Characteristics of Prospective Audit and Feedback in a Pediatric Cardiovascular Intensive Care Unit

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Background

- Prospective audit and feedback (PAF) is considered a core component of antimicrobial stewardship programs (ASP).
- Vulnerability and complexity of critically ill patients may hinder antimicrobial reduction in the intensive care unit (ICU), an area of high antimicrobial use.
- Pediatric ICU interventions have included the implementation of computer-assisted decision support at the time of antibiotic ordering, the measurement of biomarkers at sepsis onset to identify children at low risk for bacterial infection, and institution-specific guidelines for empiric antibiotic use.
- PAF in the pediatric cardiovascular intensive care unit (CVICU) has not been previously reported.

Objectives

- Describe characteristics of PAF recommendations (PAFR) and acceptance in a pediatric CVICU after PAF implementation.
- Compare antimicrobial utilization before and after PAF implementation.

Methods

Setting

- 20-bed pediatric CVICU that serves a wide range of cardiac patients, including cardiac surgery and transplantation.
- A formal PAF program was implemented in our institution's pediatric CVICU on 12/07/15.

Prospective Audit and Feedback Program

- Audits of antimicrobials active ≥ 72 hr were performed by the ASP Pharmacist and reviewed with the ASP Medical Director, before being communicated to the CVICU Pharmacist.
- CVICU Pharmacist communicated PAF to the medical team and adherence was assessed within 48 hrs.

Study Cohort

- PAF audits for patients admitted to the Lucile Packard Children’s Hospital CVICU between 12/07/15 – 11/30/16 were reviewed.

Study Endpoints

- PAF audits, recommendations, and recommendation acceptance were evaluated.
- Monthly days of therapy (DOT) per 1000 patient days from 06/01/15 – 11/30/16 were included for antimicrobial utilization evaluation.
  - Broad spectrum gram-negative antibiotics (GN ABX) included: ampicillin/subactam, ceftazidime, ceftriaxone, ciprofloxacin IV & PO, gentamicin, levofloxacin IV & PO, meropenem, moxifloxacin IV & PO, piperacillin/tazobactam (Pip/Taz), ticarcillin, tobramycin IV, and trimethoprim-sulfamethoxazole.
  - Broad spectrum gram-positive antibiotics (GP ABX) included: daptomycin, linezolid IV & PO, vancomycin IV.
- Mann-Whitney U was used to compare median DOT per 1000 patient days before and after implementation of PAF.

Results

- Figure 1a. Audit Recommendation Rate and Acceptance, by Antimicrobial Class
- Figure 1b. Audit Recommendation Rate and Acceptance, by Antimicrobial
- Figure 2. Audit Recommendation Rate and Acceptance, by Infectious Problem
- Figure 3. Audit Recommendation Acceptance, by Recommendation Type
- Figure 4. Antimicrobial Utilization (DOT/1000 Patient Days)

Discussion

- One third (156/474) of antimicrobial orders audited in a CVICU resulted in a PAFR.
- The PAFR acceptance rate was greater than 70% across all antimicrobial classes.
- The most common reason for not following a PAFR was agreement by the medical team.
- Broad spectrum GN and GP ABX were the antimicrobials most likely to have a PAFR; however, PAFR on antifungals had the highest acceptance rate.
- Vancomycin accounted for the majority of broad spectrum GP ABX audits and piperacillin/tazobactam accounted for the majority of broad spectrum GN ABX audits. The majority of PAFR were for these antibiotics and the acceptance rate was 71%.
- Sepsis was the most common infectious problem with a PAFR (37% recommendation rate/76% acceptance) and antimicrobial discontinuation was the most common PAFR (68% of recommendations/72% acceptance).
- A decrease in median DOT per 1000 patient days was observed in the year after implementation of PAF compared to the previous 6 months (p = 0.08).
- There was a statistically significant decrease in median DOT per 1000 patient days for broad spectrum GP ABX following PAF implementation (p = 0.02).

Limitations

- Our success/failure may be related to working through the CVICU Pharmacist. PAF programs that communicate to someone other than a unit-based pharmacist may have a different experience.
- Other variables impacting antimicrobial utilization, including patient acuity and new protocol/guideline initiation, were not captured.

Conclusions

- The majority of audits with a recommendation were for vancomycin and piperacillin/tazobactam, the most common recommendation was to stop antibiotics, and the most common infectious problem was sepsis. The majority of recommendations were accepted.
- Implementation of prospective audit and feedback in a pediatric CVICU resulted in a significant reduction in broad spectrum gram-positive antibiotic utilization.
- Overall antimicrobial utilization trended downward during the study period compared to the 6 months prior to PAF implementation.

Future Initiatives

- Further evaluation of PAF recommendation type may identify potential opportunities for practice standardization.
- CVICU-specific opportunities for standardized antimicrobial utilization may include prophylaxis for extracorporeal membrane oxygenation (ECMO) and ventricular assist device (VAD) implantation.