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Paper Poster Session

Gram-positive and Gram-negative bacteremia

Seasonal peaks in community-acquired Gram-negative rod bloodstream infection: a nationwide cohort study of US veterans

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Background: Seasonal increases of Gram-negative rod (GNR) bloodstream infections in summer have increasingly been recognized. Prior studies were limited by geographic region, short study duration, lack of reliable denominator data, or lack of access to patient demographic profiles. The Veterans Health Administration (VHA) is the largest integrated health care system in the United States (US) with over eight million enrolled patients and a nationwide electronic data warehouse. We aimed to examine the seasonal variability of community-acquired GNR bloodstream infection incidence rates in the VHA population over an 11-year period. Recognition of seasonal variability of infections can improve analysis of quasi-experimental and randomized trial data while also informing surveillance and prevention programs.

Material/methods: This retrospective cohort included all patients admitted to 130 VHA hospitals in 47 continental states of the US with community-acquired bacteraemia due to selected GNRs (*Escherichia coli*, *Klebsiella* sp., or *Pseudomonas aeruginosa*) during 2003-2013. Community-acquired infection was defined as the first positive culture <48 hours from admission and no health care exposure within 90 days prior to admission. The number of unique patients who received care within the VHA system for each month served as the denominator for monthly incidence rates. Seasons were categorized as Winter (January-March), Spring (April-June), Summer (July-September), and Fall (October-December). To account for autocorrelation, autoregressive integrated moving average (ARIMA) models of monthly incidence rates were used to examine the effect of seasonality.

Results: 20,883 episodes of community-acquired GNR bacteraemia (*E. coli*: 14,213; *Klebsiella* sp.: 5,116; *P. aeruginosa*: 1,554) were analyzed. The overall monthly incidence rate was 7.0 (*E. coli*: 4.76; *Klebsiella* sp.: 1.71; *P. aeruginosa*: 0.52) per 100,000 patient-months. Predicted mean incidence rates from autocorrelative models were significantly higher in summer at 7.83 (*E. coli*: 5.29; *Klebsiella* sp.: 1.92; *P. aeruginosa*: 0.63) per 100,000 patient-months (Figure) compared to winter at 6.43 (*E. coli*: 4.41; *Klebsiella* sp.: 1.56; *P. aeruginosa*: 0.46) per 100,000 patient-months. The incidence rate ratio of summer to winter was 1.22 for community-acquired GNR bacteraemia [$p < 0.0001$; *E. coli*: 1.20 ($p < 0.0001$); *Klebsiella* sp.: 1.23 ($P < 0.0001$); *P. aeruginosa*: 1.37 ($p = 0.0001$)].

Conclusions: In a large nationwide cohort over 11 years, we observed significant seasonality of community-acquired GNR bacteraemia with greater than a 20% higher incidence in summer compared

to winter for each analyzed pathogen. Further studies are needed to elucidate the underlying factors responsible for this seasonal trend.

Monthly Incidence Rates of GNR Bacteremia at US Veterans Health Administration System by Season (2003-2013)

