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Institute for Quality Management in Healthcare

Antimicrobial Resistance in Common Hospital Pathogens in Ontario: Annual Laboratory and Hospital Survey Report 2024

Annual Report
February 2026

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Contents

Executive Summary

Antimicrobial resistance (AMR) remains a critical challenge in Ontario, impacting patient safety and the effectiveness of treatments for common hospital pathogens. This report summarizes 2024 data from laboratory and infection control surveys conducted by Public Health Ontario (PHO) and the Institute for Quality Management in Healthcare (IQMH). These surveys provide a comprehensive view of the prevalence of antimicrobial-resistant organisms (AROs) and the infection control practices implemented in Ontario hospitals.

Methicillin-resistant *Staphylococcus aureus* (MRSA)
In 2024, MRSA incidence remained stable compared to the previous 5 years. There were 16,411 new MRSA cases (14.1 per 1,000 patients) reported by hospital laboratories, of which 823 (5.0%) were MRSA bacteremia. Incidence rates were highest in the North East region, followed by Toronto and East regions. Screening and Additional Precautions were consistently applied across hospitals.

Vancomycin-resistant enterococci (VRE)
In 2024, VRE incidence from non-screening specimens remained stable at 1,213 cases (1 per 1,000 patients), including 195 bacteremia cases. However, the number of VRE cases from any specimen site increased considerably, while the proportion of hospitals with VRE screening programs declined to 58%. The North East and East regions reported the highest rates of cases from non-screening specimens.

Gram-negative bacilli
Resistance among *Klebsiella* spp. continued to rise, reaching the highest at 10.9% for third-generation cephalosporins and 9.8% for ciprofloxacin in 2024, while resistance among *Escherichia coli* (*E. coli*) fluctuated in recent years. Over one third of hospitals reported screening programs for **extended-spectrum beta-lactamases (ESBLs)**.

Carbapenemase-producing organism (CPO)
The number of CPO cases from any specimen site remained at similar level with 1,046 cases reported (9 per 10,000 patients). However, the number of CPO cases identified from non-screening specimens continued to increase considerably. The highest incidence rates were observed in the West, Toronto, and Central Ontario Health regions. The proportion of hospital corporations with a carbapenemase-producing *Enterobacteriaceae* (CPE) screening program rose to 83.7% in 2024.

***Clostridioides difficile* infections (CDI)**
The CDI specimen positivity rate was 12.3% in 2024, with the highest positivity rates in the North East, Central and West regions.

***Candida auris* (*C. auris*)**
The incidence of *Candida auris* remains rare, with 3 cases reported in 2024. Screening improved, with 42% of the hospital corporations had C. auris screening program in place, up from 24% in 2023, and an additional 13% planning implementation. Among hospital-based and community-based laboratories, 58% were able to identify *C. auris* from routine clinical specimens, and 43% had processes for surveillance specimens, an increase from 33% in 2023.

Background

Antimicrobial resistance (AMR) poses a serious threat to patient safety and global public health, as current antimicrobials become less effective at treating resistant organisms. Health care-associated infections contribute to increased length of hospitalization, mortality and use of health care resources. In Canada, projections indicate that 40% of infections will be drug-resistant by 2050.[1] At that time, AMR is expected to cause 13,700 deaths and cost the health system $7.6 billion annually.[1] Recent evidence suggests the SARS-COV-19 pandemic may have accelerated the emergence and transmission of AMR.[2,3] Patients colonized with antimicrobial resistant organisms (AROs) are a major reservoir for health care-associated pathogens; screening and surveillance programs further our understanding of the burden of AROs and the impact of infection control programs in health care settings.

For nearly 20 years, the Institute for Quality Management in Healthcare (IQMH), formerly Quality Management Program – Laboratory Services (QMP–LS), administered an annual survey on antimicrobial resistance in common hospital pathogens to all licensed Ontario bacteriology laboratories and summarized the data in an annual report. In 2016, Public Health Ontario (PHO) and IQMH established a partnership to conduct an annual survey of AROs across all laboratories and hospitals for surveillance. As part of this collaboration, IQMH resumed laboratory survey administration, while PHO administered the hospital survey on infection control programs. Questions have evolved each year to capture the changing trends in AROs in Ontario.

A survey to capture information about 2024 was distributed to all licensed microbiology labs and public hospitals in Ontario. Participants were surveyed on screening and infection control programs, as well as the prevalence of AROs: methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), extended spectrum beta-lactamases (ESBLs), carbapenemase-producing organisms (CPOs), *Clostridioides difficile* infections (*C. difficile*, CDI) and *Candida auris* (*C. auris*). The survey also included questions regarding the consistency of IPAC practices across hospital sites within the same corporation. The objective of this report is to summarize the findings of the annual survey on antimicrobial resistance of common hospital pathogens from 2024.

Survey Methods

Information from two surveys was collected for this report: a laboratory survey and an infection control survey. The lab survey was distributed by IQMH to all 50 hospital-based laboratories in Ontario, 10 community-based private laboratories, and 11 PHO reference laboratories across the province. All laboratories surveyed were licensed bacteriology laboratories and able to access the survey via the existing IQMH questionnaire platform in QView. The infection control survey was also appended to the laboratory survey for hospital-based laboratories that were able to provide the infection control survey to onsite infection control staff. The laboratory survey was administered to collect data from 2024. Surveys included questions on the number of new patients identified with MRSA, VRE, ESBLs, CPO and CDI and *C. auris*. In addition, questions were included to understand the consistency of IPAC practices across hospital sites within the same corporation.

Concurrently, PHO distributed the infection control survey to all hospitals in Ontario using the PHO survey tool, Acuity4 Survey by Voxco. This survey invited infection control professionals to answer questions about their screening programs for MRSA, VRE, ESBLs, CPO, CDI and *C. auris* and infection control practices in 2024.

The surveys were made available from February 24, 2025 to July 15, 2025.

Data from both surveys were extracted and linked on unique identifiers. Duplicates and incomplete data entries were removed. Data from the Canadian Institute for Health Information - Discharge Abstract Database accessed through IntelliHEALTH were used as denominator data to calculate MRSA, VRE, and CPO rates.[4] Population Estimates 2023 from Statistics Canada, also accessed through IntelliHEALTH, were used as denominator data for calculating CDI rates.[5] Ontario Health Region boundaries were assigned based on the location of the laboratories. Data were analyzed using SAS 9.4 and Microsoft Excel. ArcGIS Pro v3.3.2 software was used to generate the maps, displayed by Ontario Health Region.

Results

Highlights of the surveys' results have been combined and presented in three sections for majority of the organisms: screening, infection control practices and laboratory data. Aggregated responses to the surveys are available upon request.

Survey Response

A total of 86/131 (65.6%) hospital corporations responded to the infection control survey questions. The response rate for 2024 hospital survey was lower than that of the 2023 and 2022 surveys, but higher than the rates observed during in pandemic years.

Of the currently licensed bacteriology laboratories, 63/71 (88.7%) responded to the 2024 survey. This included 45/50 (90.0%) hospital-based laboratories, 8/10 (80.0%) private community-based and 10/11 PHO laboratory sites. The laboratory survey response rate for 2024 survey was comparable to that of the 2023 survey (89%). Historically, the laboratory survey response rates have been between 95%-100%, except for the surveys conducted in the pandemic years.

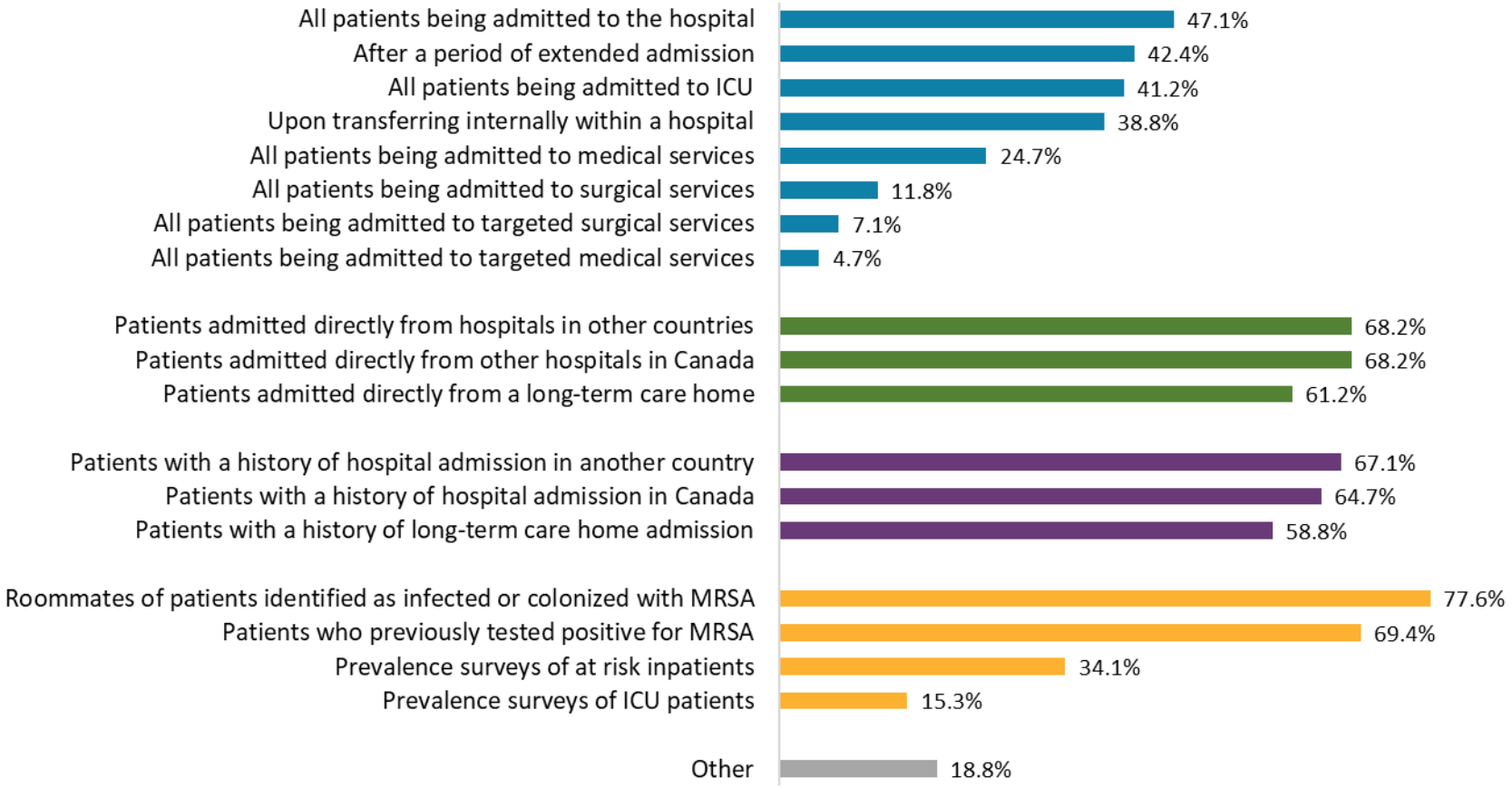
Given the variability in hospital and laboratory participation across reporting years, these data should be interpreted with caution.

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Hospital Screening

In 2024, 85/86 (98.8%) hospital corporations responded as having a screening program for MRSA, which is comparable to 100% reported in 2023. Hospitals were most likely to screen patients who were roommates of patients positive for MRSA, patients previously positive for MRSA, patients admitted from other hospitals in Canada or other countries, and patients with a history of hospital admission in other countries (Figure 1).

Figure 1: Criteria Used by Hospitals for MRSA Patient Screening, 2024



Infection Control Practices

All hospitals (86/86; 100%) reported that Additional Precautions were used to care for all patients identified (infected or colonized) with MRSA. Most 62/86 (72.1%) hospitals indicated that Additional Precautions for MRSA are discontinued once three negative swabs were taken, one week apart in the absence of antibiotic therapy. An additional nine hospitals specified that the negative swabs must be after a defined period such as one year, six months, or 90 days after the last positive to qualify for discontinuation. Eleven (12.8%) hospitals responded that patients with MRSA remain in Additional Precautions for the duration of their hospitalization.

The majority (62/86; 72.1%) of hospitals responded that their institutions do not decolonize patients with MRSA; with six (7.0%) hospitals responding that decolonization protocols are applied to all MRSA positive patients. There were 14 (16.3%) hospitals that indicated they may consider MRSA decolonization on a case-by-case basis. Of these, four (4.7%) hospitals decolonize as part of the pre-operative procedure for surgical patients, three (3.5%) hospitals decolonize to facilitate patient placement (e.g. long term care), five (5.8%) hospitals decolonize upon physician or IPAC request, and one (1.2%) hospital considers decolonization during an outbreak.

Laboratory Data

A total of 16,411 new patients with MRSA isolated from any specimen site (i.e., colonizations or infections) were reported by hospital-based laboratories in 2024, with an overall rate of 14.1 per 1,000 patients.

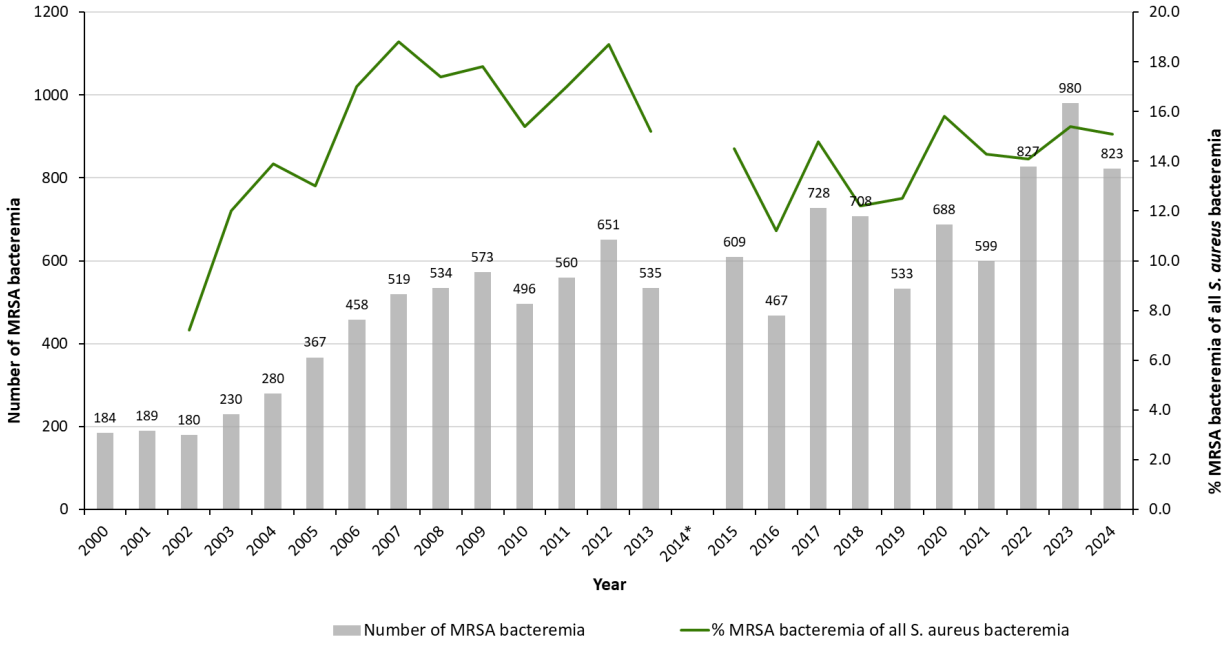
- 823 (5.0%) patient specimens were isolated from blood culture in 2024.
- 6,157 (37.5%) patients with MRSA had specimens isolated from non-screening sites, excluding blood culture in 2024.

The total number of new patients with MRSA isolated from any specimen site increased by 8.5% from 15,119 in 2023 to 16,411 in 2024. The proportion of patients with MRSA from blood culture in 2024 (823/16,411; 5.0%) was lower than the proportion in in 2023 (980/15,119; 6.5%). Overall, the 2024 numbers and rates remain within the range observed over the previous 5 years.

In 2024, 4,635 cases of methicillin-susceptible *Staphylococcus aureus* (MSSA) bacteremia were reported. Methicillin-resistant *S. aureus bacteremia* as a proportion of all *S. aureus bacteremia* was 15.1% (823/5,458) in 2024, similar to the proportion in 2023 (15.4%) (Figure 2).

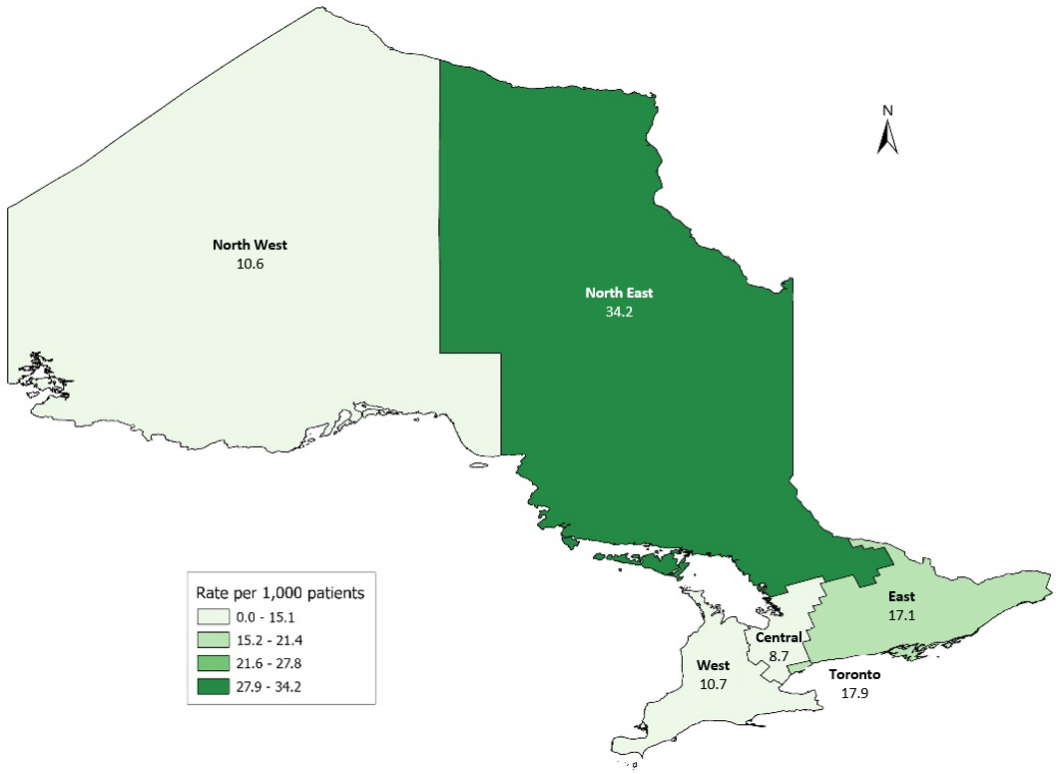
The North East region had the highest rate of new patients with MRSA isolated from any specimen site in 2024, followed by Toronto and East regions (Figure 3, Appendix A).

Figure 2: Number of MRSA Bacteremia and Percentage of All *S. aureus Bacteremia* Reported from Hospital Laboratories in Ontario, 2000–2024



*Survey was not conducted in 2014.

Figure 3: Rate of Patients with MRSA Isolated from Any Specimen Site (Colonizations and Infections) per 1,000 Patients Reported from Hospital Laboratories in Ontario, by Ontario Health Region, 2024

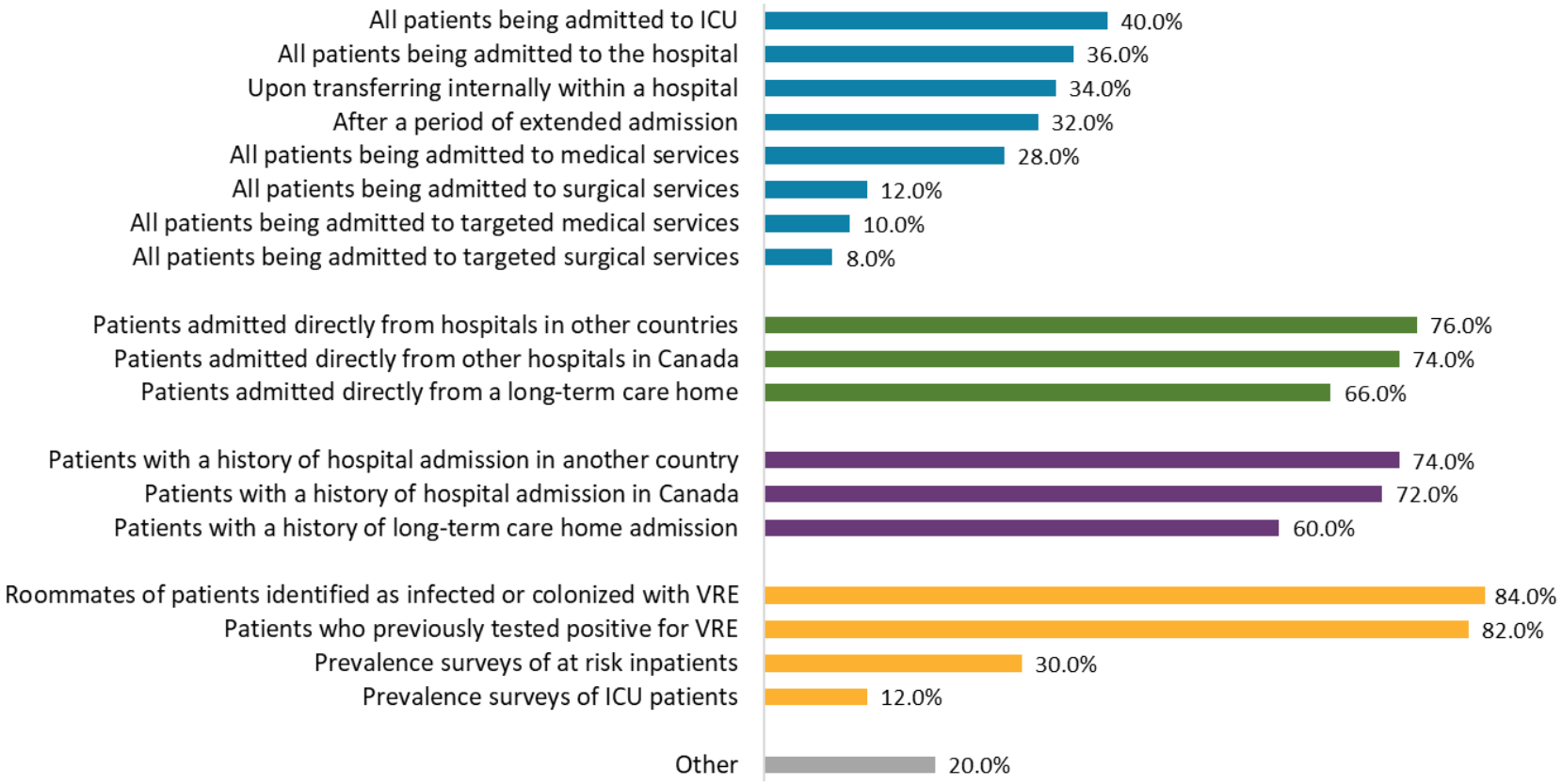


Vancomycin-resistant Enterococci (VRE)

Hospital Screening

In 2024, 58.1% (50/86) of the responding hospital corporations reported having a screening program for VRE, compared to 68.9% in 2022 and 63.2% in 2023. Hospitals were most likely to screen patients who were roommates of patients identified as infected or colonized with VRE, patients who previously tested positive for VRE, patients admitted directly from hospitals in other countries or from other hospitals in Canada, and those with a history of hospital admission in Canada or another country (Figure 4).

Figure 4: Criteria Used by Hospitals for VRE Patient Screening, 2024



Infection Control Practices

There were 51/86 (59.3%) hospitals that responded that Additional Precautions were used to care for all patients colonized and infected with VRE; three (3.5%) hospitals responded that Additional Precautions were only used for patients with VRE infections; two (2.3%) hospitals responded that Additional Precautions were only used in high risk units. There were 30 (34.9%) hospitals that reported Additional Precautions were not used for patients with VRE in 2024.

In hospitals reporting the use of Additional precautions for VRE, 45/56(80.4%) reported Additional precautions are discontinued once three negative swabs for VRE have been taken, with at least one taken three months after the last positive, and in the absence of antibiotic therapy. Hospitals also indicated discontinuation of precautions also requires the three negative swabs to be one week apart, or one negative swab from stool. Ten (17.9%) hospitals reported patients with VRE remain in Additional Precautions for the duration of their hospitalization.

Laboratory Data

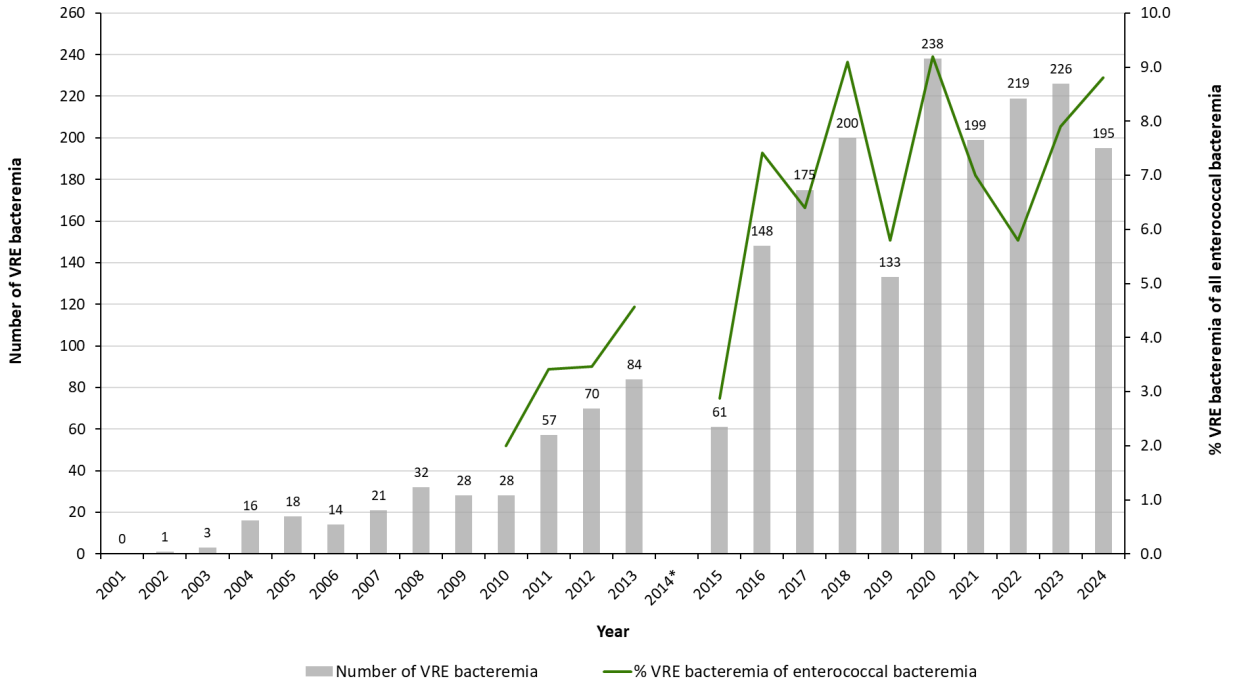
A total of 7,311 new patients with VRE isolated from any specimen site (i.e., colonizations and infections) were reported by hospital laboratories in 2024, a substantial increase from 4,425 cases in 2023.

- In 2024, 195/7,311 (2.7%) patients with VRE had specimens isolated from blood culture:
  - *E. faecium*: 174/195 (89.2%)
  - *E. faecalis*: 5/195 (2.6%)
  - Other enterococci: 16/195 (8.2%)
- In 2024, 1,018/7,311 (13.9%) patients with VRE had specimens isolated from non-screening sites, excluding blood culture:
  - *E. faecium*: 901/1,018 (88.5%)
  - *E. faecalis*: 27/1,018 (2.7%)
  - Other enterococci: 90/1,018 (8.8%)

In 2024, 2,020 cases of vancomycin-susceptible enterococcal bacteremia were reported. The proportion of vancomycin-resistant enterococcal bacteremia of all enterococcal bacteremia was 8.8% (195/2,215) in 2024 (Figure 5).

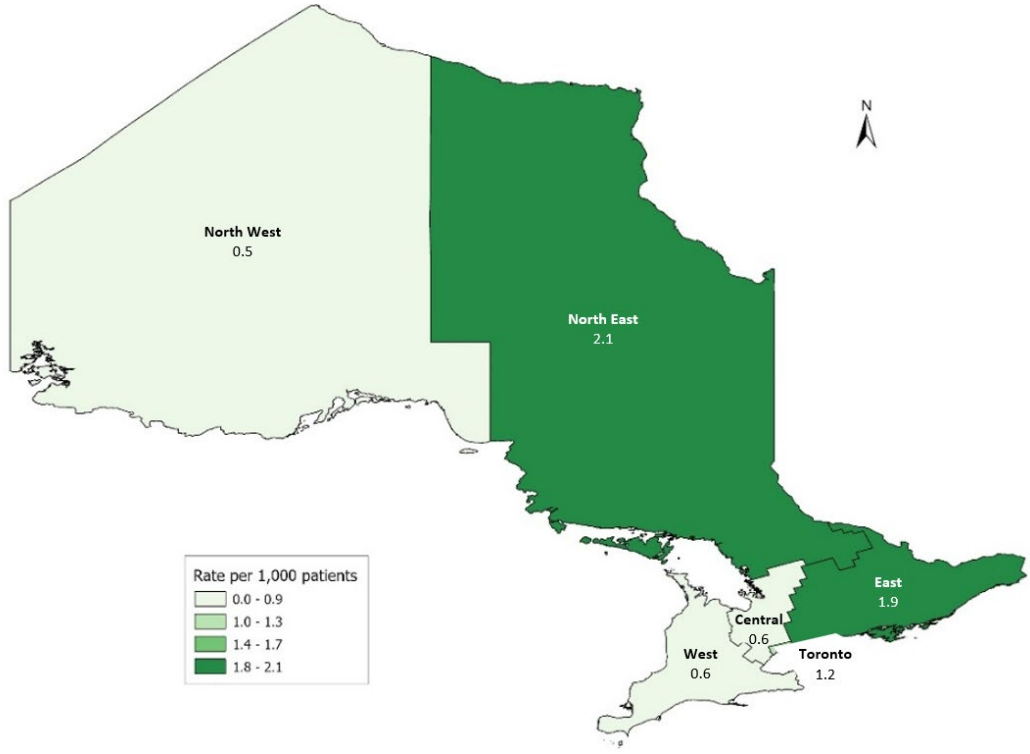
Hospital laboratories in the Ontario North East and East regions reported the highest rate of new patients with VRE isolated from all non-screening specimen sites (including blood cultures) in 2024 (Figure 6, Appendix A).

Figure 5: Number of VRE Bacteremia and Percentage of all Enterococcal Bacteremia Reported from Hospital Laboratories in Ontario, 2001–2024



*Survey was not conducted in 2014

Figure 6: Rate of Patients with VRE Isolated from All Non-screening Specimen Sites (Including Blood Cultures) per 1,000 Patients Reported from Hospital Laboratories in Ontario, by Ontario Health Region, 2024



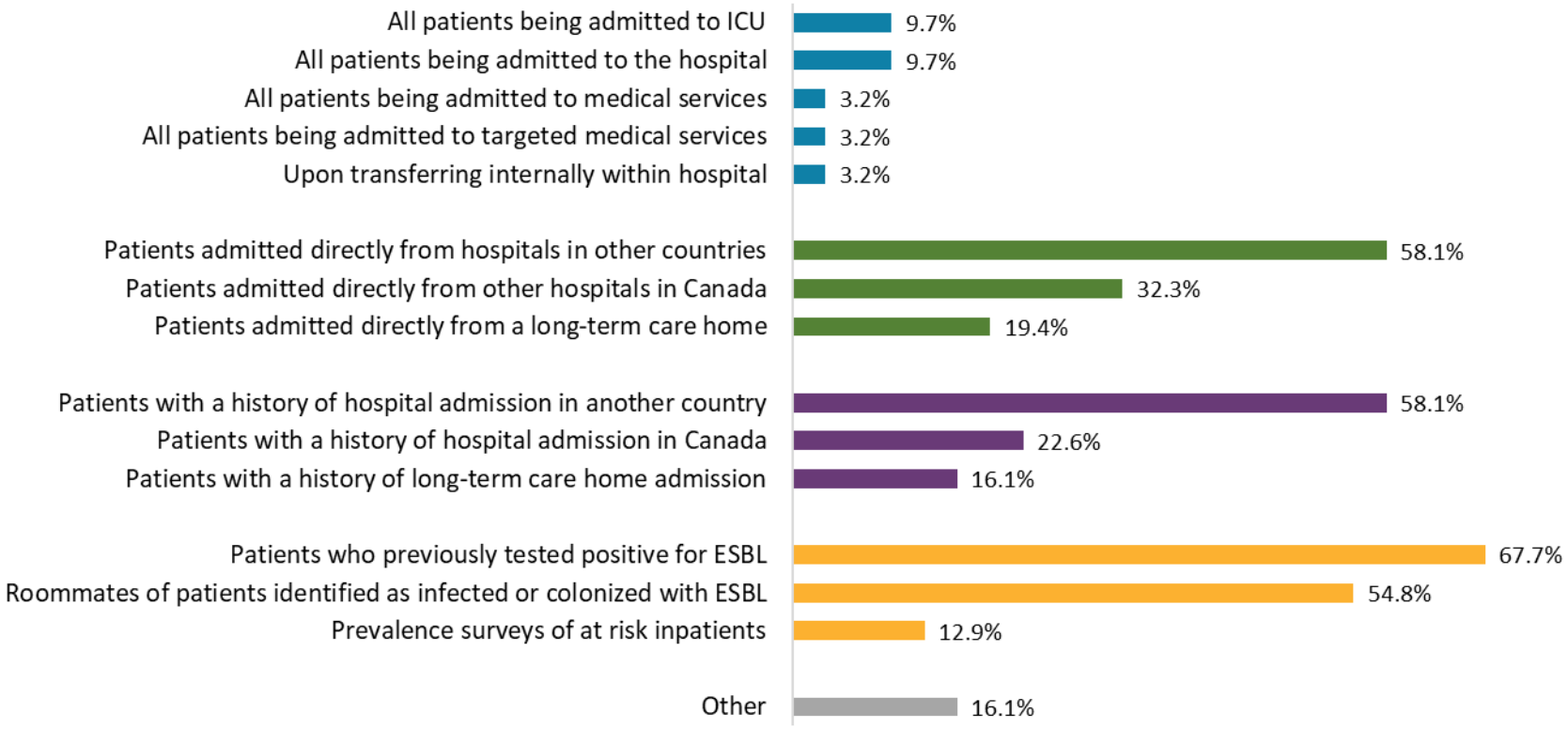
Gram-Negative Bacilli

Extended spectrum beta-lactamases (ESBL) Hospital Screening

Of the 86 responding hospital corporations, 31 (36.0%) reported having a screening program for extended spectrum beta-lactamases (ESBLs) in 2024, which is comparable to the proportion in 2023 (36.7%).

Hospitals with a screening program for ESBLs were most likely to screen patients who previously tested positive for ESBL, patients admitted directly from hospitals in other countries, patients with a history of hospital admission in another country, and roommates of patients identified as infected or colonized with ESBL (Figure 7).

Figure 7: Criteria Used by Hospitals for ESBL Patient Screening, 2024



ESBL Infection Control Practices

A total of 41 out of 86 (47.7%) hospitals responded that Additional Precautions were used for all patients colonized and infected patients with ESBLs. Four (4.7%) hospitals indicated that Additional Precautions were only used for patients infected with ESBLs. Twelve hospitals (14.0%) provided open-text responses: seven (8.1%) indicated Additional Precautions were implemented only in specific units (e.g., NICU and ICU), and five (5.8%) reported they were applied only when ESBL was not contained, such as in sputum or open wounds that soil the environment. There were 29 (33.7%) hospitals that reported Additional Precautions were not used for patients with ESBLs.

In the 57 hospitals reporting the use of Additional Precautions for ESBL, 21 (36.8%) reported Additional Precautions are discontinued once three negative swabs for ESBL have been taken, one week apart in the absence of antibiotic therapy. Twenty three (40.4%) hospitals reported that patients who test positive for ESBLs remain on Additional Precautions for the duration of their hospitalization.

Laboratory Data

In 2024, 464,519 isolates of *E. coli*, 96,587 isolates of *Klebsiella* spp., 48,919 isolates of *Pseudomonas aeruginosa,* and 3,540 isolates of *Acinetobacter* spp. from any specimen site were reported by laboratories.

Resistance to third-generation cephalosporins among *E. coli* isolated from all specimen sites declined from a peak of 12.8% in 2023 to 10.4% in 2024, returning to the levels observed in previous years (Figure 8). Resistance to third-generation cephalosporins among *Klebsiella* spp. isolated from all specimen sites has been increasing in recent years, reaching 10.9% in 2024.

Resistance among *E. coli* isolates to ciprofloxacin fluctuated in recent years. In 2024, the resistance rate was 17.9% (Figure 9). For *P. aeruginosa* isolates, the ciprofloxacin resistance rate in 2024 was 12.3%, similar to the rate of 12.0% in 2023. *Klebsiella* spp. resistance to ciprofloxacin showed an increasing trend over the years and reached the highest rate of 9.8% in 2024. Resistance to ciprofloxacin among *Acinetobacter* spp. isolates decreased from 8.1% in 2019 to 3.4% in 2024.

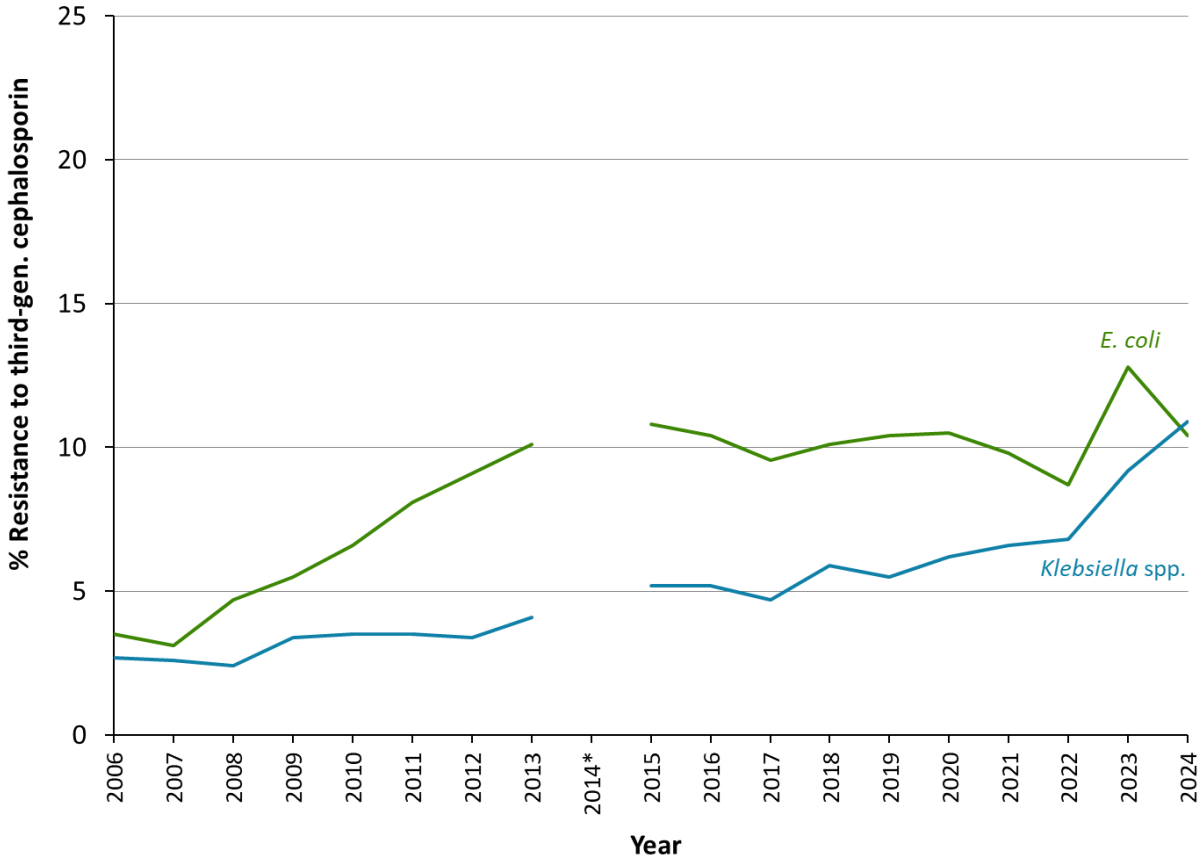
Among *P. aeruginosa* from any specimen site, resistance to third-generation cephalosporins was 7.0% in 2024, remaining stable over recent years; resistance to meropenem in 2024 was 7.5%, unchanged from 2023 (Figure 10). For *Acinetobacter* spp., resistance to third-generation cephalosporins fluctuated in recent years and was 7.1% in 2024; resistance to meropenem decreased from 6.0% in 2020 to 1.5% in 2024.

Percent resistance of *P. aeruginosa* from blood to third-generation cephalosporins decreased to 7.2% in 2024 compared to 8.9% in 2023; resistance to ciprofloxacin has remained at the similar level in recent years, at 7.7% in 2024; resistance to meropenem decreased slightly from 8.8% in 2023 to 7.9% in 2024 (Figure 11a). Among *Acinetobacter* spp. isolates from blood, percent resistance to Ciprofloxacin decreased to 6.5% in 2024 compared with 10.7% in 2023.

For *E. coli* from blood, resistance to third-generation cephalosporins increased to 21.5% in 2024 from 18.8% in 2023; resistance to ciprofloxacin remained similar at 25.7% in 2024 compared with 25.8% in 2023 (Figure 11a). *Klebsiella* spp. resistance to cephalosporin from blood has shown an increasing trend, reaching 14.3% in 2024; resistance to ciprofloxacin was 9.6% in 2024, within the range observed in recent years.

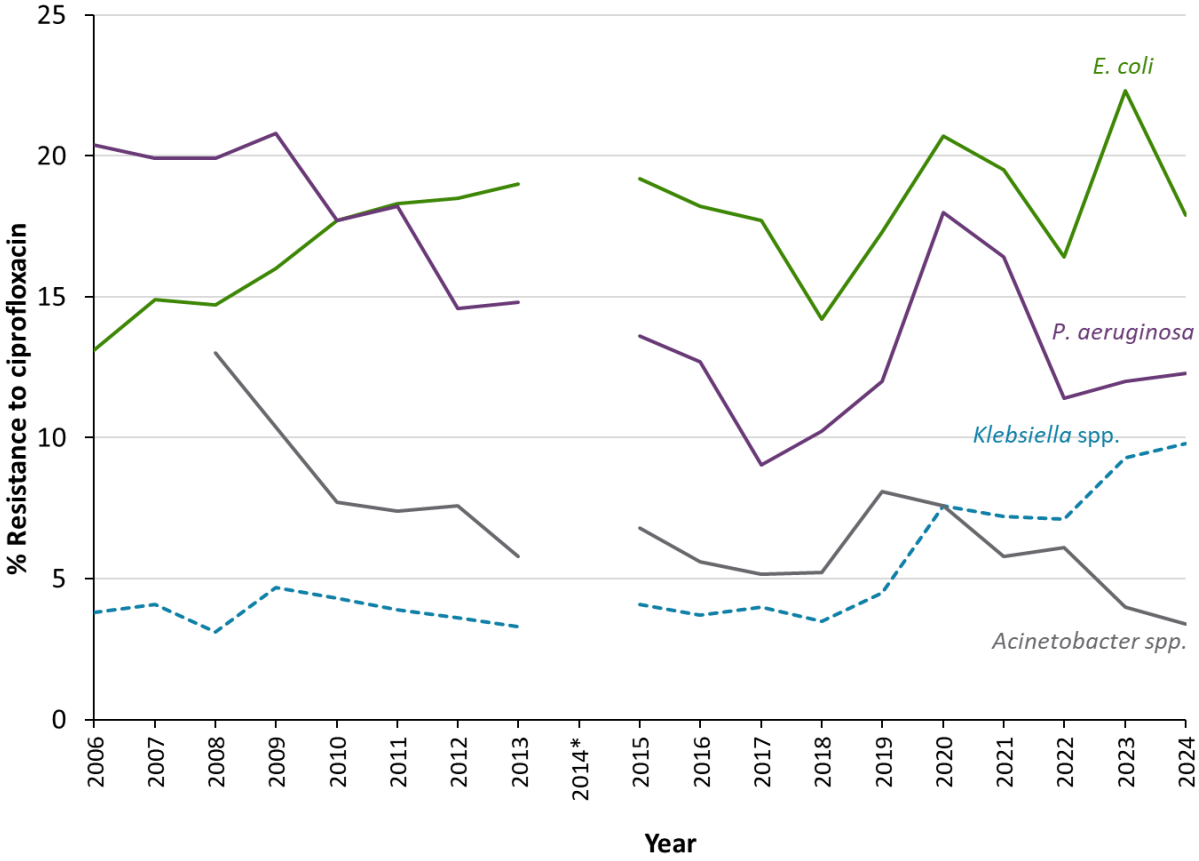
E. coli resistance in urine to third-generation cephalosporins and ciprofloxacin remained at similar level compared to 2023, at 12.0% and 21.3% in 2024 (Figure 11b), respectively. Among *Klebsiella* spp. isolated from urine, resistance to third-generation cephalosporins increased from 7.8% in 2023 to 9.8% in 2024; resistance to ciprofloxacin slightly increased from 8.9% in 2023 to 9.6% in 2024.

Figure 8: Percent Resistance of All Isolates of *E. coli* and *Klebsiella* spp. to Third Generation Cephalosporins, 2006–2024



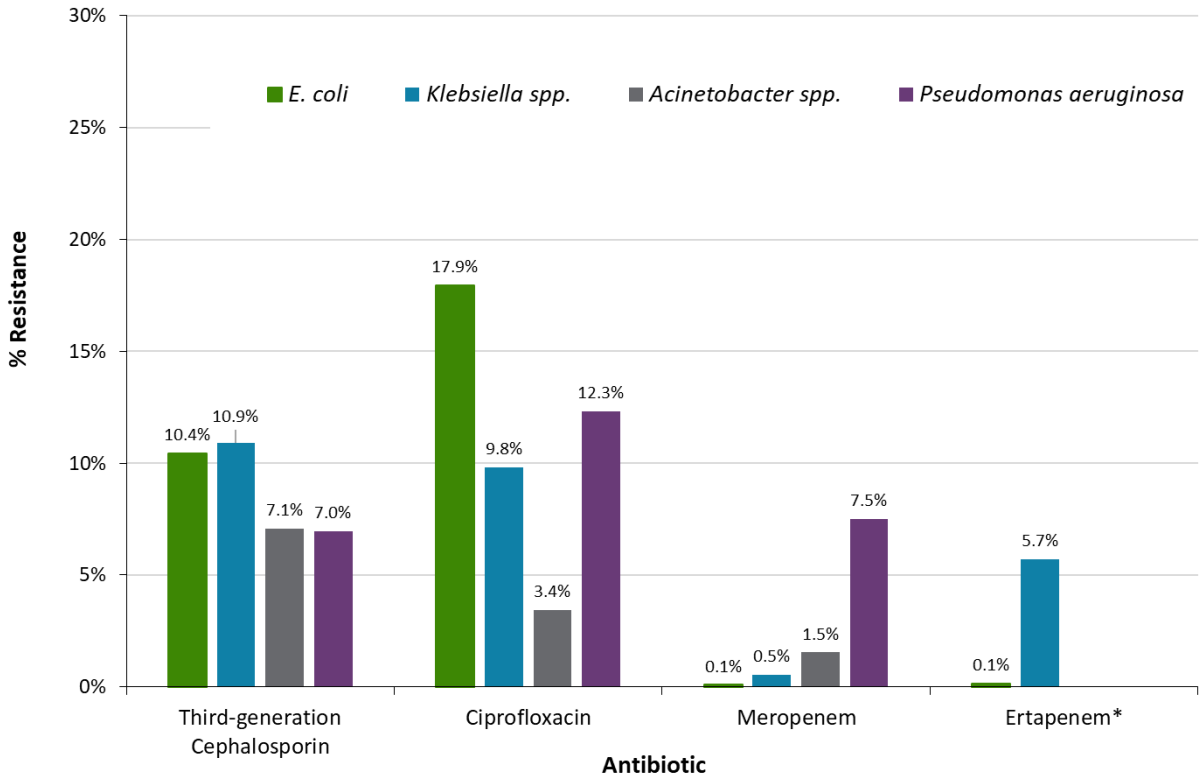
*Survey was not conducted in 2014.

Figure 9: Percent Resistance of All Isolates of *E. coli* and *Klebsiella* spp., *P. aeruginosa*, and *Acinetobacter* spp. to Ciprofloxacin, 2006–2024



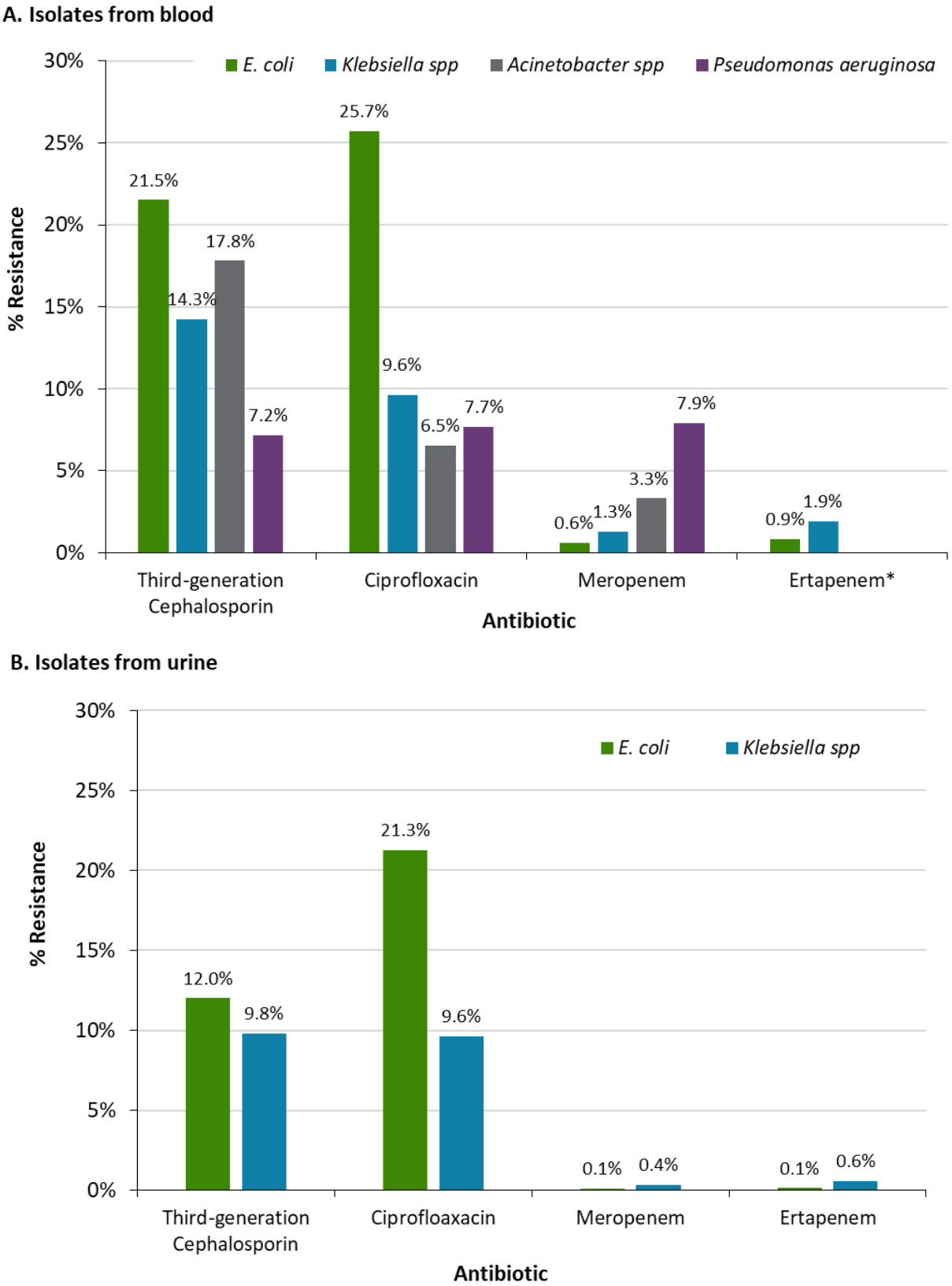
*Survey was not conducted in 2014.

Figure 10: Percent resistance of All Isolates of *E. coli, Klebsiella* spp., *Acinetobacter* spp., and *P. aeruginosa* to Third-generation Cephalosporins, Ciprofloxacin and Carbapenems, 2024



*Note: Resistance to ertapenem is shown for *E. coli* and *Klebsiella* spp. only.

Figure 11: Percent Resistance of *E. coli*, *Klebsiella* spp., *Acinetobacter* spp., and *P. aeruginosa* from Blood and Urine to Third-generation Cephalosporins, Ciprofloxacin and Carbapenems, 2024*



*Note: Resistance to ertapenem is shown for *E. coli* and *Klebsiella* spp. only.

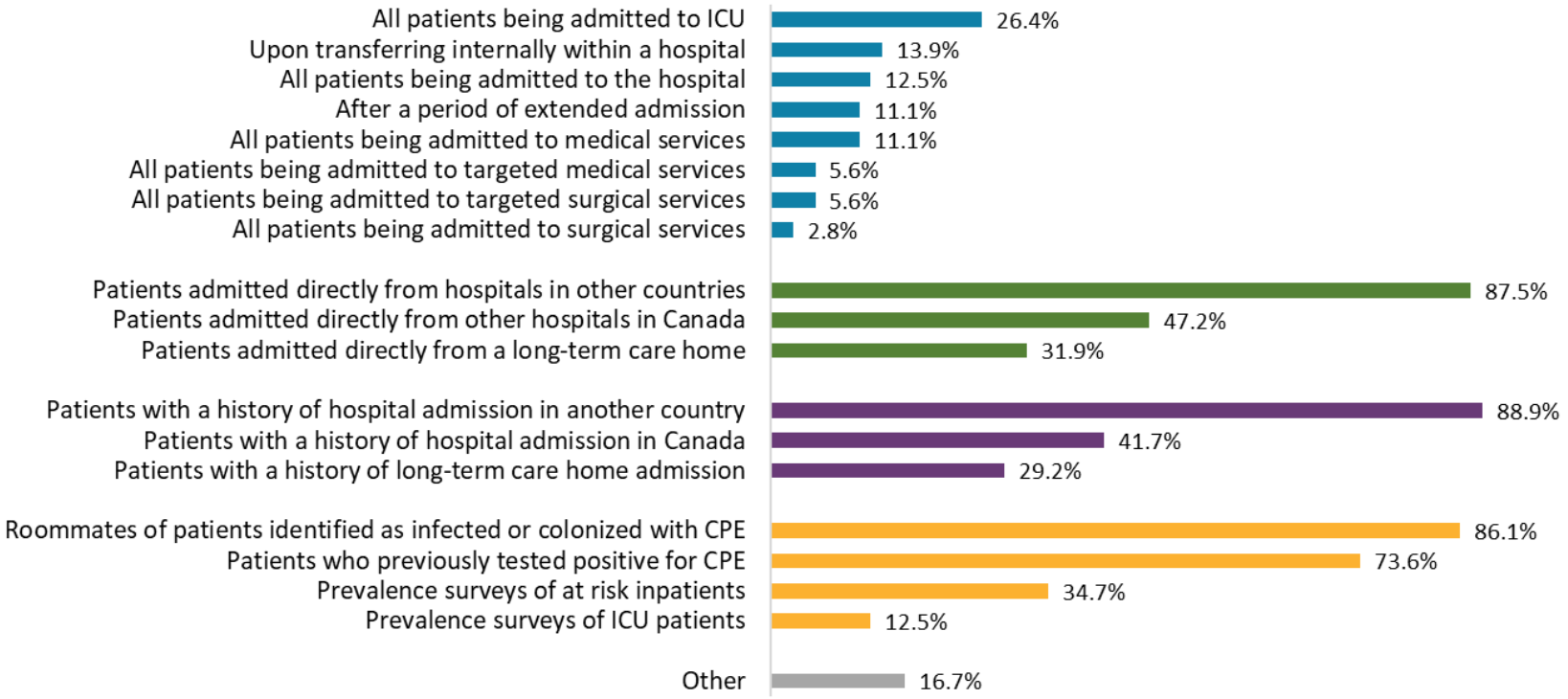
Carbapenemase-producing organisms (CPO)

Hospital Screening

Of the 86 responding hospital corporations, there were 72 (83.7%) that reported having a screening program for Carbapenemase-producing *Enterobacteriaceae* (CPE) in 2024, higher than 70.4% in 2023. The majority (64/72; 88.9%) of the hospitals with screening programs indicated that they manage all CPO colonizations/infections the same, even if they are not from the *Enterobacteriaceae* family (CPE). There were 8/72 (11.1%) hospitals replied that they only apply Additional Precautions for CPE cases.

Hospitals were most likely to screen patients with a history of hospital admission in another country, patients admitted directly from hospitals in other countries, roommates of known CPE cases, and patients who previously tested positive for CPE (Figure 12).

Figure 12: Criteria Used by Hospitals for CPE Patient Screening, 2024



Infection Control Practices

A total of 83 out of 86 (97.6%) hospitals reported that Additional Precautions were used for all patients with CPE colonizations and infections. One (1.2%) hospital responded that Additional Precautions were only used for patients with CPE infections. Another hospital (1.2%) indicated that they do not admit patients who are actively infected or colonized with CPE, and one hospital did not respond to the questions regarding Additional Precautions for CPE.

Most hospitals (64/86; 75.3%) using Additional Precautions for CPE positive patients reported that these patients remain in Additional Precautions for the duration of their hospitalization. Sixteen (18.8%) reported that Additional Precautions may be discontinued once three negative swabs have been taken in the absence of antibiotic therapy.

There were 72/86 (83.7%) hospitals reported that special attention was paid to cleaning sinks and drains used by patients with CPE. Fifty nine (68.6%) reported twice-a-day cleaning, and 52 (60.5%) reported double cleaning of rooms on CPE patient discharge/transfer or discontinuation of precautions.

Laboratory Data

A total of 1,183 new patients with CPO isolated from any specimen site (colonizations and infections) were reported in 2024. Of these new CPO patients, 1,137 (96.1%) were associated with *Enterobacteriaceae* organisms.

- 475/1,183 (40.2%) specimens were identified from non-screening sites
- 53/1,183 (4.5%) specimens were isolated from blood culture
- 1,046/1,183 (88.4%) specimens were reported from hospital laboratories (Figure 13)

Among hospital-based laboratories, West, Toronto and Central regions had the highest rates of new patients with CPOs per 10,000 patients in 2024 (Figure 14, Appendix A). The overall rate decreased from 10.2 per 10,000 patients in 2023 to 9.0 per 10,000 patients in 2024 (Figure 13).

The most reported carbapenemase in 2024 was New Delhi Metallo-beta-lactamase (NDM; 558, 47.2%), followed by Oxacillinase (OXA; 294, 24.9%), *Klebsiella pneumoniae* carbapenemase (KPC; 269, 22.7%); Verona Integron-Encoded Metallo-beta-lactamase (VIM; 24, 2.0%); and, Imipenemase (IMP; 11, 0.9%) (Figure 15).

Figure 13: Number of Patients with CPOs Isolated from Any Specimen Site (Colonizations and Infections) and Rate per 10,000 Patients Reported from Hospital Laboratories in Ontario, 2017–2024

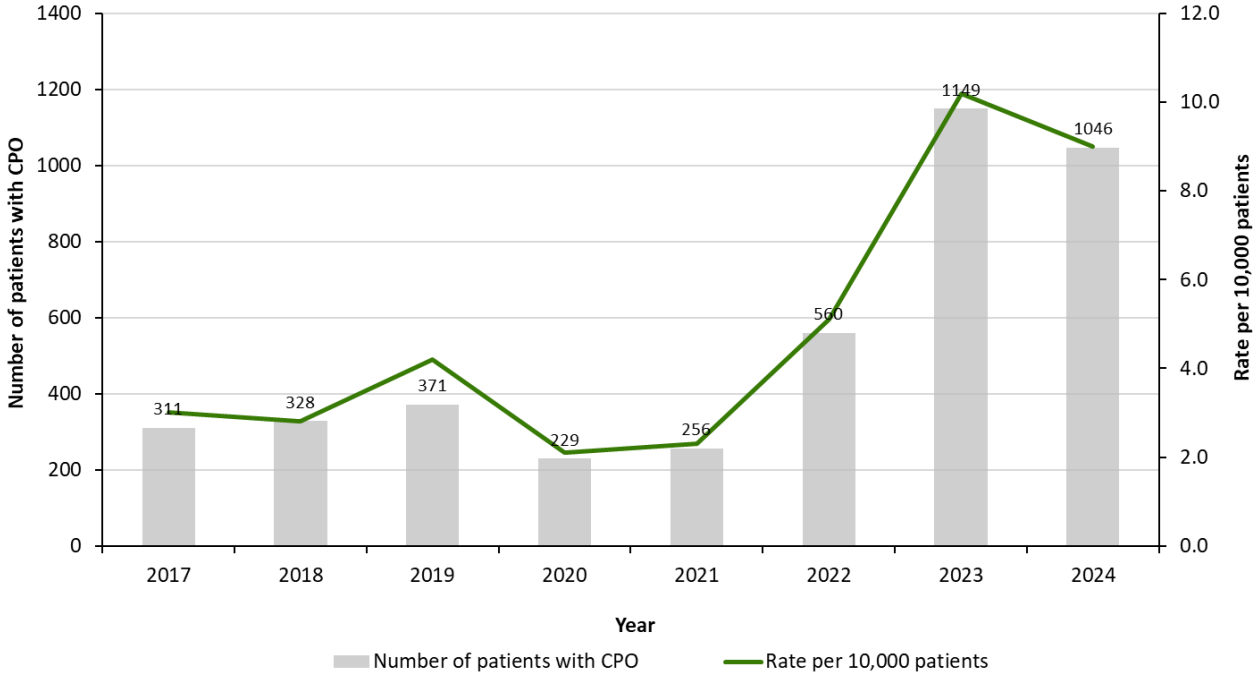


Figure 14: Rate of Patients with CPOs Isolated from Any Specimen Site (Colonizations and Infections) per 10,000 Patients Reported from Hospital Laboratories in Ontario, by Ontario Health Region, 2024

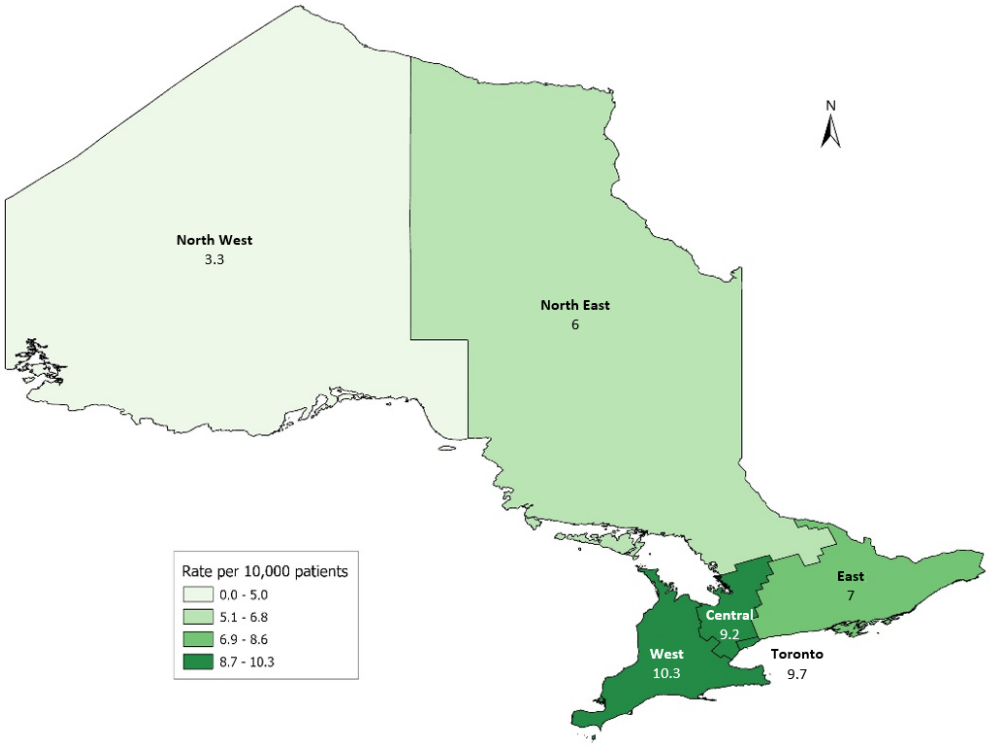
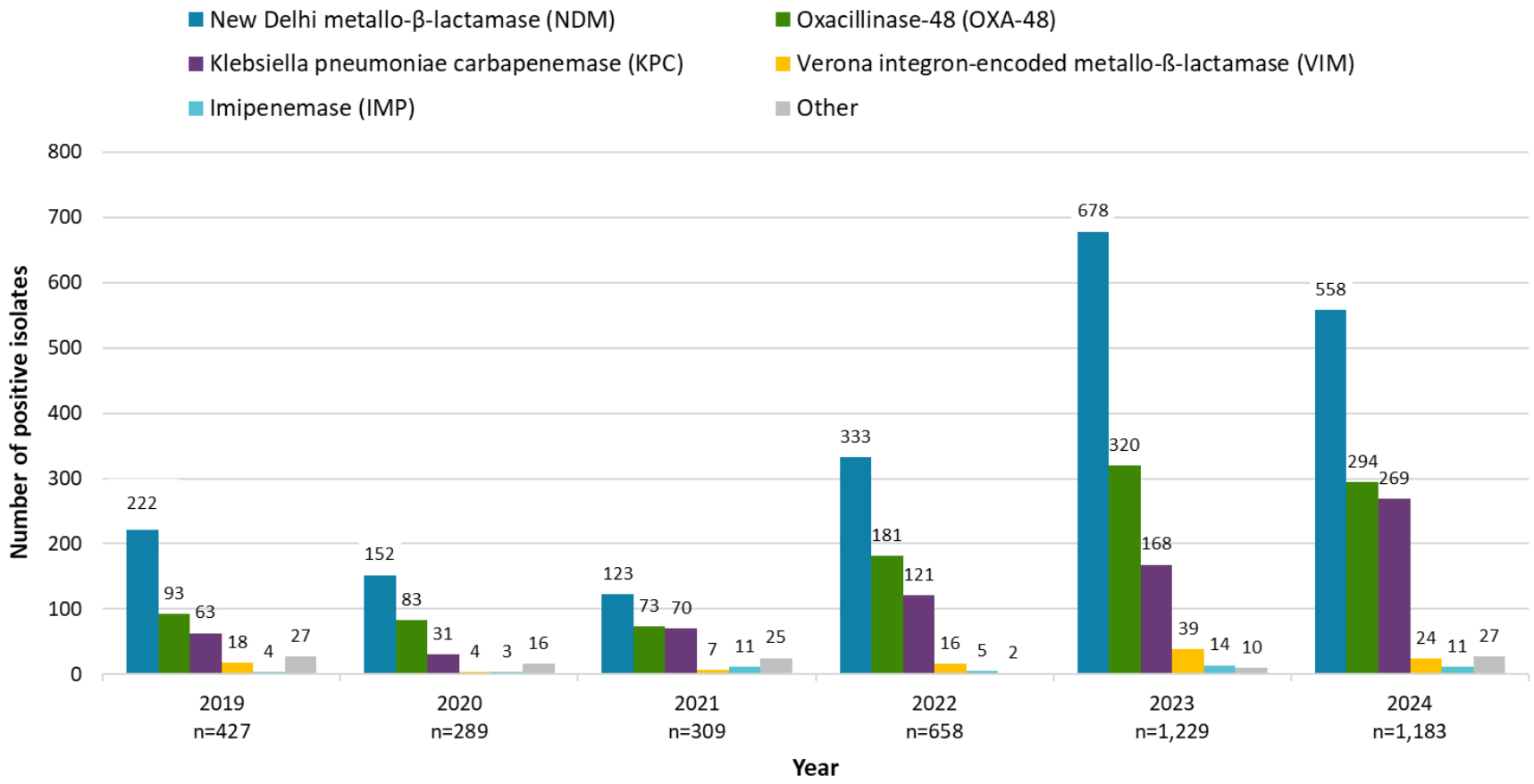


Figure 15: Number and Proportion of CPO Isolated from Any Specimen Site (Colonizations and Infections) by Carbapenemase and Year, 2019–2024



Clostridioides difficile infections (CDI)

Infection Control Practices

Most hospitals 52/86 (61.2%) hospitals responded that Additional Precautions were used for patients identified with symptomatic CDI infections. Thirty two (37.6%) hospitals responded that Additional Precautions were used for all colonized as well as symptomatically infected patients.

There were 66/86 (77.6%) hospitals that reported Additional Precautions for CDI are discontinued when patients have had at least 48 hours of return to baseline stool pattern and one (1.2%) reporting that CDI patients remain in precautions for the duration of their hospitalization. Eighteen (21.2%) provided other information such as waiting ≥72 after the patient returns to baseline stool patterns or waiting ≥48 hours following the completion of treatment to remove additional precautions.

A total of 76/86 (88.4%) hospitals reported daily double cleaning of CDI patient rooms using a sporicidal agent. Sixty six (76.7%) also reported double cleaning with a sporicidal agent after terminal/discharge or discontinuation of precautions. Nearly half of the hospitals also reported additional cleaning of patient equipment (45, 52.3%) and frequently touched surfaces (40, 46.5%) using a sporicidal disinfectant.

Laboratory Data

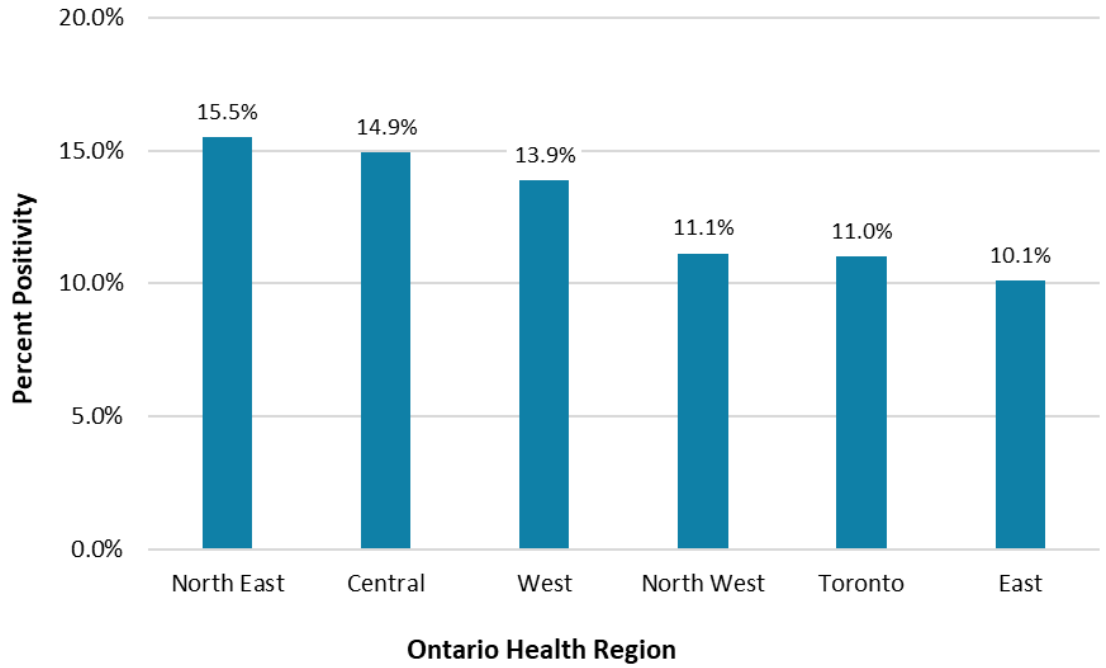
A total of 85,235 specimens were tested for *C. difficile* toxin by Ontario laboratories in 2024.

- 10,520 (12.3%) specimens were positive for *C. difficile* toxin from 8,848 people (overall rate 5.5 per 10,000 population).
- The *C. difficile* percent specimen positivity rate in 2024 (12.3%) was higher than the rate in 2023 (10.1%) but similar to the 2022 rate (12.1%).

Laboratories in North East, Central and West regions reported the highest proportion of specimens positive for *C. difficile* toxin in 2024 (Figure 16, Appendix A).

The Ontario Ministry of Health recommends turnaround time (TAT) from specimen collection to reporting is ≤24 hours. Due to limitations in understanding the interval between specimen collection and receipt at the laboratory, the survey asks laboratories about their average TAT from the time specimens are received to reporting test results. There were 48/51 (94.1%) laboratories that reported average TATs from specimen receipt at the laboratory to reporting <24 hours in 2024. Two (3.9%) laboratories reported an average TAT between 25–48 hours and one (2.0%) reported an average TAT between 49-72 hours.

Figure 16: *C. difficile* Percent Specimen Test Positivity Based on Laboratory Location by Ontario Health Region, 2024



Candida auris

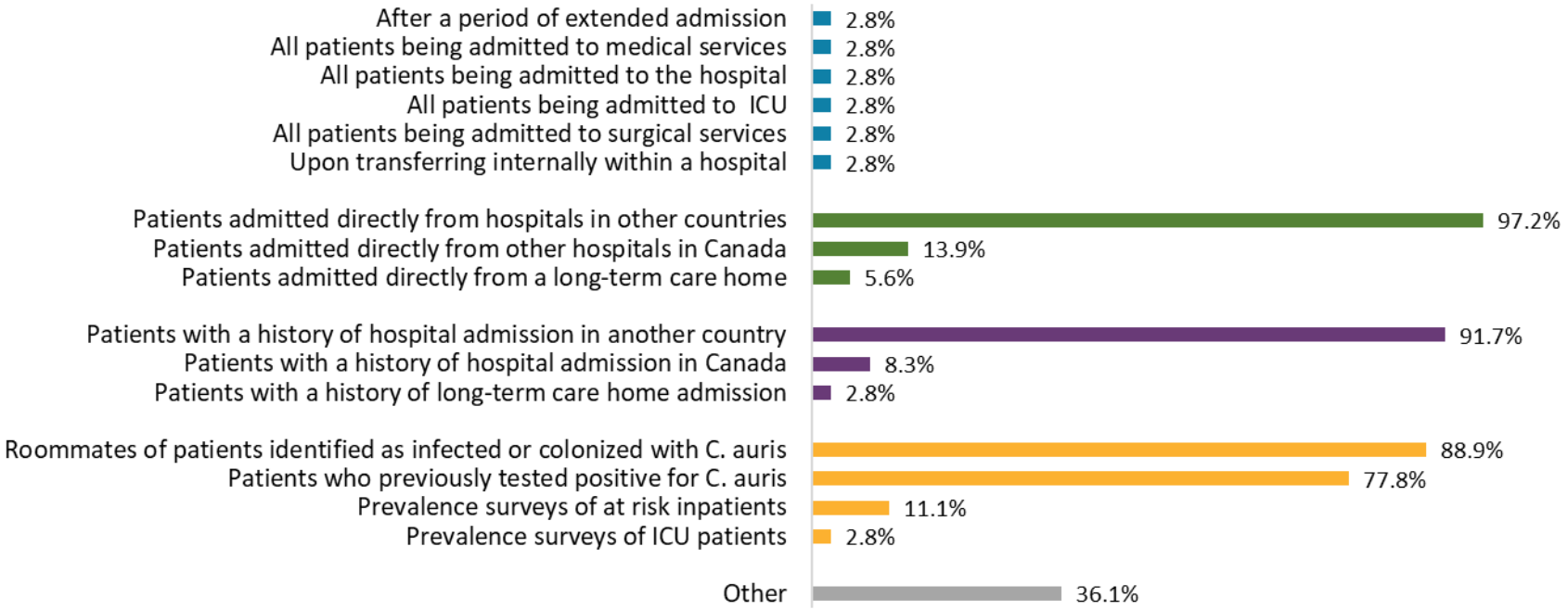
Infection Control Practices

Of the 86 responding hospital corporations, 49 (57.0%) reported they did not have a *Candida auris* screening program at the time of the survey. Thirty-six (41.9%) hospitals reported they did have a screening program in place, up from 24.5% in 2023, and 18 (13.3%) more reported they were planning to implement a screening program. One hospital did not respond to this question.

The reasons reported by hospitals for not having a *Candida auris* screening program yet were that they had not yet seen a case (18/49; 36.7%), there were too many competing priorities and/or insufficient resouces to implement testing (15/49; 30.6%), the risk level in their geogrphic area did not yet warrant a screening program (14/49; 28.6%), and they did not yet have access to laboratory testing for *Candida auris* (10/49; 20.4%).

Hospitals were most likely to screen patients admitted directly from hospitals outside of Canada, patients with a history of hospital admission in another country, roommates of known *Candida auris* cases, and patients who had previously tested positive for *Candida auris* (Figure 17).

Figure 17: Criteria Used by Hospitals for *Candida auris* Patient Screening, 2024



Laboratory Data

At the time of survey, 31/53 (58%) hospital-based and community-based laboratories reported having procedures in place to identify *Candida auris* from routine clinical specimens. Nine (17%) reported not having such procedures, and 13 (25%) did not respond to this question.

Twenty three (43%) hospital-based and community-based laboratories indicated they had procedures to identify *Candida auris* from surveillance specimens. 16 (30%) reported not having this procedure in place, and 14 (26%) did not respond to this question.

In 2024, three new patients with *Candida auris* isolated from any specimen site (colonizations and infections) were reported. One specimen was identified from a hospital screening program, one from clinical specimens, and one where the source was not reported. Two cases were reported from hospital(s) in the Toronto region, and one from the East region (Appendix A).

Discussion

Health care-associated infections contribute to increased morbidity, mortality and burden on the health care system. This report summarized the findings of the annual survey on antimicrobial resistance of common hospital pathogens from 2024. Data need to be interpreted with caution due to the year-to-year variations in the laboratory survey response rate and the variability of hospitals that participate in the survey.

In 2024, the numbers and rates of MRSA, as well as the number and proportion of MRSA bacteremia remained within the range observed over the previous 5 years in Ontario. The health care-associated (HA) infection data reported by hospitals in Ontario showed that HA MRSA bacteremia rates have stayed at a similar level in recent years.[6] In recent years (2019-2023), the Canadian Nosocomial Infection Surveillance Program (CNISP) has also observed that the rates of MRSA bloodstream infections (BSI) have remained stable in Canadian acute care hospitals.[7] There was noticeable regional variation in MRSA rates in Ontario from 8.7 to 34.2 per 1,000 patient discharges, with the highest MRSA rate continuing to be observed in North East Region in 2024.

The total number of VRE cases from any specimen site reported by hospital laboratories increased considerably in 2024, while the proportion of hospitals having a screening program for VRE continued to decline. The incidence rate of VRE from non-screening specimens remained similar to 2023, suggesting the overall increase in VRE cases may be attributable to patients identified through screening. No substantial changes were observed for VRE bacteremia in 2024. Hospital-reported HA VRE bacteremia data in Ontario showed a slight increase in 2024.[6] CNISP observed an increase in VRE BSI rates in acute care hospitals from 2020 to 2022, while the rates in 2023 and 2022 was at similar level.[7] The VRE rates reported from this survey were highest in the North East and East Region of Ontario in 2024.

Percent resistance varies by antibiotic and by Gram-negative organism. Notably, in 2024, the resistance rates among *Klebsiella* spp. have been increasing for third-generation cephalosporins and ciprofloxacin, near doubling the rates of resistance from 2019. This increase was observed for *Klebsiella* spp. from blood cultures and urine specimens. Resistance among *E. coli* to third generation cephalosporins and ciprofloxacin fluctuated in recent years.

The total number of CPO patients reported in 2024 was slightly lower compared to 2023. However, the proportion of new patients with CPO isolated from non-screening specimens in 2024 (40.2%) was higher than the proportion in 2023 (26.0%). In May 2018, carbapenemase producing *Enterobacteriaceae* (CPE) was designated as a disease of public health significance in Ontario. In 2024, the number of CPE cases reported by public health units in the integrated Public Health Information System (iPHIS) continued to increase and reached the highest of 1120 cases, close to the number of CPE cases (1137) reported by laboratories through the survey.[8] The discrepancy may be attributable to laboratory survey data being reported as counts that can not be validated, potential duplicate reporting of the same CPO case by laboratories, and possible underreporting of cases in iPHIS. Significant increases in CPE incidence was also observed by CNISP from 2020 to 2023.[7] The highest rates of CPO reported in this survey were observed in Ontario Health West, Toronto and Central regions. likely due in part to the high levels of travel to and migration from the Indian subcontinent.[8-10]

CDI test percent positivity in 2024 was higher than in 2023 but similar to 2022. Hospital-reported rates of HA CDI have remained relatively stable in recent years.[6] CNISP also observed stable CDI rates from 2019 to 2023.[7]

There has been exponential growth in colonizations and infections of *Candida auris* in the United States and in Europe.[11-14] Given Canada's proximity to the US, *Candida auris* infections across Canada are expected to increase.[15] In 2024, 3 positive isolates were reported by responding laboratories in this survey. Ontario laboratories are encouraged to submit all *Candida auris* isolates to the Public Health Ontario (PHO) laboratory for confirmation and susceptibility testing. Between 2017 to 2024, 20 *Candida auris* patients were identified based on laboratory data from Public Health Ontario.[16] As of January 1, 2025, *Candida auris* infection (not colonization) was designated as a disease of public health significance in Ontario. Less than five *Candida auris* infection cases have been reported in iPHIS in 2025 (extracted by Public Health Ontario, unpublished data, 2025). Understanding the true incidence of *Candida auris* in Ontario is difficult, as only half of the responding laboratories (hospital or community based) reported established processes for identification, and less than half of responding hospital corporations reported having screening programs in 2024. Although these findings are not directly comparable due to differences in survey scope and unit of reporting, 80% of CNISP hospitals reported having screening programs in 2024, indicating strong preparedness within that network.[17]

Infection control practices vary widely throughout hospitals in Ontario. Best practice documents by the Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control (PIDAC-IPC) provide guidance on the recommended approaches to infection control. Consistent approaches to MRSA and CDI infection control are more common (e.g., all hospitals responded that they have a screening program for MRSA and all hospitals reported using additional precautions for patients with symptomatic CDI), whereas screening and infection control of VRE, ESBL, CPO and *C. auris* continue to be inconsistent among hospitals in Ontario. Diverging infection control policies for VRE and changing epidemiology of VRE were observed in the current survey results and highlighted in a study by Johnstone et al. (2020) that found increasing rates of VRE bloodstream infections were highly associated with discontinuation of screening programs and Additional Precautions for VRE.[18]

Conclusion

The epidemiological data obtained from Ontario laboratories and hospital infection prevention and control programs helps in understanding the impact of AROs and informs recommendations to prevent spread within our province. Continued and improved surveillance of AROs are necessary to understand the current landscape of resistance. Identifying regional variation in incidence of organisms can inform provincial and local decisions regarding appropriate application of infection control policies.

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Appendix A: Number of New Patients and Rates by Ontario Health Region, 2024

Ontario Health Region	MRSA Number of new patients	MRSA Rate per 1,000 patients	VRE Number of new patients*	VRE Rate per 1,000 patients*	CPO Number of new patients	CPO Rate per 10,000 patients	*C. auris* Number of new patients	*C. auris* Rate per 10,000 patients
Central	2,439	8.7	154	0.6	258	9.2	0	0.0
East	3,571	17.1	406	1.9	145	7	1	0.0
North East	1,829	34.2	114	2.1	32	6.0	0	0.0
North West	292	10.6	14	0.5	9	3.3	0	0.0
Toronto	4,650	17.9	321	1.2	253	9.7	2	0.1
West	3,630	10.7	204	0.6	349	10.3	0	0.0
Total	16,411	14.1	1,213	1	1,046	9	3	0.0

Notes: All numbers and rates include patients reported by hospital laboratories.

*VRE numbers and rates represent non-screening specimens only.

Appendix B: Data Caveats and Assumptions

Data Caveats

Data Collection

The survey was administered in two components. For hospital-based laboratories, instructions were provided to complete the laboratory survey and facilitate completion of the infection control practices with the relevant infection control personnel for the hospital or corporation. The hospital infection control survey was also distributed separately to all hospital corporations in Ontario. Each corporation was requested to complete the survey once on behalf of all corporate sites that followed the same infection control policies. The data in this report has assigned Ontario Health Region boundaries based on postal codes of the laboratories, which potentially impacts comparisons to previous reports. In addition, rates by Ontario Health Region were calculated excluding patient discharges from hospitals served by laboratories that did not respond to the laboratory survey. Survey completion was greatest among hospital-based laboratories who were able to facilitate data entry for the infection control portion of the survey into IQMH's QView survey platform.

Different approaches to survey administration have been attempted in previous years. In 2016, we began to provide pre-survey notification and follow-up reminder emails during the survey period. Collection of infection control data through the IQMH platform from hospital-based laboratories was an approach that started in 2018. While efforts were made to ensure dissemination contact lists were up to date, infection control staff may have changed. Additionally, the survey was conducted during the pandemic and some hospital infection control staff may not have participated due to pandemic-related duties. We continue to explore opportunities to strengthen networks between PHO and hospitals, as well as streamline future surveys to encourage infection control personnel to provide important data on the prevalence of AROs.

Laboratory Data

Data on ESBLs and CDIs were requested at the specimen-level, thus duplicate specimens submitted for a single patient may be included.

For MRSA, VRE and CPOs, we assumed that the number of new patients reported by a laboratory was not duplicated by another testing laboratory; however, it is likely there were a number of patients who may have been identified and reported by multiple laboratories due to different hospital visits or admissions within the same year. This would contribute to overestimating the prevalence of AROs. Not all laboratories responded fully to each question in the survey, which may have resulted in underestimating AROs.

For both the laboratory and hospital surveys, several assumptions were made during the data cleaning process. The listed below provides a detailed list of these assumptions. Additionally, these surveys are dependent on complete and accurate responses in order to provide useful information on AROs that may benefit laboratories practicing bacteriology as well as infection control hospital staff. In most cases, no attempt was made to verify the submitted data therefore, inaccuracies may be present. Finally, results of this report may not be comparable to other surveillance systems due to different methods employed in collecting data and level of reporting implemented in each of the surveillance systems (i.e., provincial, national level).

Assumptions

Laboratory Data

1. Counts provided in the survey were assumed to be accurate.
2. The total number of isolates was used where the subtotals did not match the total number of isolates.
3. Interpretation of questions may vary between laboratories, especially when different laboratory personnel respond to the survey year to year.
4. Regionally stratified data were based on the location of the submitting laboratory.

Hospital Data

1. Infection control practices submitted by the corporation were assumed to apply across all institutions under the corporation.
2. Reinstatement of disruptions to screening and management practices due to the pandemic were assumed if respondents indicated an end date or ‘unknown’ to questions asking if practices were later reinstated.

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