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Variability in Antimicrobial Use Among Hospitals Participating in the Canadian Nosocomial Infection Surveillance Program

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Background: The association between antimicrobial use (AMU) and emergence of antimicrobial resistance is well documented. The Canadian Nosocomial Infection Surveillance Program (CNISP) has conducted sentinel surveillance of AMU at participating Canadian hospitals since 2009 resulting in the largest pan-Canadian hospital database of dispensed antimicrobials. **Objectives:** Describe interhospital variability of AMU across Canada. **Methods:** Hospitals submit annual AMU data based on patient days (PD). Antimicrobials were measured in defined daily doses (DDD) for adults using the WHO Anatomical Therapeutic Chemical (ATC) system. The AMU data among pediatric patients have been available since 2017 using days of therapy (DOT). Surveillance includes systemic antibacterial agents (J01 ATC codes), oral metronidazole, and oral vancomycin. AMU was assessed using quintiles, interquartile ranges (IQR), and relative IQRs (upper- and lower-quartile values divided by the median). **Results:** Between 2009 and 2018, 20–26 hospitals participated in adult surveillance each year (35 teaching hospitals and 3 nonteaching hospitals participated in ≥1 year). Over this period, overall AMU decreased by 13% at participating adult hospitals from 645 to 560 DDD per 1,000 PD. AMU varied substantially between hospitals, but this variability decreased over time (Fig. 1). In 2009, the IQRs for overall AMU spanned 309 DDD per 1,000 PD, and in 2018 it spanned only 103 DDD per 1,000 PD. This decrease in variability was due to large decreases in use among hospitals with high use in 2009–2010. Among hospitals in the highest use quintile in 2009–2010, AMU decreased, on average, 44 DDD per 1,000 PD each year. Among hospitals in the lowest use quintile in 2009–2010, AMU increased, on average, 6 DDD per 1,000 PD each year. In 2018, antibiotics with the largest absolute IQR variability were cefazolin (61–113 DDD per 1,000 PD), piperacillin-tazobactam (32–64 DDD per 1,000 PD), and vancomycin (24–49 DDD per 1,000 PD). Among antibiotics with ≥1 DDD per 1,000 PD, antibiotics with the largest relative IQR variability were tobramycin (0.3–6 DDD per 1,000 PD), cefadroxil (0.08–9 DDD per 1,000 PD), and linezolid (0.2–3 DDD per 1,000 PD). In 2018, the IQR for overall pediatric AMU (n = 7 teaching hospitals) was 426–581 DOT per 1,000 PD. Antibiotics with the largest IQRs were vancomycin (0.6–58 DOT per 1,000 PD), cefazolin (33–88 DOT per 1,000 PD), and tobramycin (3–57 DOT per 1,000 PD). Among antibiotics with ≥1 DOT per 1,000 PD in 2018, antibiotics with the largest relative IQRs were tobramycin (3–57 DOT per 1,000 PD), cefuroxime (1–6 DOT per 1,000 PD), and amoxicillin (8–42 DOT per 1,000 PD). **Conclusions:** There is wide variation in overall antibiotic use across hospitals. Variation between AMU at adult hospitals has decreased between 2009 and 2018; in 2018, antibiotics with the largest IQRs were cefazolin and piperacillin-tazobactam. Benchmarking AMU is crucial for informing antimicrobial stewardship efforts.

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Figure: Boxplot of overall rate of antimicrobial use (AMU) in defined daily doses (DDDs) per 1000 patient days among adult inpatients at hospitals participating in the Canadian Nosocomial Infection Surveillance Program, 2009–2018

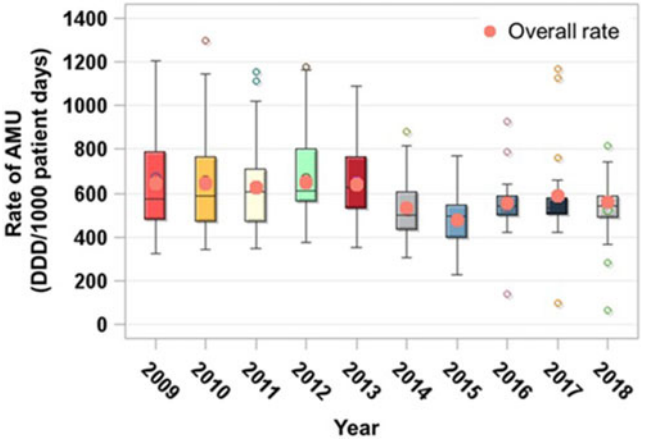

Fig. 1