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Penicillin allergy drives perioperative prophylactic antibiotic selection in orthopedic procedures

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Background

- Although 8-20% of the population is labeled penicillin allergic, >95% will tolerate penicillins after validated testing
- Penicillin allergy labels (PAL) are associated with increased surgical site infections^{1,2}
- Most patients with a penicillin allergy label can tolerate cefazolin, the preferred prophylactic agent³

Objectives

- To quantify the relationship between a penicillin allergy label and orthopedic perioperative antimicrobial selection
- To elucidate alternative explanations for clindamycin selection for antimicrobial prophylaxis

Methods

Population

Patients who have volunteered to be a part of the VUMC deidentified research derivative

Study Design

A retrospective data collection of the age, gender, date of birth, perioperative antibiotics, penicillin allergy status, and antibiotics received prior to surgery. Orthopedic surgery was defined by CPT codes 27130, 27438, 27446, and 27447.

Perioperative antibiotic was defined as any combination of antibiotics among clindamycin, cefazolin, and vancomycin received within 48 hours of surgery. PAL status was defined by the presence of a penicillin allergy in the drug allergy box, or an ICD 9 or 10 code for penicillin allergy at the time of the surgery.

Outcomes

- Differential antibiotic utilization between those reporting penicillin allergy and no penicillin allergy, % of PAL receiving a penicillin prior to surgery

Analysis

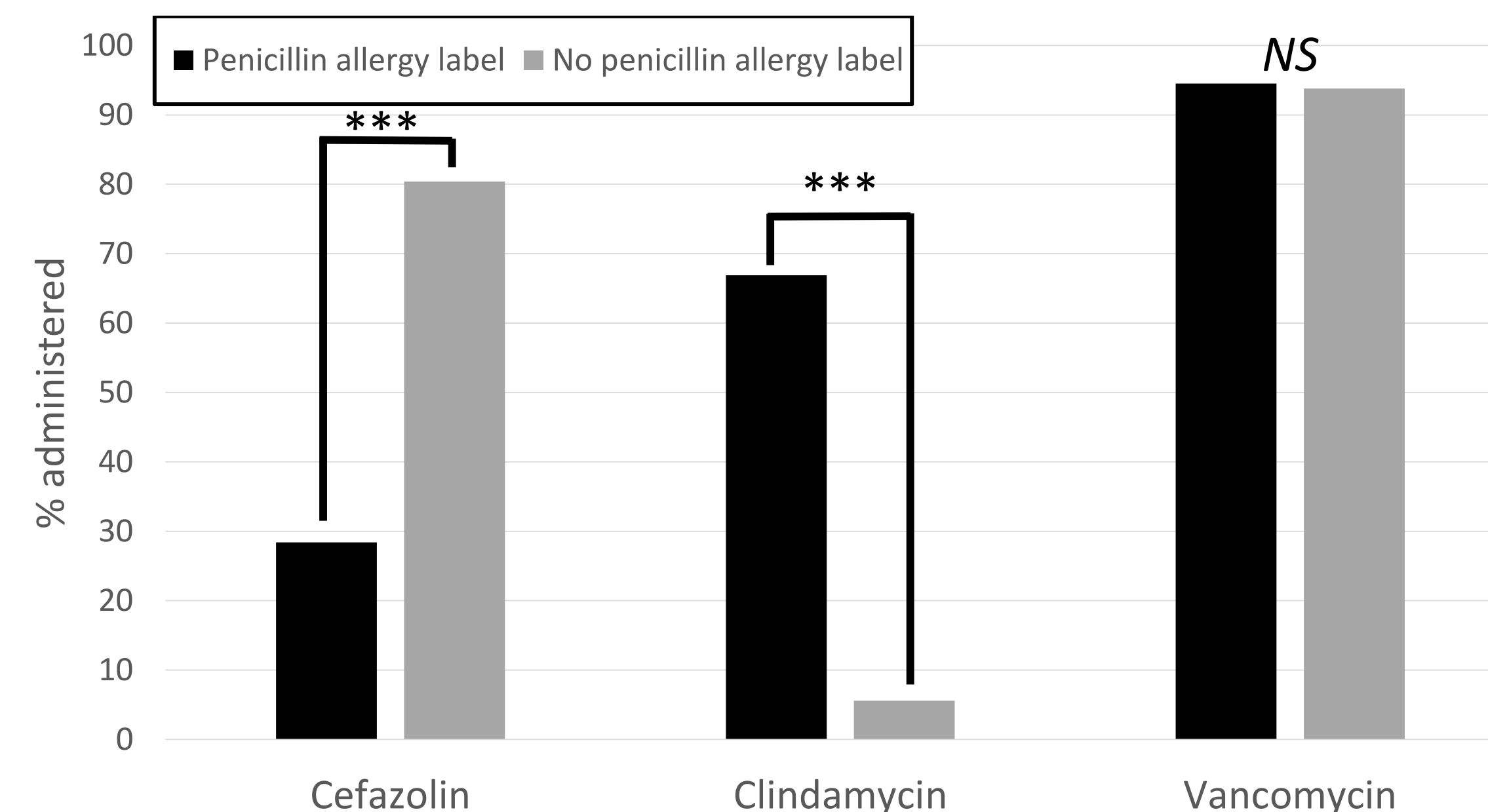
For categorical variables, Fisher's exact test or Pearson's chi-squared statistic were used. Wilcoxon rank-sum test was used to compare continuous variables (Stata 15.0).

Results

Table 1: Demographics (n=17,180)

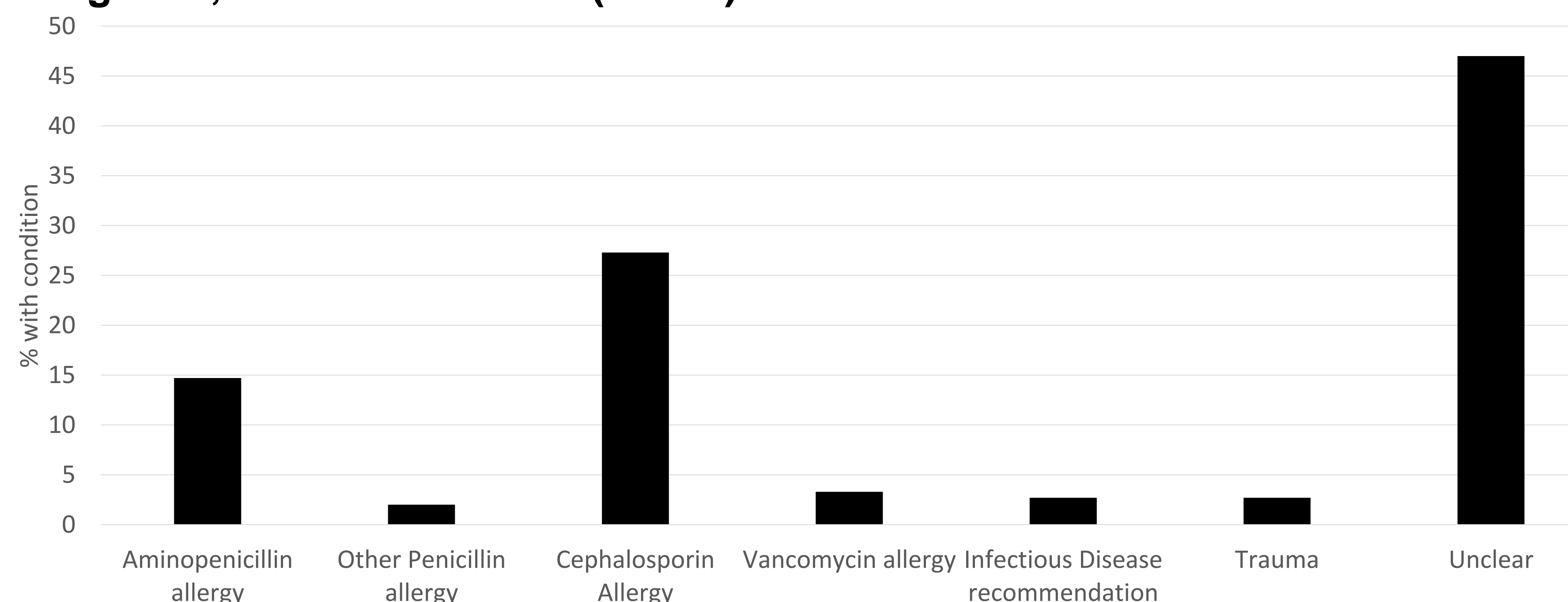
	Penicillin Allergy Label (n=2,353)	No Penicillin Allergy Label (n=14,827)	P-value
Year of Birth Median [IQR]	1947 [1940, 1956]	1949 [1941, 1956]	<0.0005
Female Sex	1,615 (68.6%)	8,339 (56.2%)	<0.005
Race			<0.05
Black	194 (8.3%)	1,432 (10.2%)	
Asian	13 (0.6%)	83 (0.6%)	
White	2,115 (90.8%)	12,519 (88.8%)	
Other	7 (1.3%)	60 (0.4%)	

Figure 1: Percentage of orthopedic surgeries utilizing cefazolin, clindamycin, and vancomycin, by penicillin allergy status.



Patients with a penicillin allergy label were less likely to receive cefazolin***, and more likely to receive clindamycin*** compared to patients with no penicillin allergy label. There was no difference in receipt of vancomycin (***) $P < 0.0005$, NS= not significant).

Figure 2: Proposed reasons for clindamycin usage in non-penicillin-allergic surgeries, after chart review (n=150)



When adjusted for age, sex, and race:

- PAL greatly **decreased** the odds of receiving cefazolin (aOR 0.10 [0.09, 0.11], $P < 0.0005$)
- PAL greatly **increased** the odds of receiving clindamycin (aOR 33.7 [29.0, 39.1], $P < 0.0005$)
- PAL did not influence vancomycin administration

When reviewing 291 charts for reactions qualifying the listed penicillin allergy:

- 195 (67%) had a qualifier, and most common reactions were:
 - Rash only (77, 39%), hives (45, 23%), and swelling (45, 23%)

When reviewing 553 PAL patients' charts for all medications ever administered between first instance of PAL and the orthopedic procedure:

- 40 (7%) had taken a penicillin prior to procedure yet retained PAL status

Conclusions

- In our population of patients undergoing orthopedic procedures 15% were in patients labeled as penicillin allergic
- Despite our PAL population's predominantly low risk reactions, cefazolin, the preferred antibiotic for surgical prophylaxis, was significantly less utilized in PAL patients
- 7% of PAL patients had actually been exposed to and tolerated a penicillin prior to the orthopedic procedure but retained a penicillin label.
- Clindamycin was also frequently used in PAL patients and clindamycin use appeared to also be associated with alternative antibiotic allergy labels
- Our study identifies an opportunity to introduce decision support to guide appropriate risk-based antibiotic prescribing (provide cefazolin via history alone or refer to allergy) in penicillin allergic patients undergoing elective orthopedic procedures.

References

1. Lam P, Tarighi P, Elligsen M, et al. Self-reported beta-lactam allergy and the risk of surgical site infection: A retrospective cohort study. *Infect Control Hosp Epidemiol.* 2020;1-6.
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3. Savic L, Khan D, Kopac P, et al. Management of a surgical patient with a label of penicillin allergy: narrative review and consensus recommendations. *Br J Anaesth.* 2019;123(1):e82-e94.