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Evaluation of a Beta-lactam Antibiotic Allergy Assessment Tool for Patients Receiving Surgical Prophylaxis

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Background

Penicillin allergies are the most reported medication allergy, however, 90% of those are not true allergies.¹ The use of alternative agents is associated with suboptimal treatment, a 50% increase in surgical site infections, adverse effects, higher costs, and increased risk of resistance.² The cross-reactivity for beta-lactams is 1.5% for dissimilar side chains.³ Therefore, patients with a documented penicillin allergy are likely to tolerate cephalosporins with a dissimilar side chain, like cefazolin. Only 0.7% of patients have a dual allergy with cefazolin and penicillin, which may represent a population that has multiple drug allergy syndrome.⁴ Decreasing use of alternative agents in surgical prophylaxis will likely reduce SSI rates and improve patient care.

Purpose

To evaluate the effects of a beta-lactam antibiotic allergy assessment tool for surgical prophylaxis in conjunction with education to the perioperative medical team to help improve incidence of surgical site infections, decrease costs associated with alternative agents, and increase beta-lactam usage.

Objectives

- Increase usage of cefazolin for patients with beta-lactam allergies requiring surgical prophylaxis
- Decrease incidence of surgical site infections

Methods

- Institutional Review Board (IRB) – exempt
- Design: quasi-experimental Eligibility: Adult (≥ 18 years old) and pediatric (< 18 years old) patients undergoing surgical procedure requiring antibiotic prophylaxis
- Study period:
 - Pre-intervention: Jan 2021 – Dec 2021
 - Intervention implemented: Jan 2022 – Mar 2022
 - Post-intervention: April 2022 – Mar 2023
- Primary outcome:
 - Cefazolin usage after implementation of surgical antibiotic assessment tool

Figure 1. Adult Antibiotic Administrations

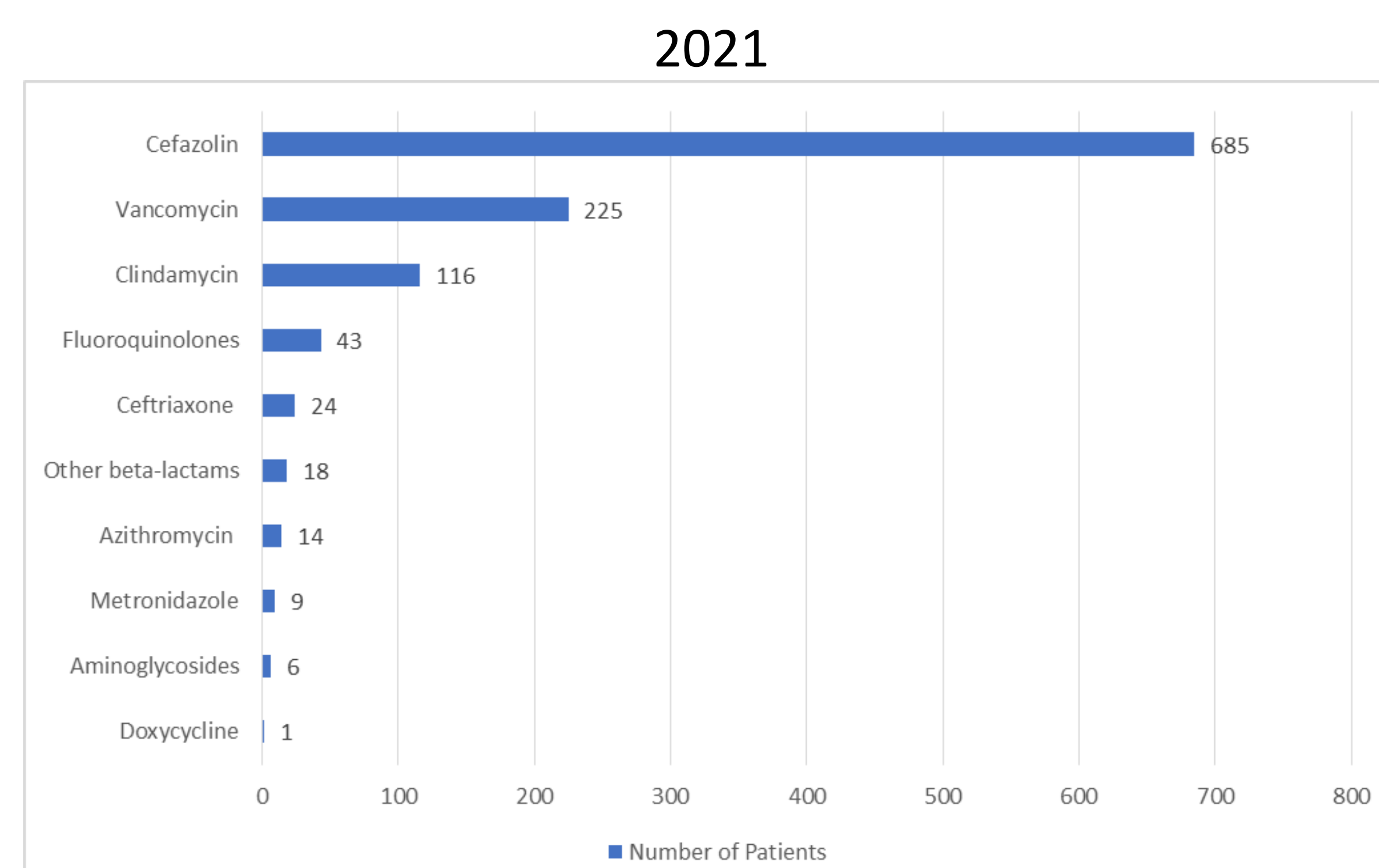
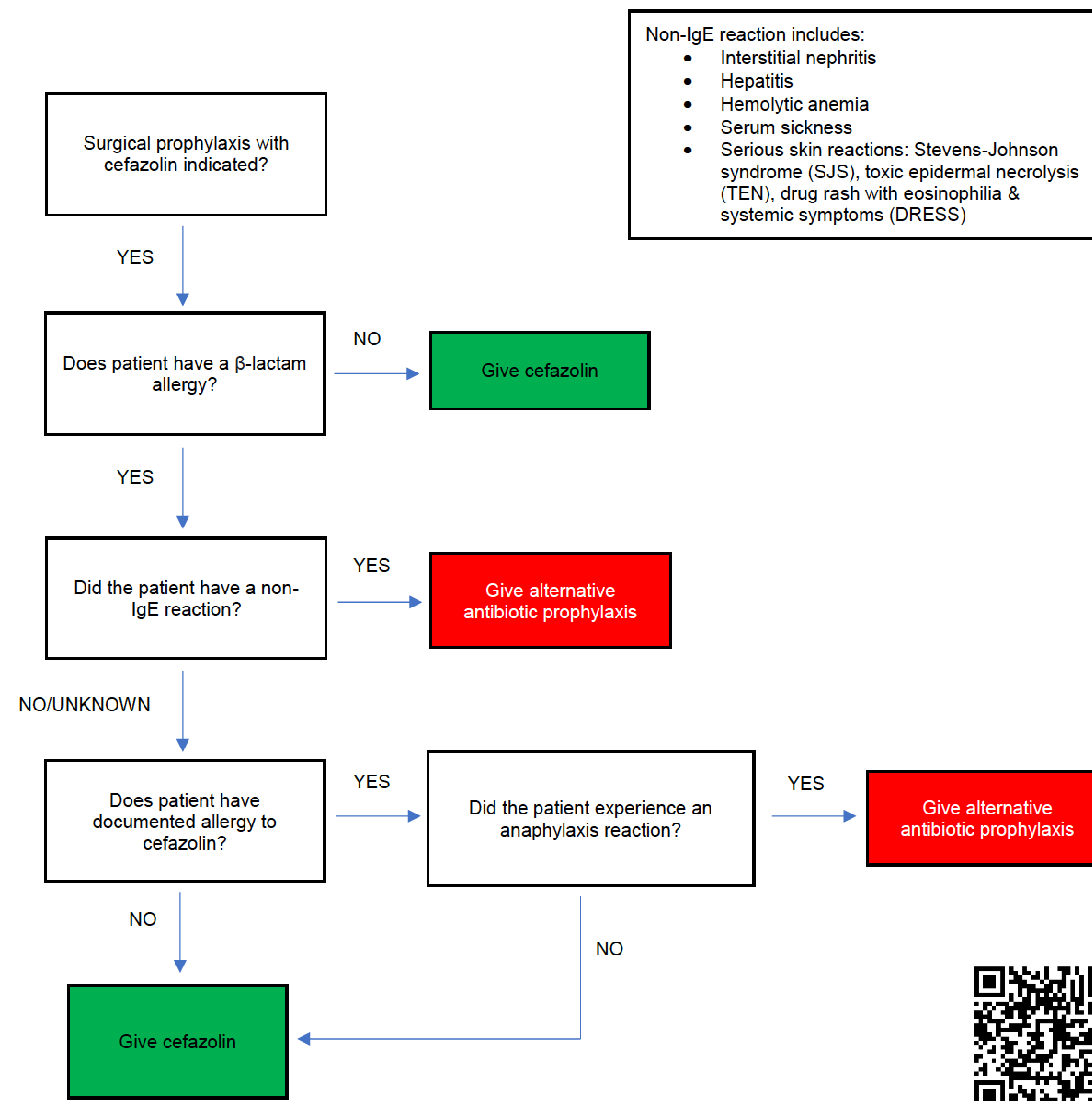


Figure 2. Assessment Tool



Results

Table 1. Baseline Characteristics

Characteristic	PATIENTS			P value
	All (n=11142)	Reported PCN Allergy (n=1150)	No reported PCN Allergy (n=9992)	
Age, median	58	61	58	
Female sex	6654 (59.7)	803 (70.6)	5851 (58.6)	<.001
Race				
White	8620 (77.4)	970 (85.0)	7650 (76.5)	<.001
Black	203 (1.8)	17 (1.5)	186 (1.9)	.42
Asian	559 (5.0)	26 (2.3)	533 (5.3)	<.001
Hispanic	165 (1.5)	10 (0.9)	155 (1.55)	.09
Other	1066 (9.6)	86 (7.5)	980 (9.8)	.01
Unknown	529 (4.7)	41 (3.6)	488 (4.8)	.06
Surgery Type				
Orthopedic		101 (8.8)	661 (6.6)	.007
Vascular		45 (3.9)	322 (3.2)	.25
Cardiac		186 (16.2)	1457 (14.6)	.16
Gastrointestinal		106 (9.2)	507 (5.1)	<.001
Urology		20 (1.7)	159 (1.6)	.064
Gynecology		34 (3.0)	653 (6.5)	<.001
Other		658 (57.2)	6233 (62.4)	<.007

Table 2. Surgical Site Infections by Antibiotic Received

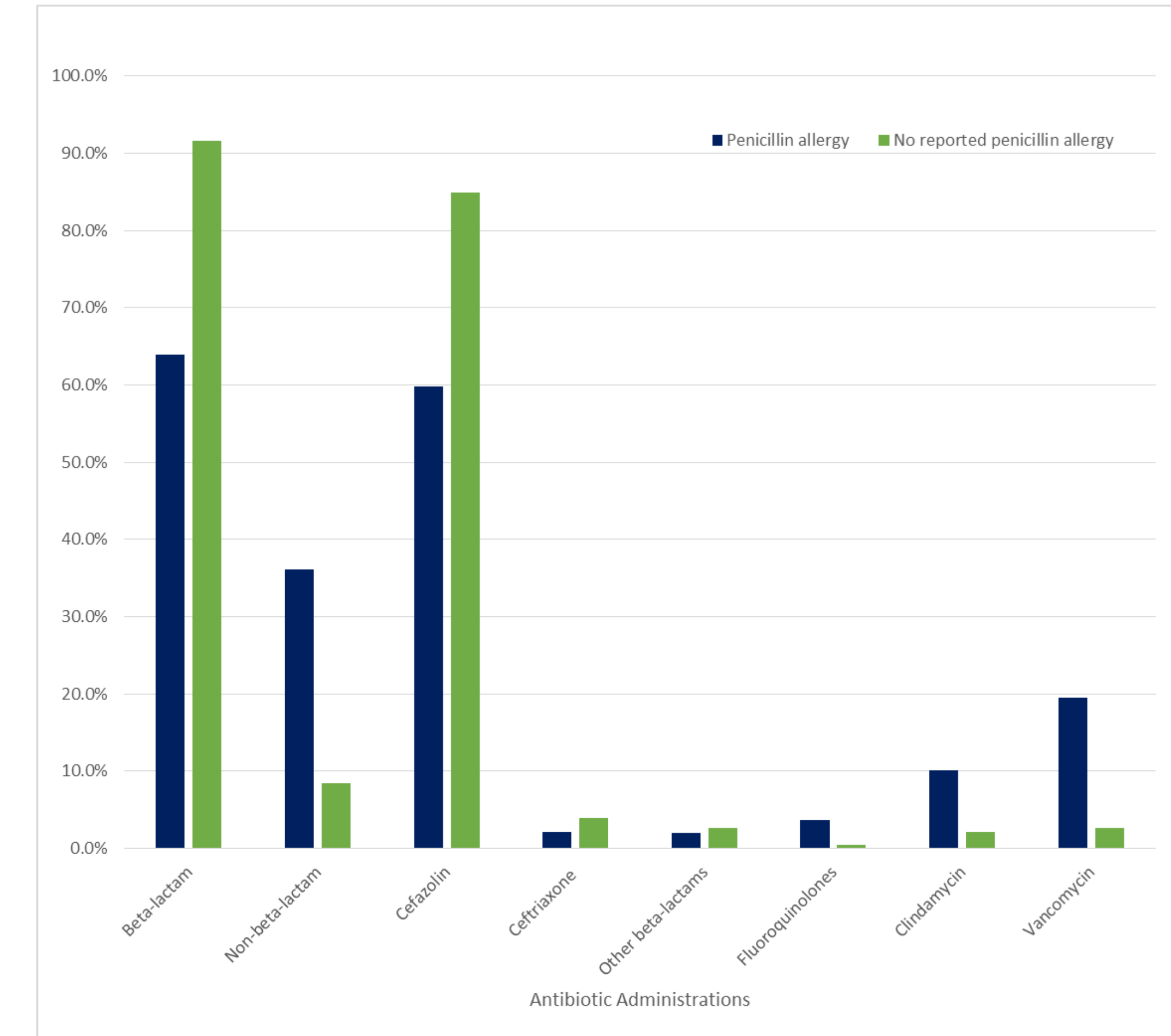
Surgical Site Infections by Antibiotic Prophylaxis and Allergy			
Prophylactic Antibiotic	Penicillin allergy	No allergy	P value
Non-Beta-lactam	12/415 (2.9%)	15/847 (1.8%)	0.2
Beta-lactam	17/735 (2.3%)	203/9226 (2.2%)	0.8
Total SSI	29/1150 (2.5%)	218/10,073 (2.2%)	0.5

Results Cont'd

Table 3. Surgical Site Infections by Procedure

Surgical Site Infections by Procedure			
Procedure	Penicillin allergy (n=29)	No allergy (n=218)	P value
Orthopedic	7 (24.1)	21 (9.6)	0.05
Vascular	1 (3.4)	2 (0.9)	0.8
Urology	1 (3.4)	10 (4.5)	0.8
Gastrointestinal	2 (6.9)	22 (10.1)	<0.001
Other	12 (41.4)	163 (74.8)	<0.05

Figure 3. Antibiotics Administered (With and Without Allergy)



Discussion/Conclusions

Preliminary data shows that adult patients primarily received a beta-lactam for surgical prophylaxis, with vancomycin as the second most used agent. Additionally, patients with a penicillin allergy were more likely to receive an alternative antibiotic than those without an allergy. Overall, surgical site infections were higher in patients with a documented allergy, though this did not reach statistical significance likely due to the small event rate. The study intervention will be conducted for 3 months followed by data collection and analysis to determine the impact on beta-lactam usage per and post intervention.

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