Thirty-day all-cause mortality among patients with bloodstream infections in England caused by Gram-negative bacteria
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INTRODUCTION

• Bloodstream infection (BSI) due to Gram-negative bacteria (GNB) represents a significant cause of morbidity and mortality.
• There have been increases in GNB BSIs reported in Europe and across England.
• Some GNB (e.g. Klebsiella spp.) are strongly associated with healthcare-acquired infections and antibiotic resistance1.
• Our aim was to ascertain the 30-day all-cause case-fatality rates (CFR) for the nine most common GNB BSIs in England.

METHODS

• Voluntary laboratory reported GNB BSIs were extracted from Public Health England’s Second Generation Surveillance System for calendar years 2009-2014.
• Cases caused by the same bacterial species*, from the same patient within 14 days were considered to be one episode.
  *When presenting data by genus, polymicrobial infections within the same genus were considered one episode
• Mortality information was obtained by linkage with the National Health Service (NHS) Spine, a central repository of patient demographic and medical information, using NHS number and date of birth.
  • Patients were lost to follow-up if they could not be linked to the NHS Spine
  • Patients lost to follow-up were excluded from further analysis
• The all-cause 30-day CFR was calculated using all deaths that occurred within 30-days of a positive specimen and the total number of infection episodes linked to the NHS Spine.

RESULTS

• ~250,000 episodes of GNB BSI were reported to PHE between 2009-2014 in England
  • 88% linked with NHS Spine
  • 43,773 identified deaths, overall CFR 19.6
• Of patients who died, 30% did so on the day or the day after the date of specimen collection
  • Range from 22.3% among patients who died following Stenotrophomonas spp. BSI to 38.3% among patients who died following Pseudomonas spp. BSI
• Highest overall CFR for 2009-2014 was among Serratia spp. and Pseudomonas spp. (26.8 and 28.9, respectively)
• Lowest overall CFR for 2009-2014 was among Acinetobacter spp. (11.8)
• CFR was highest among older population (74+ yrs) and the very young (<1 yr)
  • Number of infections low in <1yr olds (<70 deaths following GNB BSI in 2014)
• CFR following E. coli BSI was higher in men for all years (P<0.05), most others CFR higher among women.
• Over the six year period, the CFR for all GNB BSIs decreased (Figure 1)
  • Smallest decline: 0.7% among Serratia spp. BSI (2009: 27.4 vs. 2014: 27.2)
  • Greatest declines, ~20% among:
    • Pseudomonas spp. BSI (2009: 32.2 vs. 2014: 25.6)
    • E. coli BSI (2009: 20.0 vs. 2014: 15.9)
    • Klebsiella spp. BSI (2009: 25.3 vs. 2014: 19.2)
• However, the incidence of GNB BSIs has changed between 2009 and 2014:
  • Increased by 10% for Klebsiella spp. (from 10.8 to 11.8 per 100,000 population)
  • Increased by 20% for E. coli (from 43.8 to 52.8 per 100,000 population)
• Led to increase in number of deaths following these BSI (Figure 2):
  • E. coli (n=3,669 in 2009 to n=4,405 in 2014)
  • Klebsiella spp. (n=1,107 in 2009 to n=1,140 in 2014)
• Leading to an overall (9.5%) increase in deaths within 30-days of onset of GNB BSI from 6,915 in 2009 to 7,574 in 2014.

DISCUSSION

• While the CFR following E. coli BSI (15.9) was lower than that following the majority of the other GNB BSIs, the relatively high incidence of this BSI results in the largest number of deaths (n=4,405, 58% of deaths following GNB BSI) in 2014.
• Differences in CFR and time to death observed between genera, and within genera between age groups, gender and species were noted but current surveillance scheme does not provide data on comorbidities, source of bacteraemia, prescribing data or date of admission to determine if BSI was hospital-acquired.

CONCLUSIONS

• While the CFR for the most common GNB BSIs declined between 2009-2014 in England, the overall number of deaths increased over the same period, mainly due to the growing number of E. coli and Klebsiella spp. BSIs.
• In England government policy regarding healthcare-associated infections has focused on, and seen great success, in controlling MRSA and CDI.
• With policy now changing to a focus on the reduction of antimicrobial resistance, infections caused by Gram-negative bacteria will have to be addressed.
• Further surveillance should be directed towards enhancing our understanding of the underlying epidemiology and outcomes of these important infections.

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REFERENCES