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Impact of Sepsis Order Set Updates on Carbapenem Utilization in a Community Regional Medical Center

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OBJECTIVE

- Our institution has updated its sepsis order sets to provide prescribers guidance when ordering antibiotics for septic patients with non-severe penicillin allergies.
- The objective of this study is to determine the impact of these sepsis order set updates on carbapenem utilization.

BACKGROUND

- Patients with penicillin allergies who require broad-spectrum antimicrobial therapy for the treatment of sepsis often receive a carbapenem instead of a cephalosporin due to concerns of penicillin-cephalosporin cross-reactivity.
- As rates of antibiotic resistance continue to increase, institutions should prioritize efforts to preserve the efficacy of carbapenems¹.
 - Reduction of carbapenem use in institutions has been shown to lower incidence rates of carbapenem-resistant organisms².
- Cephalosporins have previously demonstrated low rates of cross-reactivity in penicillin allergic patients³.
- As of May 29th, 2018, updates to our institution's sepsis order sets recommend the use of cefepime in place of piperacillin/tazobactam in patients with a non-severe penicillin allergy rather than a carbapenem.
- An analysis of the results of these updates is warranted to identify areas of improvement that can further reduce carbapenem utilization.

METHODS

- Retrospective chart review of patients ≥18 years of age receiving at least one dose of antibiotic ordered via a sepsis order set
- Outcomes were compared between groups from pre and post order set update periods
 - Pre-update: June 1, 2017 – September 31, 2017
 - Post-update: June 1, 2018 – September 31, 2018
- Primary Outcome:** Use of a carbapenem in the initial order from a sepsis order set
- Secondary Outcomes:**
 - Adherence of antibiotic orders to order set recommendations in the penicillin-allergic population (post-update group)
 - Days of carbapenem therapy per 1000 patient days in the penicillin-allergic population
 - Incidence of allergy to a penicillin, cephalosporin, or carbapenem caused by a set-ordered antibiotic
- Additionally, a sub-analysis of the initial order for patients with penicillin allergy with and an "unknown" reaction type was conducted

RESULTS

Baseline Characteristics of Total Population

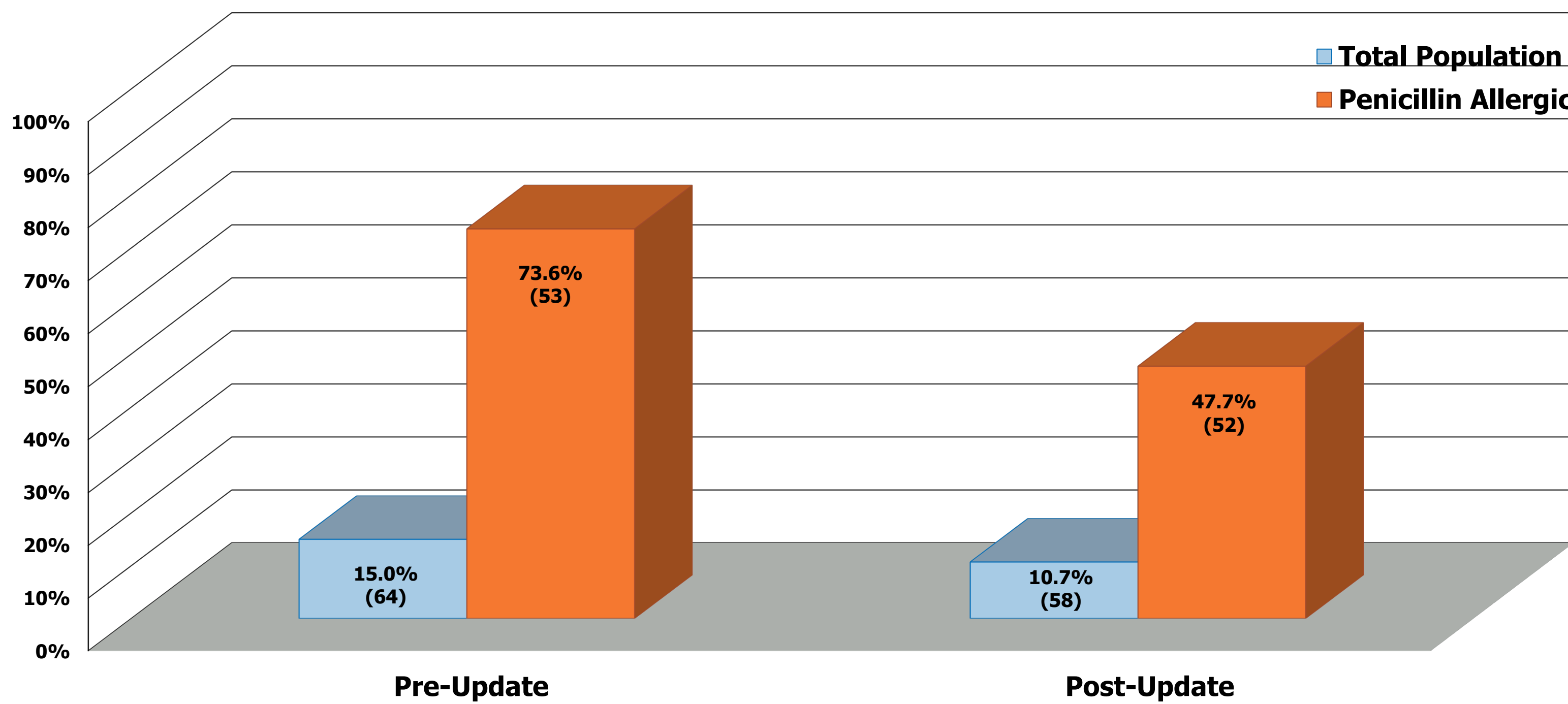
	Pre-Update (n=427)	Post-Update (n=542)
Age (Years ± SD)	66.3 (± 15.7)	63.36 (± 16.7)
Mean Length of Stay (Days, ± SD)	7.2 (± 6.8)	6.12 (± 5.1)
Admission Location (n, %)	ICU Progressive Care Unit Other	102 (18.8%) 66 (12.2%) 374 (69.0%)
Sepsis Source (n, %)	Pneumonia UTI SSTI Intra-Abdominal CNS Unknown	55% of Manual Pull Complete
Allergy Type (n, %)	Penicillin Cephalosporin Carbapenem	109 (20.1%) 35 (6.5%) 0 (0.0%)

RESULTS

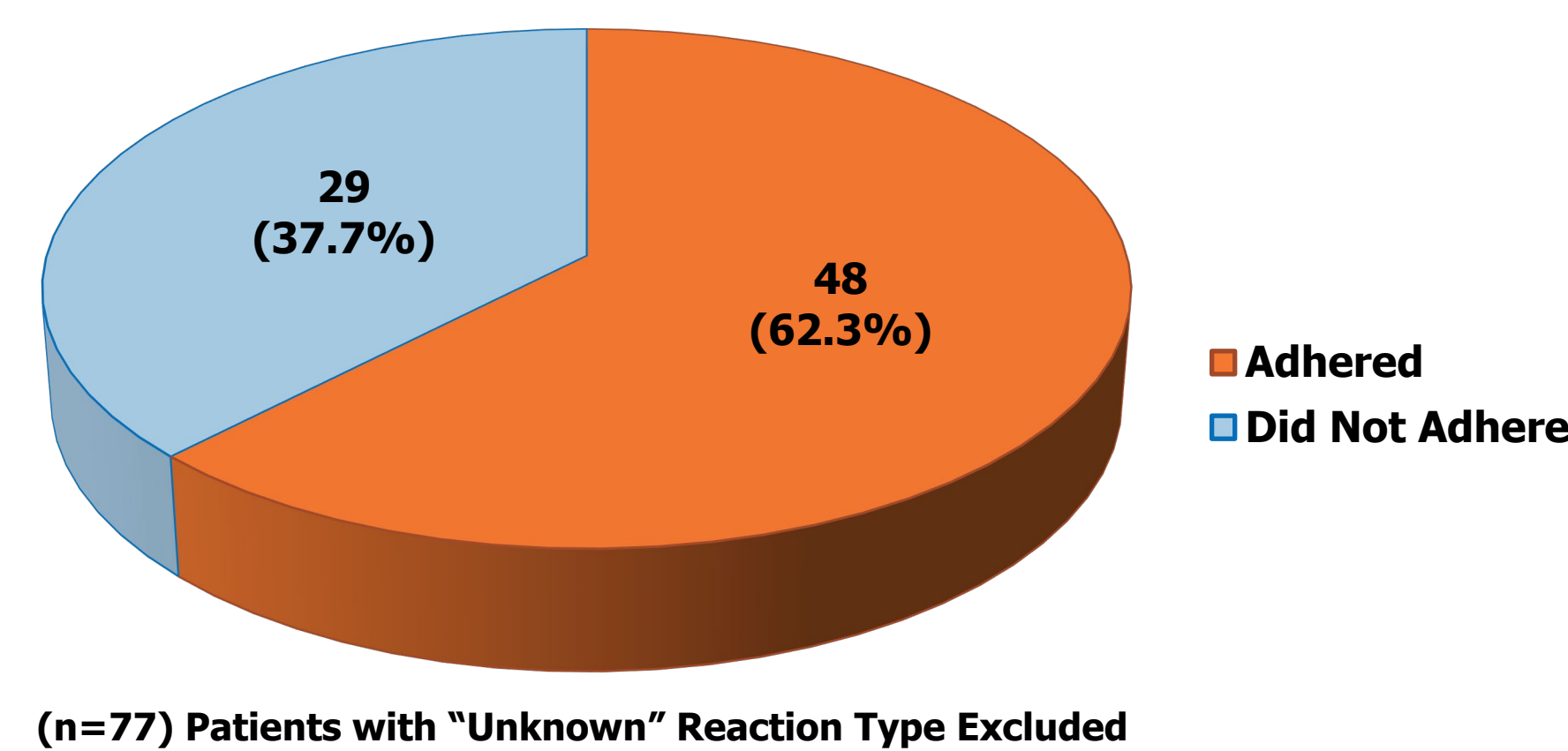
Baseline Characteristics of Penicillin Allergic Population

	Pre-Update (n=72)	Post-Update (n=109)
Age (Years ± SD)	66.4 (14.3)	63.7 (17.2)
Mean Length of Stay (Days ± SD)	7.0 ± (5.3)	5.6 ± (4.8)
Admit Location (n, %)	ICU Progressive Care Unit Other	17 (15.6%) 10 (9.2%) 85 (78.0%)
Sepsis Source	Pneumonia UTI SSTI Intra-Abdominal Unknown	28 (25.7%) 22 (20.2%) 25 (22.9%) 11 (10.1%) 23 (21.1%)
Reaction Type	Severe Non-Severe Unknown	44 (40.4%) 33 (30.3%) 32 (29.4%)

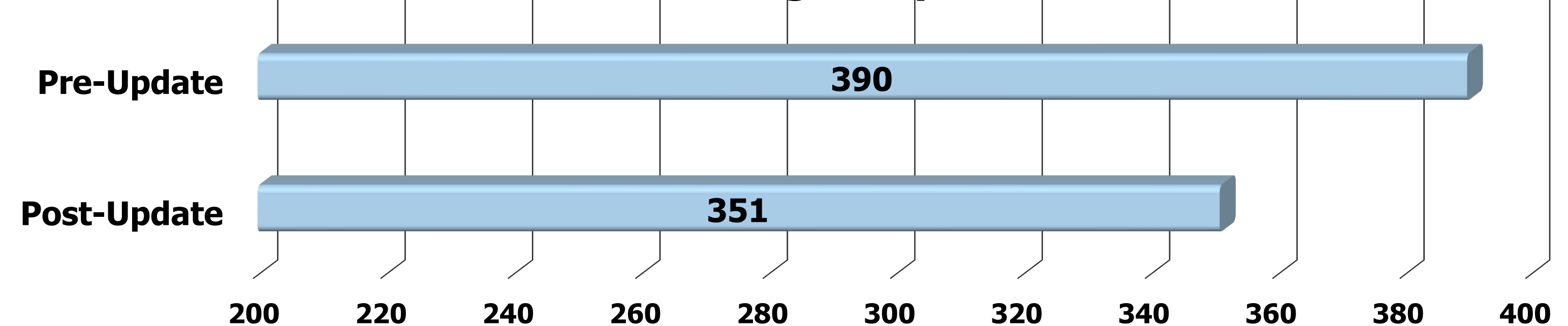
Use of a Carbapenem in the Initial Order from a Sepsis Order Set



Adherence to Order Set Recommendations: Penicillin Allergic Population, Post-Update Group

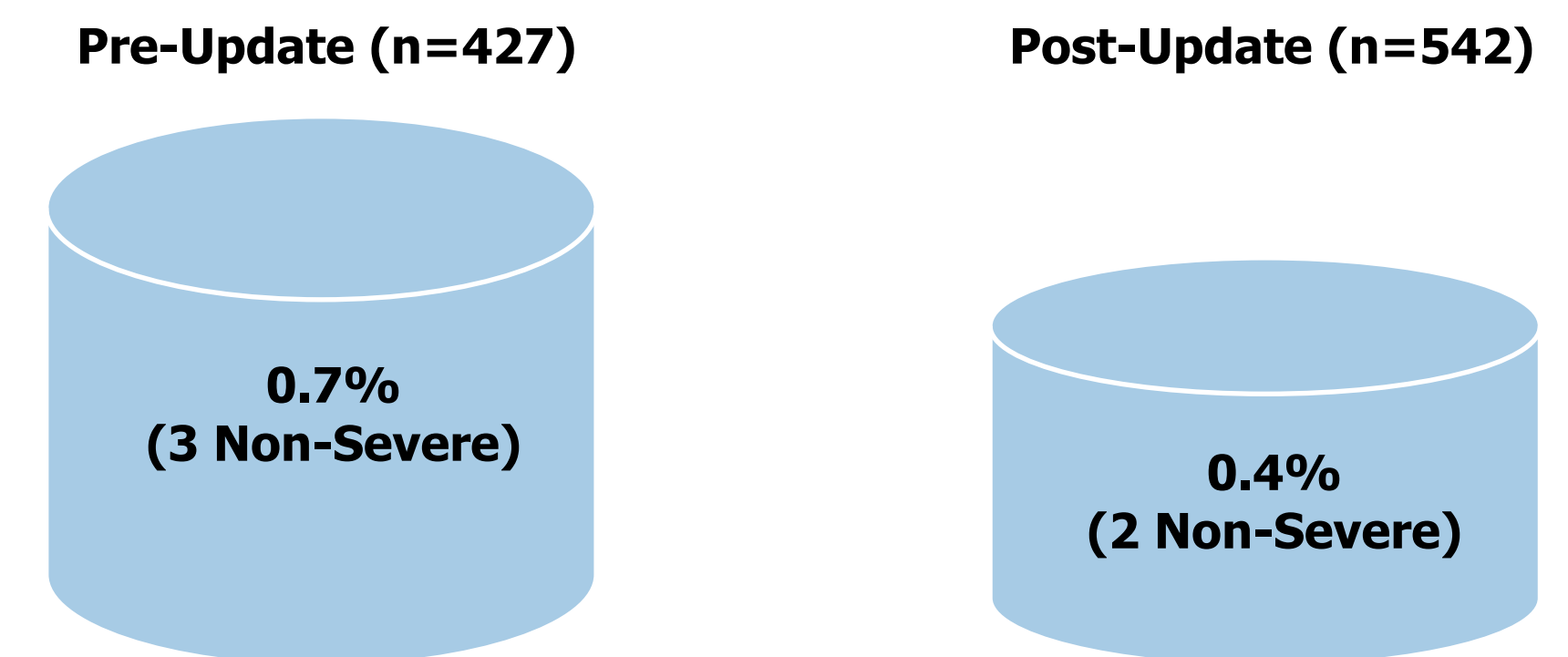


Days of Carbapenem Therapy per 1000 Patient Days: Penicillin Allergic Population

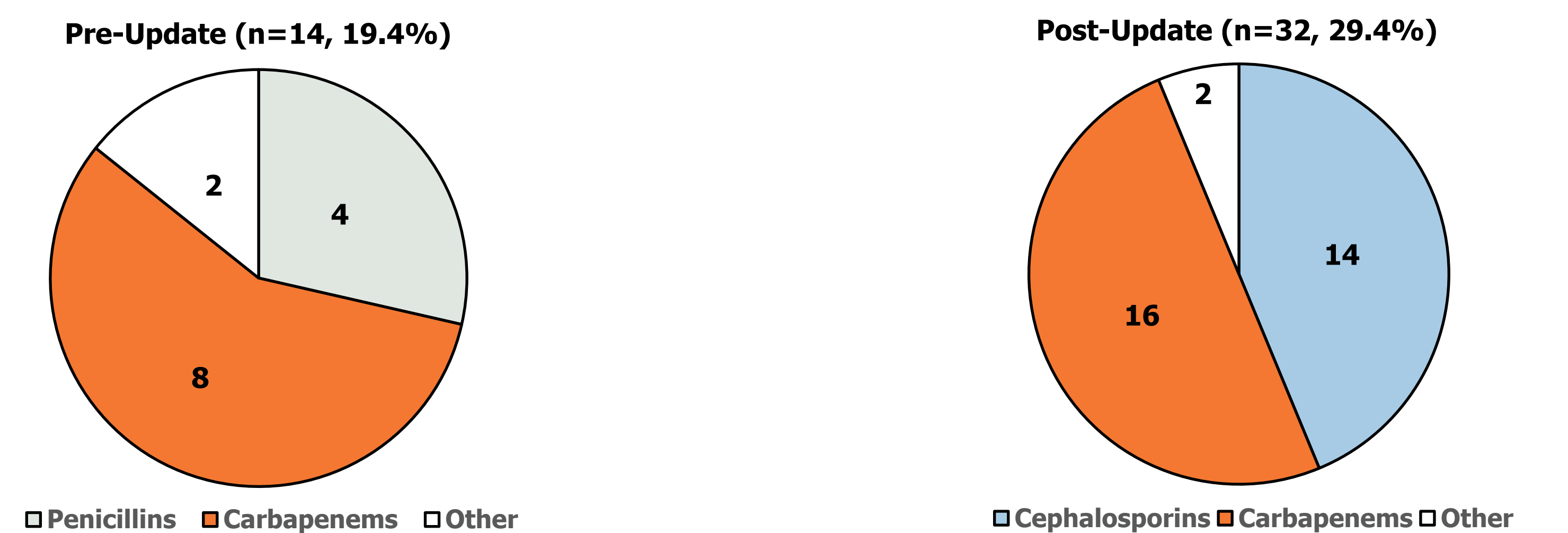


RESULTS

Incidence of Allergy to a Penicillin, Cephalosporin, or Carbapenem Caused by a Set-Ordered Antibiotic



Initial Order for Patients with Penicillin Allergy with "Unknown" Reaction



DISCUSSION & CONCLUSIONS

- Updates to the sepsis order sets were effective in reducing carbapenem orders in the post-update period.
 - Cefepime prescribing rose from 0% in the pre-update penicillin allergic group to 33% in the post-update penicillin allergic group, in line with order set recommendations.
- No increase in allergy incidence was seen as a result of the order set updates.
- A substantial portion of orders failed to adhere to the recommendations for penicillin allergic patients provided in the order sets, suggesting a need for further provider education on order set usage.
 - Several patient factors could confound provider adherence, including MDR organism history and previous hospital admissions.
- Institutional changes to carbapenem dosing regimens were implemented during the study period, limiting the ability to utilize a cost savings analysis or measures of antibiotic use that require a dosage quantity (such as defined daily doses).
 - A carbapenem days of therapy measure is less impacted by these dosing changes, and was used to quantify carbapenem use in this study.
- Efforts to clarify allergy type in patients who have a penicillin allergy with an unknown reaction could further reduce carbapenem usage and lead to safer antibiotic prescribing.
- This research demonstrates that further modification of the sepsis order sets is warranted, and that other antibiotic order sets should be assessed for potential interventions to spare carbapenem use.
 - Considering that nearly 10% of carbapenem orders hospital-wide originated from sepsis order sets during the study period, the impact of these updates and future interventions is substantial.

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Disclosure
The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
Brandon Euen: Nothing to disclose Michele Swihart: Nothing to disclose Luke Keller: Nothing to disclose