospital Antibiogram** for example, patient population, levels of stratification and specimen types incorporated in the antibiograms varied between sites. In the **Ontario Urinary Antibiogram**, data is limited by laboratory testing policies and coding practices.

Please note that all information is provided on an "as-is" basis. PHO cannot and does not warrant or represent that the information is accurate, complete, reliable or current.

For specific questions about specific local susceptibility data, consult your microbiology laboratory.

Missing Data

The **Ontario Hospital Antibiogram** only contains information about hospitals/corporations that voluntarily responded to the 2018 Ontario ASP Landscape Survey and provided antibiogram data. Any hospitals/corporations that would like to participate can contact asp@oahpp.ca.

In the **Ontario Urinary Antibiogram**, susceptibility results are limited by what laboratories report to clinicians, so suppressed results that were not reported are not available; however, when susceptibility results were missing, rule-based imputation (i.e., intrinsic resistance and cross-resistance between classes) and model-based imputation (i.e., logistic regression based on non-missing data from the cohort including age, sex, setting, region, organism, and susceptibility results for other antibiotics) was used to extrapolate to missing results.

General Notes

Ontario Hospital Antibiogram

Isolate Counts

Only hospital antibiograms with reported isolate numbers were included in the Ontario Hospital Antibiogram. Isolate numbers were captured to ensure weighted susceptibility across regions and the province. Only organisms with 30 or more total isolates in Ontario are reported in the provincial antibiogram.

Time Range

Only antibiograms developed in 2014 or later were included in the Ontario Hospital Antibiogram. Where multiple antibiograms were provided for a specific hospital site, only the most recent antibiogram was included.

Patient Population

Hospital-wide inpatient antibiograms were incorporated into the Ontario Hospital Antibiogram; however, hospitals combining inpatient and outpatient specimens were included if they could not be stratified further. Two northern hospitals that provide laboratory services for a large number of outpatient clinics were included; however, isolate numbers were adjusted to reflect an estimate of the proportion of inpatient specimens.

Susceptibility

Susceptibility ranges from 0-100% and is colour coded in the antibiogram (Red for 0-69%, Yellow for 70-79%, Green for 80% or greater). Infrequently, hospitals reported susceptibility as >95%. In these cases, susceptibility was assumed to be 96%. Blank spaces in the antibiogram indicate either insufficient data (e.g., < 30 isolates in the province, no data available), intrinsic resistance, or organisms with potential inducible AmpC β-lactamases (i.e., Enterobacter, Morganella, Citrobacter, Serratia, Providencia species) along with third generation cephalosporins or piperacillin-tazobactam.

Specimen Type

Antibiograms representative of all clinical specimen types combined were included in the antibiogram. In situations where this data was unavailable, urine and non-urine or blood and non-blood specimens were used.

Organisms

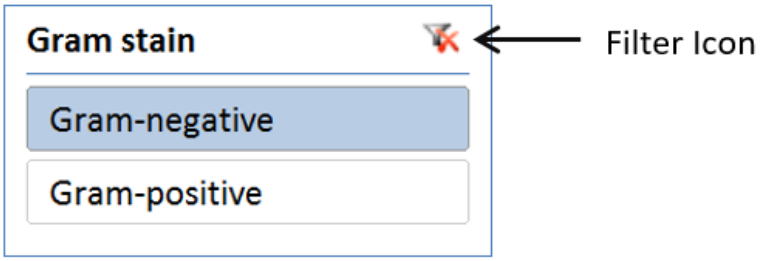
Different phenotypes of bacterial species were combined wherever possible (e.g., *S. aureus* includes MSSA and MRSA); however, due to variations in susceptibility reporting practices based on phenotype, *E. coli* was separated into three categories (all isolates, non-ESBL, ESBL). Note that all categories are mutually exclusive. Coagulase negative Staphylococcus species were grouped together, with the exception of *S. lugdunensis*.

Inferred Susceptibility

1. Cloxacillin was used for nafcillin or oxacilllin.
2. Ampicillin/Amoxicillin susceptibility was combined.
3. Ceftriaxone was used for cefotaxime.
4. Cefazolin was used for first generation cephalosporin. Cephalexin is a separate column, as cefazolin cannot infer susceptibility for cephalexin, with the exception of urinary isolates.

Navigating the Antibiogram

Antibiogram data can be stratified by either gram-negative, gram positive or combined, as well as by specific LHIN. The slicer will highlight the selected data as blue. Click on the filter icon to clear the stratification and show all data.



Ontario Urinary Antibiogram

Isolate Counts

Only organisms with six or more urine culture isolates were included in the antibiogram. Organisms with less than 30 isolates should be interpreted with caution, as there may be imprecision in the estimated susceptibility.

Time Range

Laboratory test results between January 1, 2016 and December 31, 2017 were included.

Patient Population

Urine culture data were obtained from linked Ontario-wide administrative datasets housed at ICES (formerly known as the Institute for Clinical Evaluative Sciences). ICES is an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement. Urine culture and susceptibility data were obtained from Ontario Laboratory Information System (OLIS), with over 95% of laboratories reporting their data to OLIS. Demographics data were collected from the Registered Persons Database (RPDB), CIHI Discharge Abstract Database (DAD), and Continuing Care Reporting System – Long-Term Care (CCRS-LTC). These datasets were linked using unique encoded identifiers and analyzed at ICES.

Susceptibility

Susceptibility ranges from 0-100% and is colour coded in the antibiogram (Red for 0-69%, Yellow for 70-79%, Green for 80% or greater).

Organisms

Different phenotypes of bacterial species were combined (e.g., E. coli includes ESBL and non-ESBL). Organisms are separated by species (e.g., *Klebsiella pneumonia, Klebsiella oxytoca*) and less common species were grouped by genus (e.g., *Klebsiella sp.* Other).

Navigating the Antibiogram

Urinary antibiogram data can be stratified by health care setting (hospital inpatient, LTC, outpatient), age group (<18, 18-64, 65+), as well as by specific LHIN. The slicer will highlight the selected data as blue. **Only one filter should be selected for each slicer.** Click on the filter icon to clear the stratification and show all data.

Queries about the Ontario Antibiogram

Please contact asp@oahpp.ca for additional questions about the Ontario Hospital Antibiogram or to provide your data.

Disclaimer

This document was developed by Public Health Ontario (PHO). PHO provides scientific and technical advice to Ontario's government, public health organizations and health care providers. PHO's work is guided by the current best available evidence at the time of publication.

The application and use of this document is the responsibility of the user. PHO assumes no liability resulting from any such application or use.

Citation for the Ontario Hospital Antibiogram

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario Hospital Antibiogram [Internet]. Toronto, ON: Queen's Printer for Ontario; 2021 [cited date].
Available from: www.publichealthontario.ca/-/media/documents/ontario-hospital-antibiogram.xlsx.

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Contact

For more information, please contact asp@oahpp.ca.

Ontario