

EVALUATING THE ANTIBIOTIC SPECTRUM INDEX AS AN OUTCOME IN THE CONTEXT OF A RANDOMIZED CLINICAL TRIAL

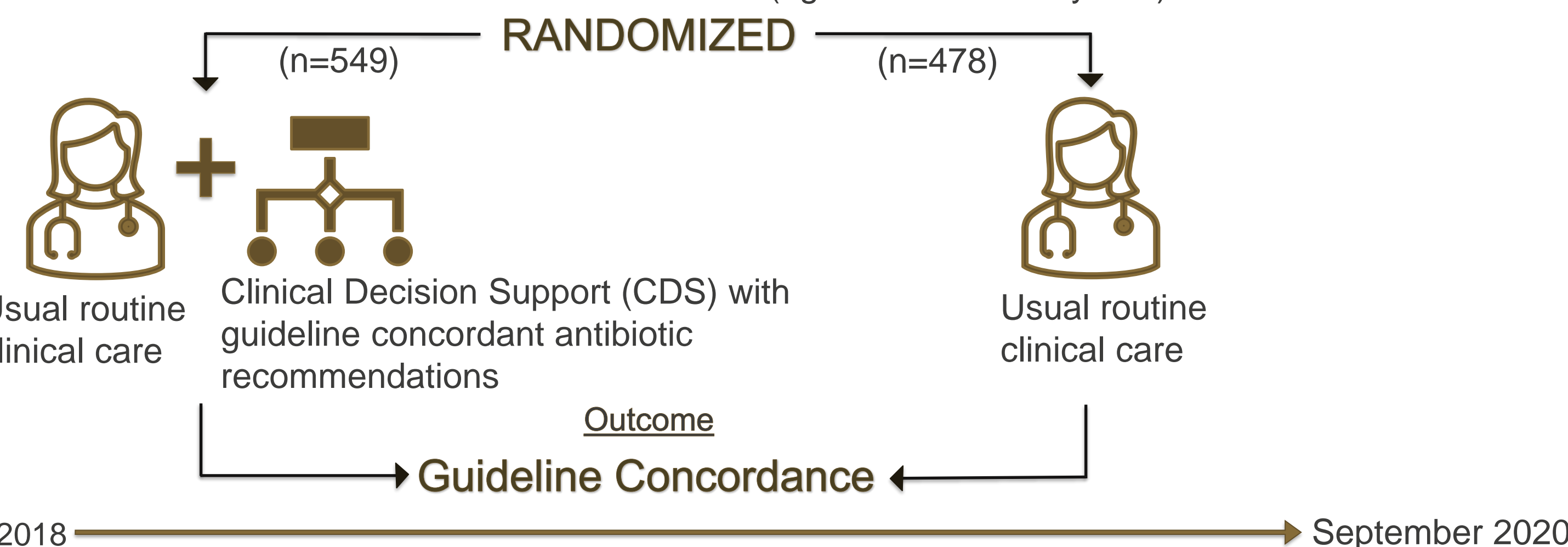
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BACKGROUND

The *Improving Care for Community Acquired Pneumonia* (ICECAP) clinical trial compared EHR-based decision support against usual care alone for promoting guideline-concordant antibiotic use in pediatric pneumonia

1027 Emergency Department (ED) based encounters enrolled from two Children's Hospitals (ages 6 months-18 years)



The Antibiotic Spectrum Index (ASI) is a novel outcome that quantifies antibiotic exposure based on spectrum of activity against bacterial pathogens

- May provide additional useful information in the context of stewardship interventions; has not been evaluated in the context of a clinical trial

OBJECTIVE

Examine and re-analyze data from the ICECAP trial using ASI as an exploratory outcome

METHODS

- Primary outcome: Daily ASI, a sum of ASI scores (range 1-13) for each unique antibiotic administered per 24-hour period in the ED or hospital (censored at discharge)
 - Also classified into clinically-relevant, ordered ASI categories (Table 1)
- Descriptive analyses summarized Daily ASI overall and by treatment arm, ED disposition, and guideline concordance
- Unadjusted proportional odds logistic regression was used to estimate the OR of a higher ordinal ASI (broader treatment) by treatment arm and ED disposition; analogous estimates for the OR of guideline concordance (narrower treatment) as defined by ICECAP included for reference
- Changes in Daily ASI were summarized using a Sankey diagram (categorical) and stacked bar plots (continuous, stratified by in-hospital ED disposition)

ASI Category (ASI Score Range)	Antibiotic Examples (Total ASI Score)
No Antibiotics (0)	N/A
Narrow (1-2)	Oxacillin/Dicloxacillin (1); Ampicillin/Amoxicillin (2)
Intermediate (3-4)	1 st Gen Cephalosporins (3); Clindamycin (4) Most 2 nd Gen Cephalosporins (4); Azithromycin (4)
Broad (5-7)	Ceftriaxone (5); Vancomycin (5); Most 3 rd Gen Cephalosporins (5) Ampicillin + Azithromycin (6); Ampicillin-Sulbactam (6); Cefepime (6)
Very Broad (≥8)	Ceftaroline (8); Levofloxacin (9); Ceftriaxone + Vancomycin (10) Ceftriaxone + Vancomycin + Azithromycin (14)

Table 1: Antibiotics examples with corresponding score, further organized into ordered categories.

RESULTS

	Total ASI Characteristics				
	Overall (n=1027)		By Guideline Concordance		p-value
	Median [IQR]	Mean (SD)	Concordant (n=542)	Discordant (n=485)	
Overall	4 [2,7]	5.1 (4.9)	2.1 (2.8)	8.4 (4.5)	< 0.001
ED Disposition					
Outpatient (n=431)	2 [0,4]	2.3 (2.4)	1.0 (1.1)	5.4 (1.9)	< 0.001
Inpatient (n=404)	5 [2,9]	5.9 (4.5)	3.0 (2.6)	8.6 (4.2)	< 0.001
ICU (n=192)	9 [5,14]	9.5 (5.7)	5.8 (6.0)	10.6 (5.1)	< 0.001

Table 2: Description of Total ASI characteristics for overall patient population and stratified by ED Disposition in the first 24 hours of care.

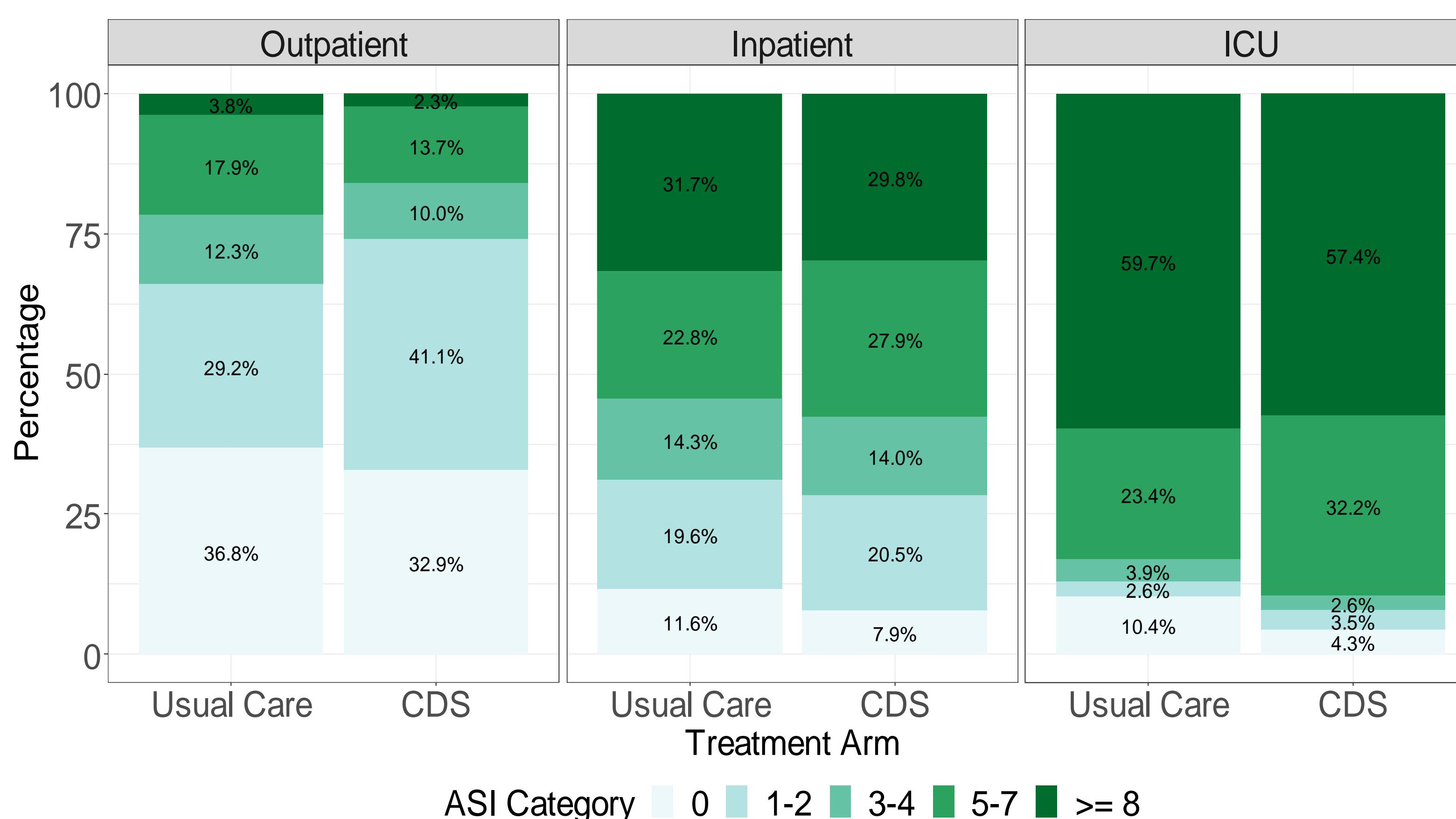


Figure 1: Percentage of each ASI Category in the first 24 hours of care (n= 1027) stratified by ED Disposition and Treatment Arm.

Categorical ASI and Guideline Concordance During First 24 hours by Treatment Arm

	Guideline-Concordant OR [95% CI]	ASI OR [95% CI]
Overall	0.94 [0.73, 1.20]	0.88 [0.72, 1.09]
ED Disposition		
Outpatient	1.53 [1.01, 2.33]	1.10 [0.78, 1.55]
Inpatient	0.88 [0.60, 1.30]	0.93 [0.66, 1.32]
ICU	0.56 [0.28, 1.11]	0.96 [0.54, 1.71]

Table 3: For ICECAP's guideline concordant outcome, an OR >1 indicates an increased odds of guideline concordant prescribing (generally more narrow antibiotics) in the CDS group relative to usual care. For the ASI outcome, an OR >1 indicates an increased odds of being in a lower ASI category (on more narrow antibiotics) in the CDS group relative to usual care.

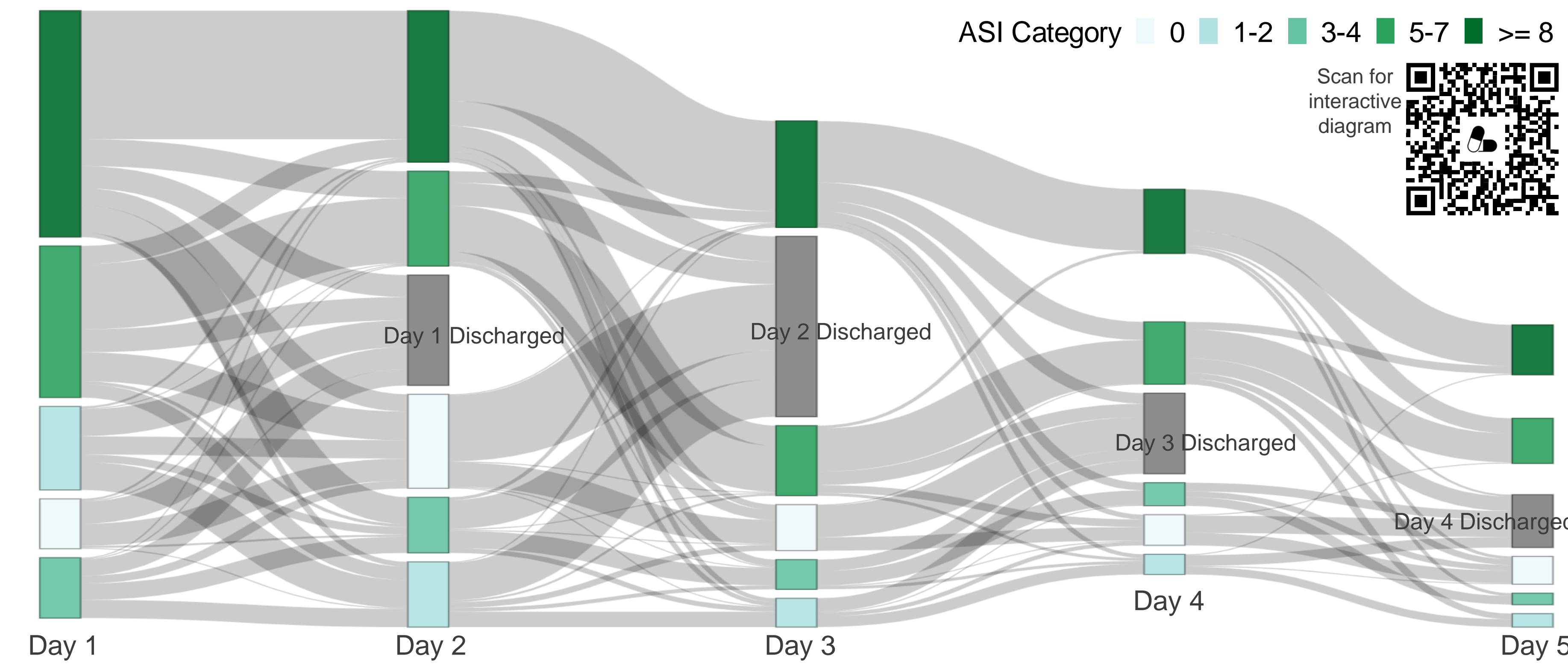


Figure 2: Day-to-day changes in ASI Category throughout all in-hospital encounters. Therapeutic inertia is evident, specifically in broader categories. Overall, many patients either stay in the same category or de-escalate with relatively few escalations visualized. Please scan QR code for interactive diagram.

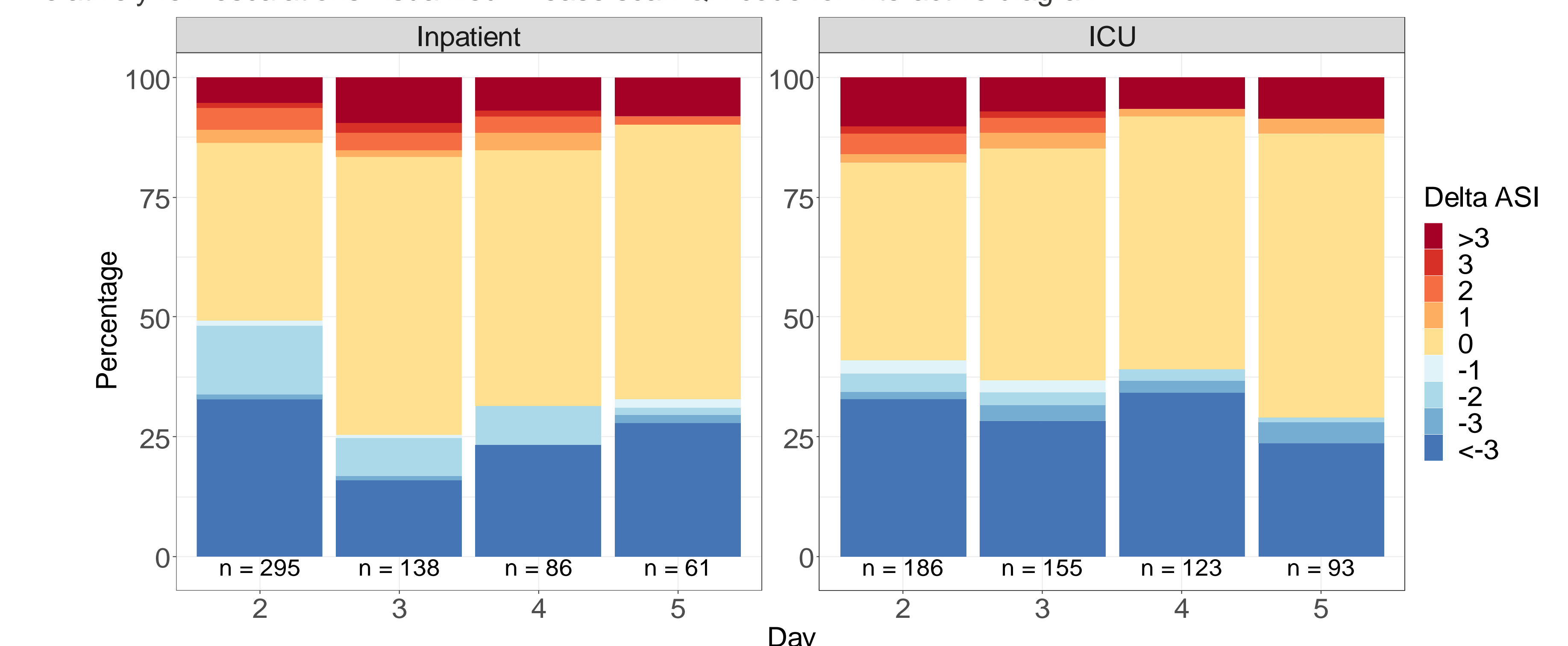


Figure 3: Difference in Total ASI over time stratified by in-hospital encounters. It is important to note that a Delta ASI of 0 in this instance indicates no change in antibiotic spectrum from the prior day.

LIMITATIONS

- ASI only examines spectrum of activity, requiring other metrics in conjunction to provide better clinical context and evaluate appropriateness
- Outpatient/ discharge prescriptions were not captured during the ICECAP trial

CONCLUSIONS

- Daily ASI was sensitive to changes in prescribing based on disposition and guideline-concordance
- Ordinal ASI outcome mirrored the directionality of the trial's primary, dichotomous guideline-concordance outcome
- ASI allows for more granular, quantitative insight into day-to day prescribing patterns during in-hospital encounters
- Relatively few escalations in ASI during in-hospital encounters suggest antibiotic overtreatment

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