

# Implementation and Impact of Antimicrobial Stewardship in a Neonatal Intensive Care Unit

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## Abstract

**INTRODUCTION:** Inappropriate administration and prolonged duration of antibiotics in neonates increases morbidity and mortality in pediatric patients.<sup>1</sup> IDSA, Pediatric Infectious Disease Society of America, and Society of Epidemiology of America advocate for antimicrobial stewardship programs in pediatric patients.<sup>2</sup>

**METHODS:** In 2019, Texas Health Presbyterian Dallas (THD) developed guidelines for prophylactic antibiotic use in neonates and a pharmacy specific antibiotic monitoring dashboard. After education and implementation of antibiotic guidelines and monitoring dashboard, a retrospective chart review was performed. This retrospective chart review evaluated neonates and infants who were admitted to THD and who had an active order for ampicillin, nafcillin, gentamicin or vancomycin, both before and after the implementation of antibiotic use guidelines. The primary outcomes included the decrease in antibiotic days of therapy per 1000 patient-days and the number and types of pharmacist driven interventions.

**RESULTS:** A total of 243 patients were included in the study. There were 132 patients in the period before antibiotic use guideline introduction (preASP), and 111 patients in the period after antibiotic use guideline introduction (postASP). Overall neonatal and infant days of antibiotic therapy per 1000 patient-days decreased in the time period after the implementation of antibiotic use guidelines. In the preASP period, there were 253 antibiotic days of therapy per 1000 patient-days compared to 214 antibiotic days of therapy per 1000 patient-days in the postASP period (p = 0.0189). There were a total of 17 pharmacist-driven antibiotic interventions, with 14 of those aimed at decreasing duration of therapy.

**CONCLUSION:** The implementation of antimicrobial stewardship programs can help to decrease antibiotic days of therapy per 1000 patient-days in neonatal and infant patients. Pharmacist-driven interventions may help to drive adherence to antibiotic stewardship guidelines.

## Objectives

To compare the number of antibiotic days of therapy per 1000 patient-days before and after the implementation of an antimicrobial stewardship program (ASP), and to quantify pharmacist driven interventions after the time implementation of ASP.

## Methods

### Retrospective chart review

- preASP: December 2018 – February 2019
- postASP: December 2019 – February 2020

### Inclusion Criteria

- Neonatal or infant patient
- Admitted to Neonatal Intensive Care Unit (NICU) or Special Care Nursery
- Active order for ampicillin, gentamicin, nafcillin, or vancomycin

### Outcomes

#### Primary:

- Decrease in antibiotic days of therapy per 1000 patient-days for ampicillin, gentamicin, nafcillin, and vancomycin
- Number and types of pharmacist-driven interventions

### Statistical analyses

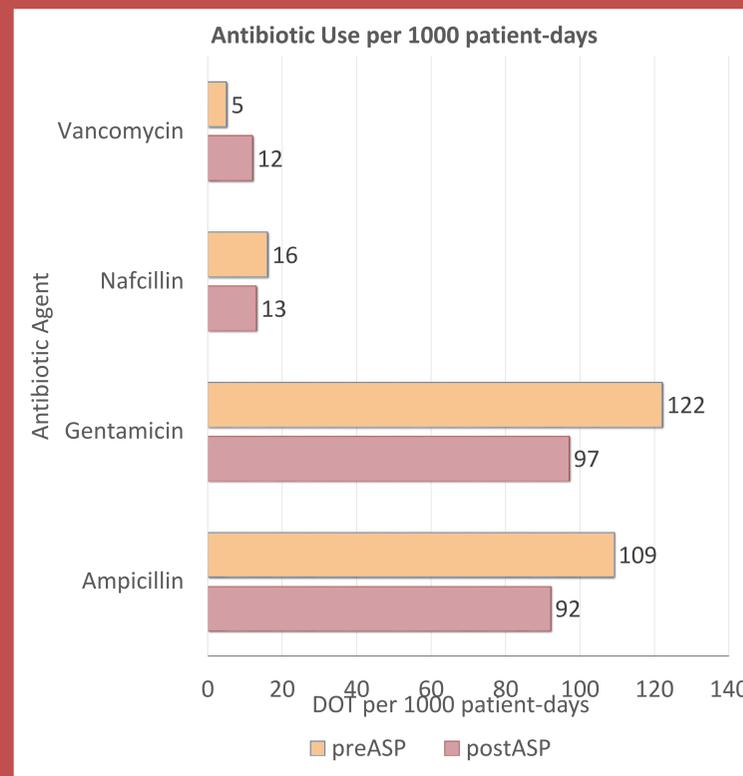
- Continuous data: Student unpaired t-test
- Categorical data: Fisher's exact test

Indication	Duration	Empiric Antimicrobial(s)
Culture Negative Sepsis	5 days	Ampicillin or Nafcillin + Gentamicin
Group B Streptococcus (GBS)	<u>Asymptomatic:</u> 48 hours <u>Symptomatic:</u> 7 – 10 days; 14 days meningitis	Ampicillin + Gentamicin
Necrotizing Enterocolitis (NEC)	<u>Stage 1:</u> 48 hours <u>Stage 2:</u> 7 days <u>Stage 3:</u> 10 days	Ampicillin or Vancomycin + Gentamicin
	<u>NEC + perforation:</u> 10 days	Ampicillin + Gentamicin + Metronidazole
Peri-Operative Antibiotics	<u>Non-contaminated:</u> 1 dose pre-op <u>Small bowel atresia:</u> 24 hours post-op	Cefazolin
	<u>Gastroschisis:</u> until abdominal closure	Ampicillin + Gentamicin
Rule Out Early-Onset Sepsis	48 hours	Ampicillin + Gentamicin
Urinary Tract Infection (UTI)	7 days	Nafcillin + Gentamicin

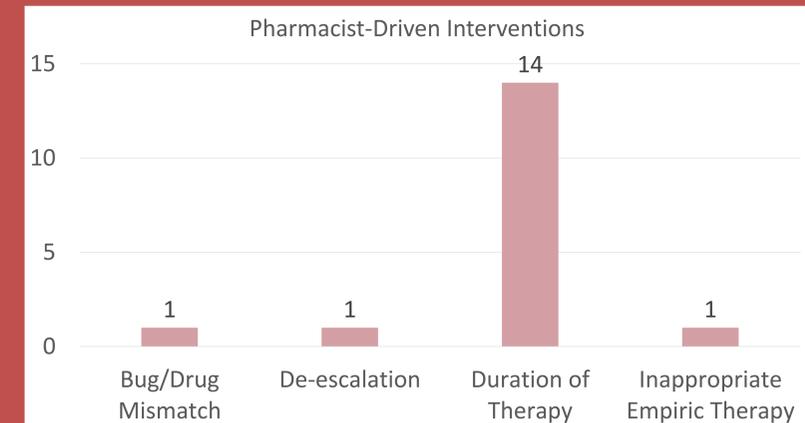
## Results

Baseline Characteristics			
	preASP cohort (n = 132)	postASP cohort (n = 111)	p-value
Gestational Age (weeks), Mean	35.2	36.5	0.0333
Birth Weight (g), Mean	2585	2786	0.1161
Length of Stay (days), Mean	24	20	0.4135
Patient Deaths, N (%)	2 (1.5)	2 (1.8)	1.0000

Days of Antibiotic Therapy per Antibiotic			
	preASP	postASP	p-value
Ampicillin	109	92	0.0841
<b>Gentamicin</b>	<b>122</b>	<b>97</b>	<b>0.0340</b>
Nafcillin	16	13	0.5405
vancomycin	5	12	0.5459
<b>Overall</b>	<b>253</b>	<b>214</b>	<b>0.0189</b>



## Results (cont.)



## Study Critique

### Limitations

- Retrospective chart review
- Limited number of infection indications
- Confounding of results due to incorrect infection classification

### Strengths

- Pharmacists had a direct role in maintaining adherence to antibiotic guidelines
- Antibiotic guidelines aided in the standardization of empiric antibiotic selection

## Conclusions

- The implementation of an antimicrobial stewardship program in neonates and infants significantly reduced the overall duration of empiric antibiotic days of therapy per 1000 patient-days.
- Pharmacists-driven antibiotic monitoring may further drive adherence to antibiotic stewardship efforts.

## References

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