National bloodstream infection surveillance in Switzerland 2008-2014: Patterns and trends differ between university and community hospitals

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INTRODUCTION

- Demographic changes and advances in medical technology have changed the epidemiology of bloodstream infections over the last decades, resulting in a shift in the pathogen spectrum toward Gram-negative bacteria (1). As epidemiology guides empiric antimicrobial therapy, it needs to be reassessed periodically.

- While a new category of healthcare-associated bloodstream infections to distinguish “true” community acquisition from those with previous healthcare exposure has been validated (2), the distinction between university centers (UH) and community hospitals (CH) has received less attention (3).

- The present study elucidates the epidemiology, etiology and temporal changes of bloodstream infection episodes (BSI) in community and university hospitals in Switzerland from 2008 to 2014, using data accrued by the national bloodstream infection surveillance database.

METHODS

Design and setting

We conducted a longitudinal, observational, retrospective, multicenter study on BSI in Switzerland from 2008 to 2014. Data on BSI were obtained from the national bloodstream infection surveillance database (ANRESIS), which collects microbiological data from laboratories of different hospitals. We restricted the dataset to 26 acute-care hospitals (33.7% of all Swiss acute-care hospital beds) that continuously reported BSI information throughout the study period.

Definitions

Positive cultures were grouped as a bloodstream infection episode (BSI) if they occurred within a 7 day-window in an individual patient. If another set of cultures was obtained >7 days after the most recent positive blood culture result, it was considered a separate episode.

Contaminant episodes were defined as episodes including only one positive culture of a typical contaminant microorganism (coagulase-negative staphylococci, Corynebacterium spp., etc.) isolated from the analysis. A BSI was defined as polymicrobial if different microbial species were isolated ≥2 cultures within the same episode.

Analysis and statistics

Descriptive statistics were used to compare selected categories of pathogen and exposure. The ANRESIS database is funded by the Federal Office of Public Health, the Conference of Cantonal Health Ministers and the University of Bern, Switzerland.

RESULTS

- The present study analyzed a total of 42,802 bloodstream infection episodes. The most common etiologies were E. coli (28.3%), S. aureus (12.4%) and polymicrobial bloodstream infections (14.1%). The proportion of E. coli increased from 27.1% in 2008 to 28.6% in 2014 (p<0.04).

- E. coli and S. aureus were more commonly reported in CH (34.3% vs 22.7%, p<0.001 and 13.9% vs 11.1%, p<0.001, respectively). Fifty percent (21'308) of episodes were CA, with E. coli again being more common in CHs (41.0% vs 32.4%, p<0.001). The proportion of E. coli in CA bloodstream infections even increased over time in CH. In contrast, CA-polymicrobial infections (9.9% vs 5.6%, p<0.001) and CA-CoNS (6.7% vs 4.8%, p<0.001) were more prevalent in UH, and their frequency in UH was more pronounced in the HA subset of bloodstream infections.

Conclusion: E. coli’s role as predominant pathogen in bloodstream infections in Switzerland has recently become more pronounced. There are distinct patterns in CHs and UHs, potentially influencing empiric antibiotic treatment.

Table 1: Characteristics of the four major microorganism groups

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Community Acquired (%)</th>
<th>Hospital Acquired (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>28.3%</td>
<td>29.6%</td>
</tr>
<tr>
<td>S. aureus</td>
<td>12.4%</td>
<td>10.0%</td>
</tr>
<tr>
<td>CoNS</td>
<td>12.4%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Polymicrobial</td>
<td>14.1%</td>
<td>12.2%</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- E. coli maintained a predominant role in BSI’s, its importance becoming even more pronounced.

- S. aureus was the second most frequent pathogen identified, predominated in hospital-acquired infections in community hospitals, and saw its prevalence decrease between 2008 and 2014.

- Difficult to treat infections. CoNS and polymicrobial BSIs remained important, especially in the hospital-acquired subset and in university hospitals.

- To our knowledge, this is the first nationwide study describing a divergent epidemiology of BSI between community hospitals and university hospitals, with E. coli representing almost 50% of episodes in community-acquired BSI in community hospitals in 2014.

- The choice of empiric antibiotic treatment should be based on local epidemiology considering the type of hospital. A reduced use of broad-spectrum antimicrobial agents (e.g., antibiotics against Oxacillin-resistant strains) could be envisioned for the treatment of CA and HA infections in community centers.

REFERENCES