Pre- and Post-Pandemic Incidence of Carbapenemase-producing *Enterobacterales* (CPE) in Toronto and Peel Region, Ontario

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Background

- The spread of CPE is an increasing public health threat. The Toronto Invasive Bacterial Diseases Network (TIBDN) has performed population based surveillance for CPE in metropolitan Toronto and Peel region since first detection in 10/2007.
- The COVID-19 pandemic has been associated with different effects on CPE incidence in different geographic areas. We aimed to assess its impact in Toronto/Peel region.

Methods

- We analyzed population-based surveillance data from 2007 to 2023 in metropolitan Toronto and Peel region. Isolates were reported by all hospitals serving residents, and community laboratories serving >80% of residents.
- All laboratories test/refer carbapenem non-susceptible *Enterobacterales* isolates for PCR testing for carbapenemases genes.
- Residence in the population area is defined by postal code. Population data are obtained from Statistics Canada.
- Only the first clinical or blood culture isolate was considered for incidence calculations and for describing the distribution of bacterial species and carbapenemase genes.

Results

- From 2007 to end 2023, 3760 CPE isolates were identified from 1772 patients colonized or infected with CPE.
- Males comprise 56%, median age is 68 years (range 0 days-103 years).
- 810 (46%) persons had ≥1 clinical isolate,
  - 136 (17%) were bacteremic,
  - 64 (8%) had other infections with positive sterile site specimens,
  - 610 (75%) with non-sterile site cultures positive (504 urine only).

Results (Cont'd)

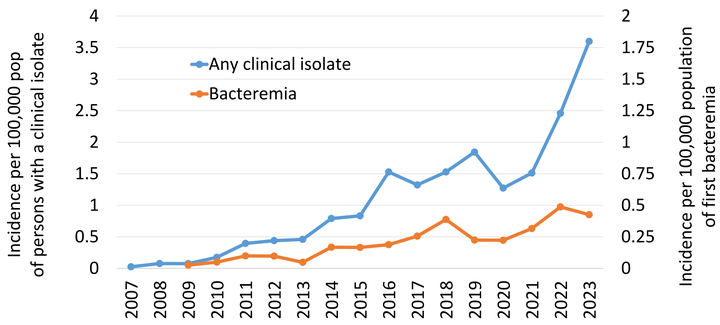

Figure 1. Incidence of 1st clinical isolates and bacteremia in Toronto and Peel.

- There was a 24% decrease in clinical CPE incidence from 2019 to 2020-21 (IRR 0.76, 95%CI 0.57-1.00).
- In 2022 and 2023, clinical CPE incidence increased steeply (compared to 2019, IRR for 2023 was 1.95, 95%CI 1.50, 2.55).

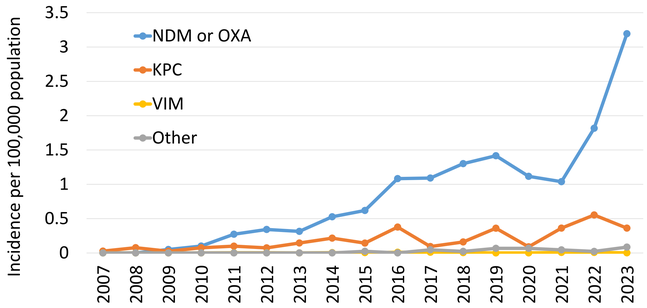

Figure 2. Incidence of CPEs by gene, over Time in Toronto and Peel.

- The incidence of patients with first clinical isolates with NDM- , OXA- and KPC-producing *Enterobacterales* all decreased during the pandemic. (NDM+OXA: 2019 vs 2020-21, IRR 0.76, 95%CI 0.55, 1.05; KPC: 2019 vs 2020-21, IRR 0.62, 95%CI 0.32, 1.23)
- Post pandemic, incidence of patients with NDM- and OXA-producing *Enterobacterales* increased more significantly than other carbapenemases (NDM+OXA: 2023 vs 2019, IRR 2.26, 95%CI 1.39, 3.04; KPC: 2023 vs 2019, IRR 1.01, 95%CI 0.50, 2.02).

Results (Cont'd)

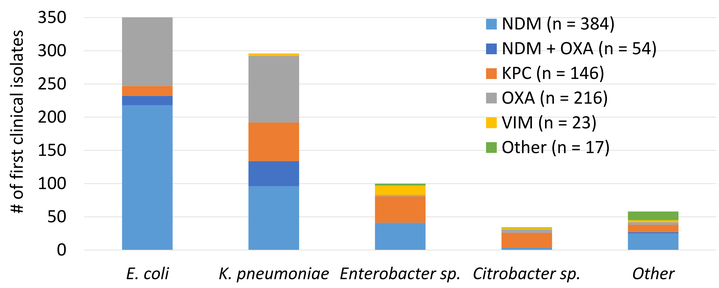

Figure 3. Characteristics of 1st clinical isolates by species and genes of 840 clinical isolates from 810 patients colonized/infected with CPE.

- Most common other species include *Proteus mirabilis* (16), *Klebsiella oxytoca* (10), *Serratia sp*. (10), *Morganella morganii* (9)
- Other genes include IMP (9), NMC/IMI (3), SME (5)

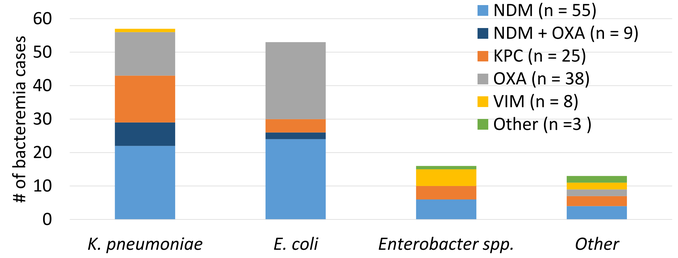

Figure 4. Characteristics of 1st bacteremia cases by species and carbapenamase of 139 isolates from 136 patients.

- Most common other species include *Citrobacter spp*. (4), *Klebsiella oxytoca* (2), *Morganella morganii* (2), *Proteus mirabilis* (2)
- Other genes include IMP (1), NMC/IMI (1), SME (1)

Conclusion

- CPE infections are increasing in Toronto and Peel region, interrupted briefly by the pandemic.
- More effective control of in-hospital transmission is needed to combat this threat to public health.