Epidemiology and outcomes of hospital-acquired bloodstream infections in intensive care unit patients: the EUROBACT-2 international cohort study

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RESEARCH AIM

To update the **epidemiology of hospital-acquired blood stream infections** (HA-BSI) in ICU patients.

To investigate **factors associated with 28-day mortality** in patients with HA-BSI.

BACKGROUND

HA-BSI are frequent in ICU patients with an associated mortality of 36-42%.

The EUROBACT-1 study highlighted in 2012 the prevalence of multidrug-resistant organism among ICU patients with HA-BSI and identified an association with increased risk of death.

Larger studies are required to identify potential modifiable factors associated with poor prognosis.

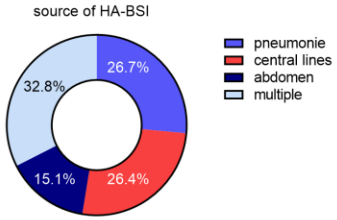
METHODS

Design: Prospective, observational, multi-centric cohort study.

Population: Adult patients (>18 years of age) treated in ICU.

Exposure: HA-BSI defined as a positive blood culture sampled > 48h of hospital admission.

Statistic: Wilcoxon rank-sum test and Fisher's exact test for the comparison of continuous and categorial variables. Three-tiered hierarchical logistic mixed model and a subdistribution hazard frailty model to identify factors associated with death at day-28.



RESULTS

2600 patients, from 333 ICUs in 52 countries were enrolled (June 2019 to January 2023).

Isolated pathogens:

59% Gram-negative
(27.9% Klebsiella spp., 20.3% Acinetobacter spp., 15.8% E.coli, 14.3% Pseudomonas spp.)
31.1%Gram-positive
(34.5% Enterococcus spp., 30% coagulase negative staphylococci, 27.6% Staphylococcus aureus)
2.1% strict anaerobe bacteria
7.9% fungi
(39.6% C. albicans, 57.8% non-candida albicans, 2.6% others)

Resistency:

Carbapenem-resistance was present in 37.8% Klebsiella spp., 84.6% Acinetobacter spp., 7.4% E. coli and 33.2% Pseudomonas spp. 37.1% of Staphylococcus aureus were MRSA.

Difficult to treat resistance (resistance to all first line antimicrobials) and pan-drug resistance (resistance to all tested antimicrobials) was present in 23.5% and 1.5% of Enterobacterales, Pseudomonas spp. and Acinetobacter spp.

Mortality

37.1% of patients have died until day-28.

Mortality was associated with: Medical ICUs, lower availability of clinical pharmacists or therapeutic drug monitoring (TDM) for aminoglycosides and vancomycin, co-morbidities, higher severity of illness, respiratory source, COVID-19 infection, sepsis and septic shock, difficult-to-treat resistant gram-negative bacteria or fungus, not receiving the adequate antimicrobial treatment and failing to achieve source control.

SIS COMMENTS

The EUROBACT-2 study provides valuable insights into HA-BSI within the ICU, based on a substantial international cohort. It underscores the significant day-28 **mortality rate**, particularly in cases involving multidrug-resistant pathogens, septic shock, and inadequate antibiotic therapy or source control. While the pathogen distribution aligns with previous research, this study delves deeper into factors associated with 28-day mortality, shedding light on potential avenues for enhancing patient care through clinical implementation.

Notably, the role of **clinical pharmacists** emerges as a critical factor. The study reveals that only 25.5% of participating ICUs have access to round-the-clock clinical pharmacist consultation. Intriguingly, odds ratios for 28-day mortality increased when such consultation was limited to business days (OR 1.32, 95% CI 0.99-1.78) or provided sporadically or not at all (OR 1.64, 95% CI 2.21-2.24). This underscores the vital role of clinical pharmacologists in ensuring the safe and effective use of antimicrobial treatments.

Another significant finding pertains to **therapeutic drug monitoring** (TDM). The study highlights the importance of daily availability of TDM for aminoglycosides and vancomycin. Further investigation into a direct causal relationship between these risk factors and mortality would yield valuable insights and help determine whether broader implementation of these measurements in clinical practice should be advocated.

An additional noteworthy finding is the association of mortality with timely **delay in receiving appropriate antimicrobial treatments**. While the complete absence of adequate treatment is understandably associated with an increased risk of mortality, a simple delay of up to 5 days does not appear to show any association with the outcome. This finding challenges the current practice, which typically involves early broad antimicrobial coverage (sometimes including resistance species) followed by secondary narrowing as a key principle. Further investigations into this topic would be of significant interest, especially given the increasing prevalence of multi-resistant organisms with current practice.

In summary, this study offers a novel and intriguing insight into factors associated with increased mortality among patients hospitalized in the ICU with HA-BSI. It lays the groundwork for potential future strategies to improve the outcomes of these patients, making a significant contribution to the field of critical care and infectious diseases.

