

Rossana Rosa MD^{1,2}; Jose G. Castro² MD, Dennise Depascale MT³, Adriana Jimenez MPH, MLS³, L. Silvia Munoz-Price MD, PhD⁴.

¹Department of Medicine, Jackson Memorial Hospital, Miami, FL; ²Department of Medicine, Division of Infectious Diseases, University of Miami Miller School of Medicine, Miami, FL; ³Department of Infection Control, Jackson Memorial Hospital, Miami, FL; ⁴Institute for Health and Society and Department of Medicine, Medical College of Wisconsin, Milwaukee, Wisconsin

Abstract

Background: Infections with carbapenem-resistant Enterobacteriaceae (CRE) carry high mortality rates. Identification of risk factors for development of infections may aid in rapid initiation of optimal antibiotic therapy. We aimed to determine if colonization with CRE detected through active surveillance cultures had an impact on the development of CRE bloodstream infections (BSI).

Methods: Retrospective cohort study conducted at a 1500-bed county teaching hospital located in Miami, Florida, from August 2013 to August 2015. We included all patients consecutively admitted to the surgical intensive care unit (SICU) that had at least one surveillance culture done. Patients with evidence of CRE BSI prior to performance of first surveillance culture were excluded. Rectal and tracheal aspirate (if intubated) cultures were performed upon admission to the unit and weekly thereafter. Swabs were streaked on MacConkey agar plates containing 10 ug ertapenem disc and 10 ug meropenem discs and incubated overnight at 37°C. Colonies were then selected based on color and morphology. Final identification and susceptibilities were performed using Vitek II. The main outcome of interest was CRE BSI during index hospitalization. Relative risks and 95% confidence intervals (CI) were determined.

Results: 1581 patients were included in the analysis, and 58 (3.7%) had CRE on surveillance cultures. 10 patients developed CRE BSI, out of which 4(40%) had evidence of CRE colonization prior to BSI. The risk of CRE BSI among surveillance positive patients was 6.89% (4/58). The risk of CRE BSI among surveillance negative patients was 0.39% (6/1523). The relative risk for the development of CRE BSI among surveillance positive patients compared to surveillance negative patients was 17.5 (95% CI: 5.1-60.3; p-value<0.0001).

Conclusion: CRE colonization is a strong risk factor for the subsequent development of CRE BSI.

Background

- In 2012, it was estimated that 4% of US hospitals and 18% of long-term acute care hospitals had at least one patient with a CRE infection.
- Invasive infections due to CRE carry mortality rates ranging from 40 to 50%.
- Risk factors for development of invasive infections with CRE include organ or stem-cell transplantation, mechanical ventilation, exposure to antimicrobials, prolonged hospital stay.
- Risk factors associated with acquisition of CRE include poor functional status and intensive care unit (ICU) stay.
- We aimed to determine if colonization with CRE detected through surveillance cultures had an impact on the development of CRE bloodstream infections.

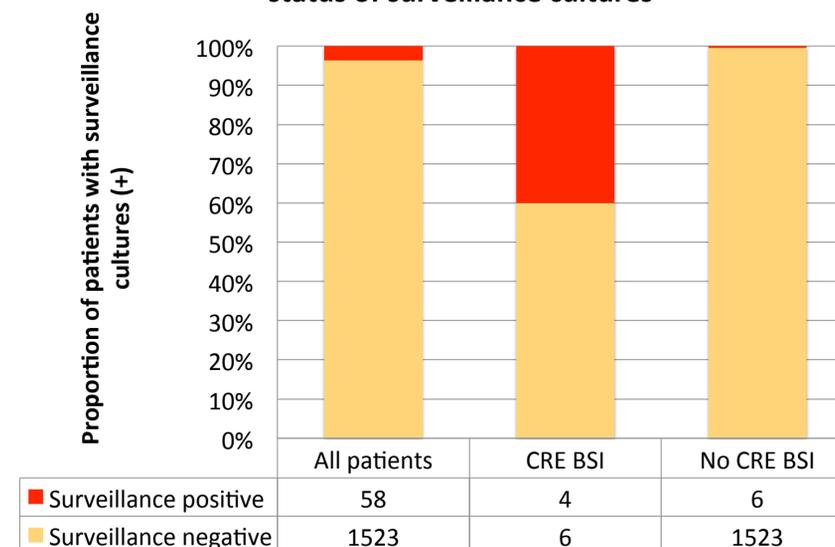
Methods

- Retrospective cohort study conducted at a 1500-bed county teaching hospital in Miami, FL. The study period spanned from August 2013 to August 2015.
- We included all patients consecutively admitted to the surgical intensive care unit (SICU) that had at least one surveillance culture done. Patients with evidence of CRE BSI prior to obtaining a surveillance culture were excluded.
- Surveillance cultures were performed upon admission to the unit and weekly thereafter. This included rectal swabs, and in mechanically ventilated, lower respiratory cultures.
- Swabs were streaked on MacConkey agar plates containing 10 ug of ertapenem disc and 10 ug of meropenem disc and incubated overnight at 37 C. Colonies were then selected based on color and morphology. Final identification and susceptibilities were performed using the Vitek II system.
- Relative risks for the development of CRE BSI during index hospitalization were calculated.

Results

- A total of 1581 unique patients had at least one surveillance culture done.
- Fifty-eight patients (3.7%) had surveillance cultures with CRE.
- Ten patients (0.6%) had bloodstream infections with CRE.
- The risk of CRE BSI among surveillance positive patients was 6.89% (4/58).
- The risk of CRE BSI among surveillance negative patients was 0.39% (6/1523).
- The relative risk for the development of CRE BSI among surveillance positive patients compared to surveillance negative patients was 17.5 (95% CI: 5.1-60.3; P-value <0.0001).
- A graphic depiction of this association is shown in Figure 1.

Figure 1. Risk of bloodstream infection based on status of surveillance cultures



Conclusion

- Colonization with carbapenem-resistant Enterobacteriaceae is a strong risk factor for the subsequent development of CRE bloodstream infections.
- Strategies aimed at preventing patient acquisition of CRE should be explored.