

Appropriateness of Antibiotic Prescribing in U.S. Children's Hospitals: A National Point Prevalence Survey



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Background

- Multiple studies estimate that 30-50% of antibiotic prescribing for hospitalized patients is inappropriate.
- Few studies have included pediatric patients, and pediatric data are needed to better target and improve pediatric antimicrobial stewardship program (ASP) efforts.

Objectives

- Characterize antibiotic prescribing at academic, tertiary children's hospitals across the United States (U.S.)
- Assess appropriateness of antibiotic prescriptions and degree of ASP oversight in these hospitals

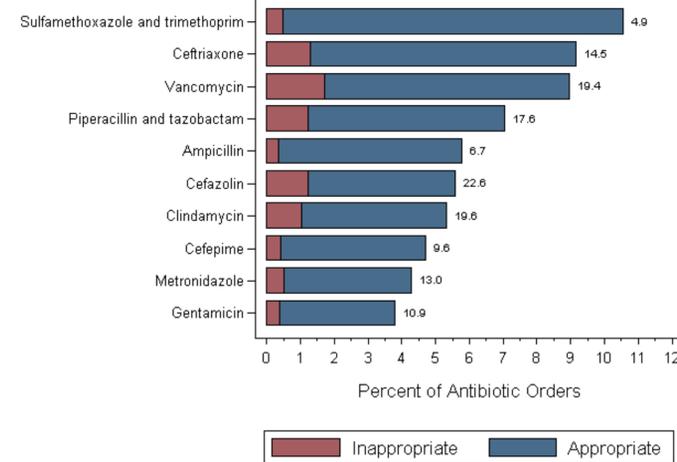
Methods

- Cross-sectional analysis of antibiotic prescribing at 30 U.S. children's hospitals
- Participating hospitals were recruited from the Sharing Antimicrobial Reports for Pediatric Stewardship (SHARPS) collaborative.
- Subjects were 0-17 years with an active antibiotic order at 0800 on a single day during three consecutive calendar quarters (Q3 2016 – Q1 2017).
- Each hospital's ASP used a standardized survey to collect data on antibiotic orders and evaluate appropriateness.
- Data from the three survey days were pooled. The primary outcome was the pooled estimate for the percentage of prescriptions classified as inappropriate.
- Secondary outcomes were pooled estimates for indication, reason the use was classified as inappropriate, and ASP review status for each antibiotic.

Results

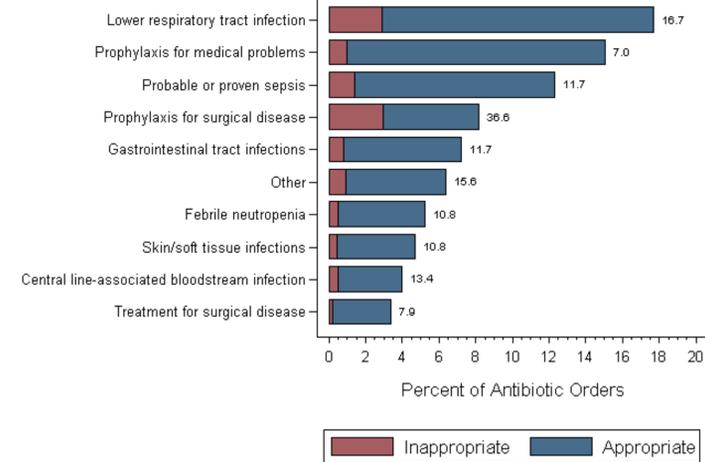
- Of 19,598 children hospitalized on survey days, 6,921 (35%) had at least one active antibiotic order, for a total of 10,170 antibiotic orders.
- Sulfamethoxazole and trimethoprim (11%), ceftriaxone (9%), and vancomycin (9%) were the most commonly prescribed antibiotics (Figure 1). Lower respiratory tract infection (18%), medical prophylaxis (15%), and suspected or proven sepsis (12%) were the most common indications for antibiotic therapy (Figure 2).
- Of all antibiotic orders, 1,514 (15%) were classified as inappropriate (inter-hospital range: 5% - 25%). Of all patients with antibiotic orders, 1,309 (19%) had at least one inappropriate antibiotic order.
- On bivariate analysis, a greater proportion of children receiving inappropriate antibiotics were admitted to non-neonatal intensive care units (30% vs. 20%) and had two or more chronic conditions (40% vs. 35%, Table 1).
- The most common reasons for classifying use as inappropriate were bug-drug mismatch (26%), surgical prophylaxis > 24 hours (18%) and unnecessary duplicate therapy (12%) (Figure 3).
- Fifty percent of all inappropriate orders would not have been reviewed by an ASP. An additional 22% of inappropriate orders were for antibiotics typically reviewed by ASPs, but yet to be reviewed at the time of the survey (Figure 4).

Figure 1: Most Commonly Prescribed Antibiotics



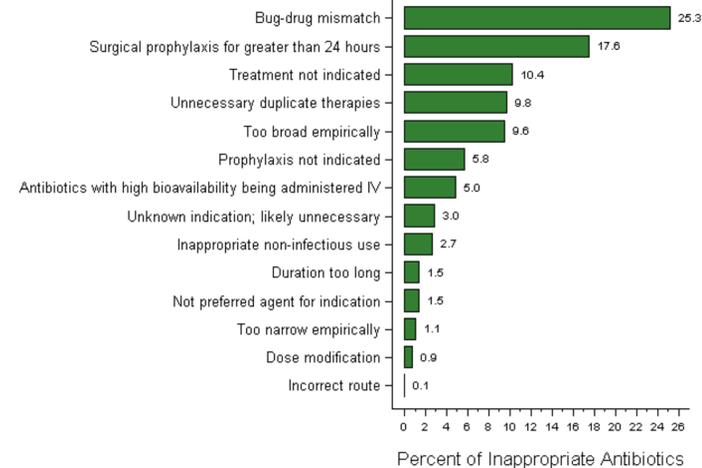
Number next to each bar indicates the percent inappropriate for that drug

Figure 2: Most Common Indications for Antibiotic Prescribing



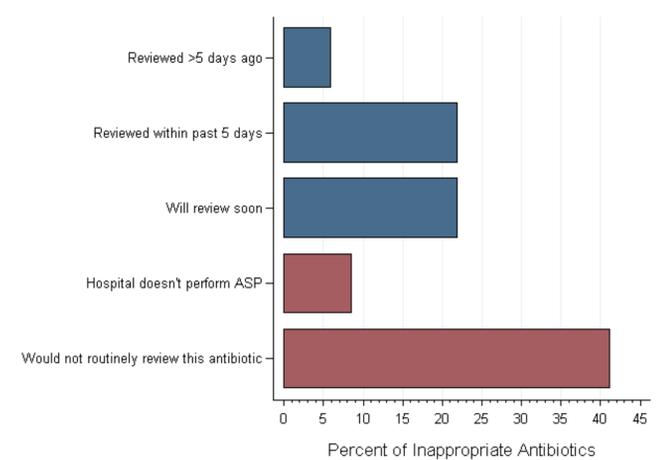
Number next to each bar indicates the percent inappropriate for that drug

Figure 3: Reasons Antibiotic Use Classified as Inappropriate



Percent of Inappropriate Antibiotics

Figure 4: Antimicrobial Stewardship Review Status of Inappropriate Antibiotics



Percent of Inappropriate Antibiotics

Table 1: Characteristics of Children Receiving Antibiotics

Characteristic [†]	Children receiving only appropriate antibiotics (n = 5612)	Children receiving ≥1 inappropriate antibiotic (n = 1309)
Age (years)	3.8 (0.5, 10.9)	3.2 (0.6, 10.6)
Male sex	3012 (55)	698 (54)
Ward type*		
Medical	2857 (53)	553 (43)
Surgical	733 (14)	194 (15)
Neonatal ICU	731 (14)	142 (11)
Non-neonatal ICU	1070 (20)	384 (30)
Number of chronic conditions*		
Zero	1270 (23)	248 (19)
One	2320 (42)	540 (41)
Two	1211 (22)	334 (26)
Three or more	722 (13)	184 (14)
History of adverse antibiotic reactions		
Any class	818 (15)	206 (16)
Penicillins	306 (6)	65 (5)
Cephalosporins	139 (3)	44 (3)

[†]Summarized as median (interquartile range) or n (%) as appropriate
^{*}p < 0.05 on bivariate analysis

Conclusions

- Across 30 U.S. children's hospitals, approximately 1 in 3 hospitalized children is receiving an antibiotic at any given time.
- Almost 20% of these children are receiving inappropriate therapy.
- Current antimicrobial stewardship review strategies at these hospitals do not address a substantial proportion of inappropriate antibiotic use.