



Trend in Resistant Gram Negative Organisms in Children: Role of an Antimicrobial Stewardship Program

John Lyles, MD; Benjamin Hammer, PharmD; Victoria Basalyga, PharmD, BCPS; Bryan Stierman, MD, MPH;
Joseph Campos, PhD; Nalini Singh, MD, MPH.

George Washington University, Children's National Health System, 111 Michigan Ave NW, Washington, DC 20010

Background:

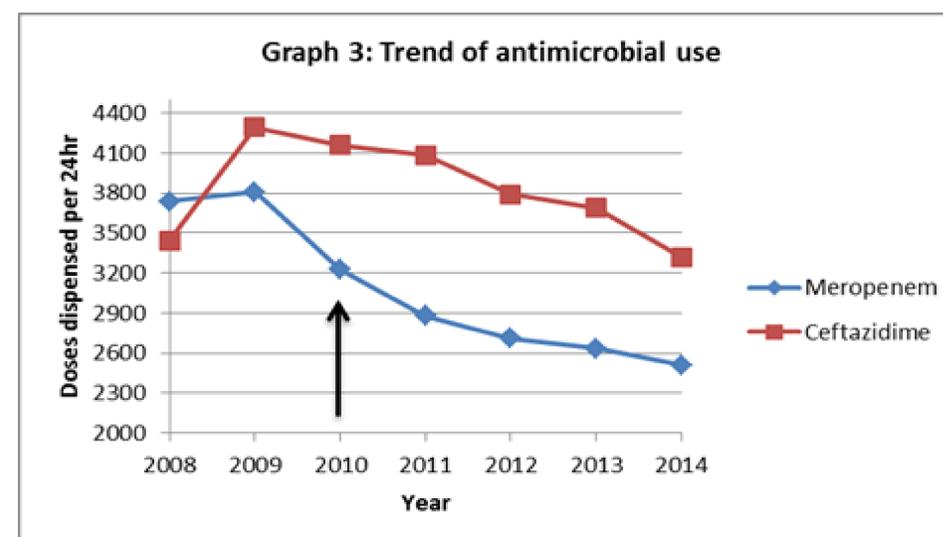
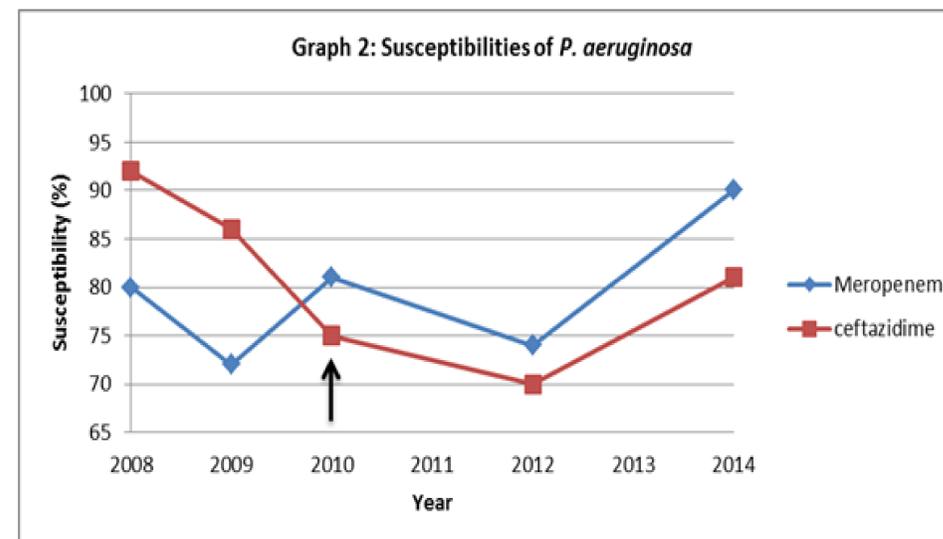
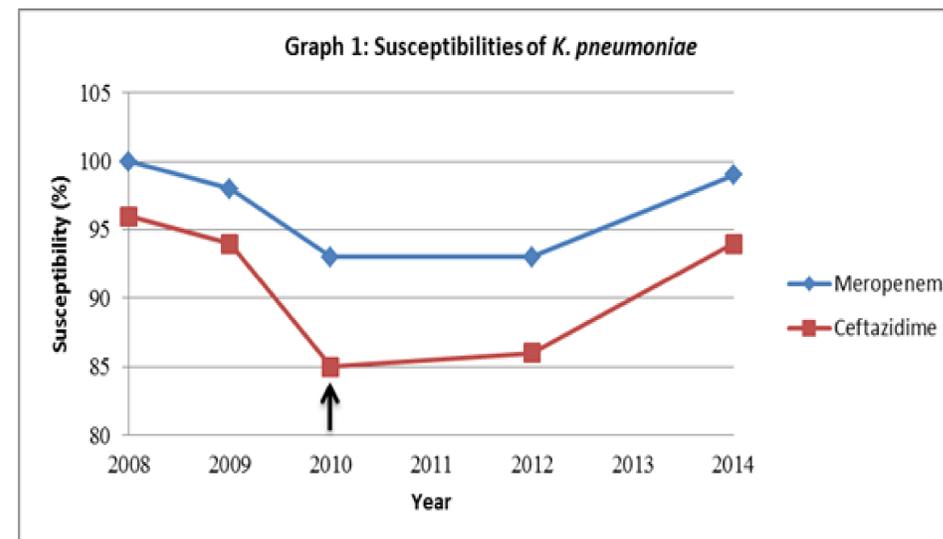
Antimicrobial resistance is a concerning reality in children. Carbapenem resistant enterobacteriaceae and extended spectrum beta lactamase (ESBL) producers are of a growing global concern due to limited treatment options and are listed as priority pathogens in the World Health Organization's (WHO) Global Antimicrobial Resistance Surveillance System. To that end, antimicrobial stewardship programs are implemented in order to optimize antimicrobial use. In 2010 Children's National instituted a prospective, targeted, audit-based antimicrobial stewardship program. This study evaluated the efficacy of that stewardship program focusing on gram negative rod (GNR) WHO priority pathogens.

ASP implementation:

- Unit Pharmacist/Infectious Disease (ID) Pharmacist (VB) identified patients on Vancomycin and Meropenem ≥ 72 hours.
- Antimicrobial Stewardship Program/ID attending reviewed microbiology culture results and electronic medical record for infectious disease related diagnosis and underlying disease.
- ASP/ID attending verbally communicated and documented in medical record recommendations to unit pharmacist regarding ability to safely de-escalate antimicrobial use.

Methods:

- Retrospective analysis of Children's National antibiograms from 2008-2015 analyzed for trends in antimicrobial resistance focusing on WHO priority pathogens and correlating antibiotics of concern.
- Focus was narrowed to GNR, in particular *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* as these had the most significant trends in growing resistance prior to initiation of targeted, prospective-audit based ASP in 2010.
- Antimicrobial use calculated based on doses of Meropenem and Ceftazidime dispensed divided by standard dosage frequency.



Results:

- The susceptibility of *K. pneumoniae* (n=1214) to Meropenem and Ceftazidime was 93% and 85% respectively in 2010. In 2014 both had increased to 99% and 94% respectively (graph 1).
- The susceptibility of *P. aeruginosa* (n=2433) to Meropenem was 72% in 2009 while Ceftazidime was 70% in 2012. In 2014 both had increased to 90% and 81% respectively (graph 2).
- Amount of Meropenem and Ceftazidime dispensed decreased by 22% and 20% respectively (graph 3).

Discussion:

A targeted, prospective, audit based ASP was implemented in 2010 focusing on 72 hour review of Meropenem and Vancomycin (data not presented). There is a temporal association between the increased susceptibilities of *K. pneumoniae* and *P. aeruginosa* to Meropenem and decrease in Meropenem use. Of note for nosocomial sepsis, Piperacillin-tazobactam, Aminoglycoside, and Vancomycin became preferred empiric therapy unless patient had a history of ESBL/IBL organisms or clinical deterioration on above regimen.

Limitations and next steps:

- Retrospective data analysis suggests temporal association that should be confirmed with prospective study.
- Next step is to analyze susceptibilities of *K. pneumoniae* and *P. aeruginosa* to Ciprofloxacin, Piperacillin-Tazobactam, and Aminoglycoside and the use of aforementioned antimicrobials.
- Comorbidity and other risk factor analysis contributing to observed trends was not accounted for.

Acknowledgements:

Authors acknowledge Drs. David Hyun and Richard Parrish as the designated Infectious Disease and Pharmacy co-directors of the Antimicrobial Stewardship Program at Children's National for their key roles in its implementation. Also a special thanks to Dr. Rana Hamdy for her helpful suggestions.