Impact of Pharmacist – led Antimicrobial Stewardship in the Intensive Care Unit: One Year Pre- and Post – implementation

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Abstract

Background: High rates of antimicrobial use and increasing antimicrobial resistance make intensive care units (ICUs) ideal targets to implement antimicrobial stewardship programs (ASPs). The purpose of this investigation was to determine if the implementation of a pharmacist-led ASP in a community hospital ICU decreased antimicrobial utilization and improved antimicrobial susceptibilities.

Methods: An ASP was established at a community teaching hospital in July, 2013, with 32 acute-adaptable ICU beds. The program was led by an infectious diseases-trained pharmacist who worked daily with a critical care pharmacist rounding with the ICU care team to make ASP interventions. Prospective audit with intervention and feedback began in October, 2013. We chose to compare 12 months of pre-ASP data with 12 months of post-ASP data. Data collected included antimicrobial use and susceptibility trends. Groups were compared using t test or chi-square tests. Antimicrobial susceptibility was compared from 2012 - 2014. ASP interventions were characterized by type and rate of acceptance for all patient admitted to the ICU between October 1, 2013 and September 30, 2014.

Results: In the first year of ASP implementation 1349 ICU interventions were made with an acceptance rate of 96.2%. The majority of interventions were de-escalating or discontinuing antimicrobial therapy (49.6%), dose optimization (15.5%), and intravenous to oral conversion (12.7%). Carbapenem utilization decreased by 77% (leupenem DDD mean: 10.9 vs 4.1, p < 0.001; ertapenem DDD mean: 35.4 vs 4.3, p < 0.001) while fluoroquinolone utilization decreased by 66% (levofloxacin DDD mean: 207.5 vs 72.3, p < 0.001; ciprofloxacin DDD mean: 68.6 vs 32.5, p < 0.001). Pseudomonas aeruginosa susceptibility to ciprofloxacin in the ICU increased by 33% (57% 2012, 68% 2013). Carbapenem use decreased by 60% (levofloxacin DDD mean: 207.5 vs 72.3, p < 0.001; ertapenem DDD mean: 35.4 vs 4.3, p < 0.001) while fluoroquinolone utilization decreased by 66% (levofloxacin DDD mean: 207.5 vs 72.3, p < 0.001). The majority of interventions were de-escalating or discontinuing antimicrobial therapy (49.8%), dose optimization (15.5%), and intravenous to oral conversion (12.7%).

Conclusions: A pharmacist-led ASP in a community teaching hospital ICU significantly impacted antimicrobial prescribing, reduced antimicrobial utilization, and improved antimicrobial susceptibility trends among Gram-negative organisms.

Background

- Antibiotic use is the single most important factor leading to antimicrobial resistance
- The CDC affirms that up to 50% of all antibiotics are prescribed incorrectly or unnecessarily
- Inpatient antimicrobial stewardship programs (ASPs) within acute care hospitals have been shown to improve patient outcomes, shorten length of stay, reduce antimicrobial resistance, and are cost effective
- ASPs initiated in the ICU have shown to decrease antimicrobial utilization, length of stay, and cost and are prime targets for ASP intervention due to the high rate of antimicrobial use

Methods

Primary objective: To assess the impact of a pharmacist-led inpatient antimicrobial stewardship program in a community teaching hospital ICU one year following program implementation.

Study Setting: Mercy Health Saint Mary’s Hospital in Grand Rapids, Michigan

Pharmacist-led ASP began in July 2013 with audit and intervention with feedback beginning in October 2013.

- 1.0 FTE ASP pharmacist, 0.1 FTE ASP physician

Study Design: Retrospective, pre-post intervention study

Inclusion Criteria: ≥ 18 years of age

- Admitted to ICU-adapted or general medical-adapted bed
- Receipt of systemic antimicrobial therapy

Population: All ICU patients requiring antimicrobial stewardship intervention

n = 1363

Data Collected: Intervention characteristics

- Type, acceptance rate
- Antimicrobial utilization trends
- Defined Daily Doses (DDD) per 1000 patient days
- Antimicrobial susceptibility trends

Analysis: Descriptive analysis was used to characterize intervention characteristics and susceptibility trends

Antimicrobial use pre-and post-ASP initiation was compared using the Students’ t test

Results

Antimicrobial Use Trends

- Significant decrease in the use of carbapenems
- Fluoroquinolones
- Piperacillin/tazobactam
- Vancomycin

- Significant increase in the use of Cefepime
- Ampicillin/sulbactam
- Cefazolin

ICU Prescribing

- Average daily ICU census of 28 patients
- 15 to 20 patients receiving antibiotics daily
- 1363 patients requiring antimicrobial stewardship intervention over 12 months

- Mean: 113 interventions /month

- Fluoroquinolones, Carbapenems, Cefepime
- Antimicrobial Restriction

- Initiated in March 2014

ASPs included

- Empiric therapy guidelines
- IV to PO
- Dose adjustment

Conclusions

- Pharmacist-led ASP in the ICU significantly impacted antimicrobial prescribing
- High rate of intervention acceptance
- Reduced prescribing of carbapenems, fluoroquinolones, cephalosporins
- Susceptibility of Gram-negative organisms to fluoroquinolones and beta-lactams improved in the year following ASP implementation

References