An Evaluation of Meropenem Use and Resistance in a Mixed Medical/Surgical Intensive Care Unit
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ABSTRACT
Background: Carbapenem use pressures applied to bacteria in the hospital provide a competitive advantage for nosocomial pathogens resistant to frequently utilized antimicrobials. Through this mechanism, non-fermenting Gram-negative bacilli (NFGNB) may become more prominent nosocomial pathogens as carbapenems are overused. Moreover, carbapenem use in hospitals and specific care units has been associated with increased rates of resistance among isolated pathogens. Better understanding of the relationship between use of and resistance to meropenem (MEM) may promote judicious use of this last-line agent in the intensive care unit (ICU).

Methods: Criteria for use with prospective audit and feedback was established for MEM at an urban community teaching hospital in September 2015. Antimicrobial utilization and susceptibility patterns of NFGNB from clinical cultures obtained from patients in a mixed medical-surgical ICU were collected from January 1, 2013 to June 30, 2016. Days of therapy per 1000 patient-days (DOT/1000PD) was utilized to describe use of MEM. All clinical isolates of target organisms collected in the ICU were analyzed. Only the first isolate for a patient was included. MEM-resistant NFGNB rates were evaluated as number of isolates per 10,000PD (MEM-NFGNB) January 2013 to August 2016 (pre-intervention) and September 2015 to October 2016 (post-intervention). Groups were compared using Mann Whitney U test for categorical variables.

Results: The antimicrobial stewardship (AS) intervention led to decreased MEM utilization from 81 (pre-intervention) to 37 DOT/1000PD (post-intervention; P<0.001). Additionally, fewer patients received at least one dose of MEM per month in the post-intervention group (19 vs 14 median; P=0.011). MEM-NFGNB were isolated from clinical cultures less frequently following the intervention (15.4 vs 3.3; P<0.001). A reduction in Stenotrophomonas maltophilia (10.2 vs 3.1 isolates/10,000PD; P=0.014) was also observed after the intervention.

Conclusion: Decreased MEM use following an AS intervention in a mixed ICU was associated with a reduction in MEM-NFGNB. Further investigation of strategies to reduce use of MEM is warranted.

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RESULTS

Figure 1. Meropenem Use and Resistance in ICU by Quarter
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BACKGROUND

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REFERENCES
6. McDougall BCPS, Tung MD; Ed Desai T, Essaied J, Hittle F. Antimicrobial use and resistance in ICU by Quarter

Figure 3. Anti-Pseudomonal Beta-lactam use in ICU by Quarter

CONCLUSIONS

• Establishing criteria for use with prospective audit and feedback by critical care pharmacists in a mixed medical-surgical ICU was associated with:
  • Decreased utilization of meropenem
  • Decreased identification MR-GNB pathogens
  • Decreased S. maltophilia identification
  • Fewer ESBL-producing pathogens were identified post-intervention
  • Meropenem (and all carbapenems) is vital to combat multidrug-resistant organisms and their utility should be considered in the clinical context of each patient

• Strategies focused on limiting use of these agents may lead to less carbapenem-resistant isolates Further investigation of identifying patients warranting empiric carbapenems due to the risk of infections caused by ESBL-producing bacterial pathogens is warranted

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Table 1. Meropenem Use and Resistance in ICU by Quarter

Table 2. MR-GNB Specimen Types

Statistical Analysis:
Groups were compared using Mann Whitney U test for continuous variables and Fisher’s exact or chi-square test for categorical variables. All statistical analyses were performed using SPSS Statistics, version 24.0 (Chicago, IL, USA). For all analyses, a p value of <0.05 was considered statistically significant.

GBL

Figure 2. MR-GNB Specimen Types

Definitions:
DOT: Represents administration of a specific medication on a calendar day
PD: Number of patients present in the ICU for any portion of a calendar day
MEM: Carbapenem-sensitive beta-lactam phenotype (MIC) testing as intermediate or resistant to MEM. MEM-NFGNB were isolated from clinical cultures less frequently following the intervention (15.4 vs 3.3; P<0.001). A reduction in Stenotrophomonas maltophilia (10.2 vs 3.1 isolates/10,000PD; P=0.014) was also observed after the intervention.