The ROAD Home:

Interventions to Reduce Overuse of Antibiotics at Discharge Home

Valerie Vaughn, MD, MSc
Director of Hospital Medicine Research
University of Utah

Hospitalist Lead, Antimicrobial Use Initiative,
Michigan Hospital Medicine Safety Consortium

valerie.vaughn@hsc.utah.edu

Antibiotic Overuse at Discharge

- Types of Overuse at Discharge
- Framework for Improvement
- Pathways to Better Antibiotic Use at Discharge

Antibiotic Overuse at Discharge

- Types of Overuse at Discharge
- Framework for Improvement
- Pathways to Better Antibiotic Use at Discharge

MEASURING ANTIBIOTIC OVERUSE AT DISCHARGE

Unnecessary Antibiotics

Given for a non-infectious or non-bacterial syndrome

Excessive Antibiotics

Antibiotic needed, but prescribed for longer than necessary

Avoidable Fluoroquinolones

Antibiotic needed, but safer alternative exists

MEASURING ANTIBIOTIC OVERUSE AT DISCHARGE

Unnecessary Antibiotics

Given for a non-infectious or non-bacterial syndrome

1/8 patients treated for pneumonia lack symptoms or radiographic findings→?PNA

1/3 patients treated for UTI lack signs/symptoms→ ASB

MEASURING ANTIBIOTIC OVERUSE AT DISCHARGE

Unnecessary Antibiotics

Given for a non-infectious or non-bacterial syndrome

Excessive Antibiotics

Antibiotic needed, but prescribed for longer than necessary

Annals of Internal Medicine

ORIGINAL RESEARCH

Excess Antibiotic Treatment Duration and Adverse Events in Patients Hospitalized With Pneumonia

A Multihospital Cohort Study

Two-thirds of patients received excess antibiotic therapy

Each excess day of treatment was associated with 5% increase in odds of antibiotic adverse events

Vaughn, VM et.al. *Annals of Internal Medicine*. 2019

Annals of Internal Medicine

ORIGINAL RESEARCH

Excess Antibiotic Treatment Duration and Adverse Events in Patients Hospitalized With Pneumonia

A Multihospital Cohort Study

Two-thirds of patients received excess antibiotic therapy

93% of Excess Days Occur **After** Discharge

Vaughn, VM et.al. *Annals of Internal Medicine*. 2019

MEASURING ANTIBIOTIC OVERUSE AT DISCHARGE

Unnecessary Antibiotics

Given for a non-infectious or non-bacterial syndrome

Excessive Antibiotics

Antibiotic needed, but prescribed for longer than necessary

Avoidable Fluoroquinolones

Antibiotic needed, but safer alternative exists

WHY FLUOROQUINOLONES???

Adverse events

- Up to 27% of inpatients

Large driver of C. difficile infections

- Even short durations can double the risk of CDI

Associated with antimicrobial resistance

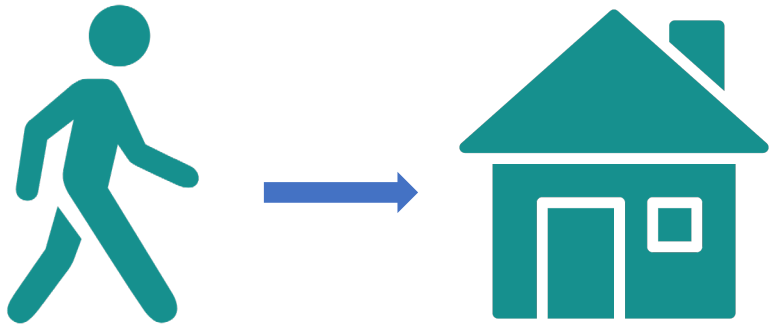
- MRSA/VRE, MDR Gram-negative infections
- Neighborhood FQ consumption→resistant E. coli

Most Common Antibiotic Prescribed at D/C

Avoidable Fluoroquinolones

Antibiotic needed, but safer alternative exists

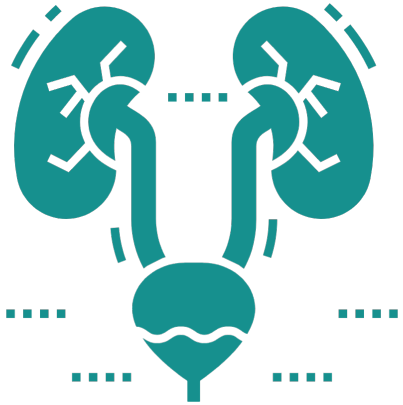
Tamma PD. JAMA Internal Medicine. 2017
Low M. et al. Lancet ID. 2019



12% were switched to a fluoroquinolone at discharge

Vaughn VM. *Clinical Infectious Diseases*. 2019.

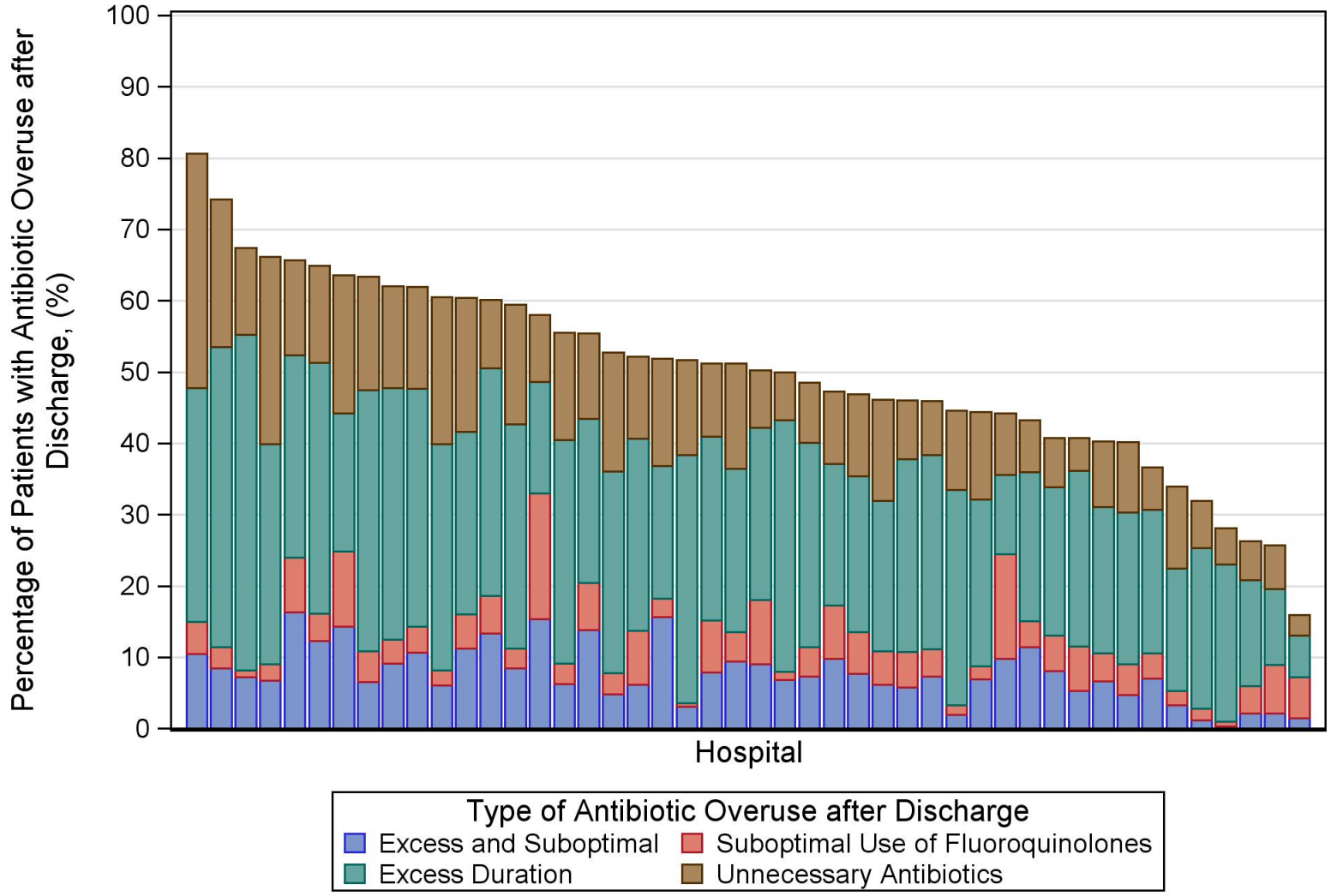
57% had antibiotic overuse at discharge



39% had antibiotic overuse at discharge

5-FOLD VARIATION ACROSS HOSPITALS

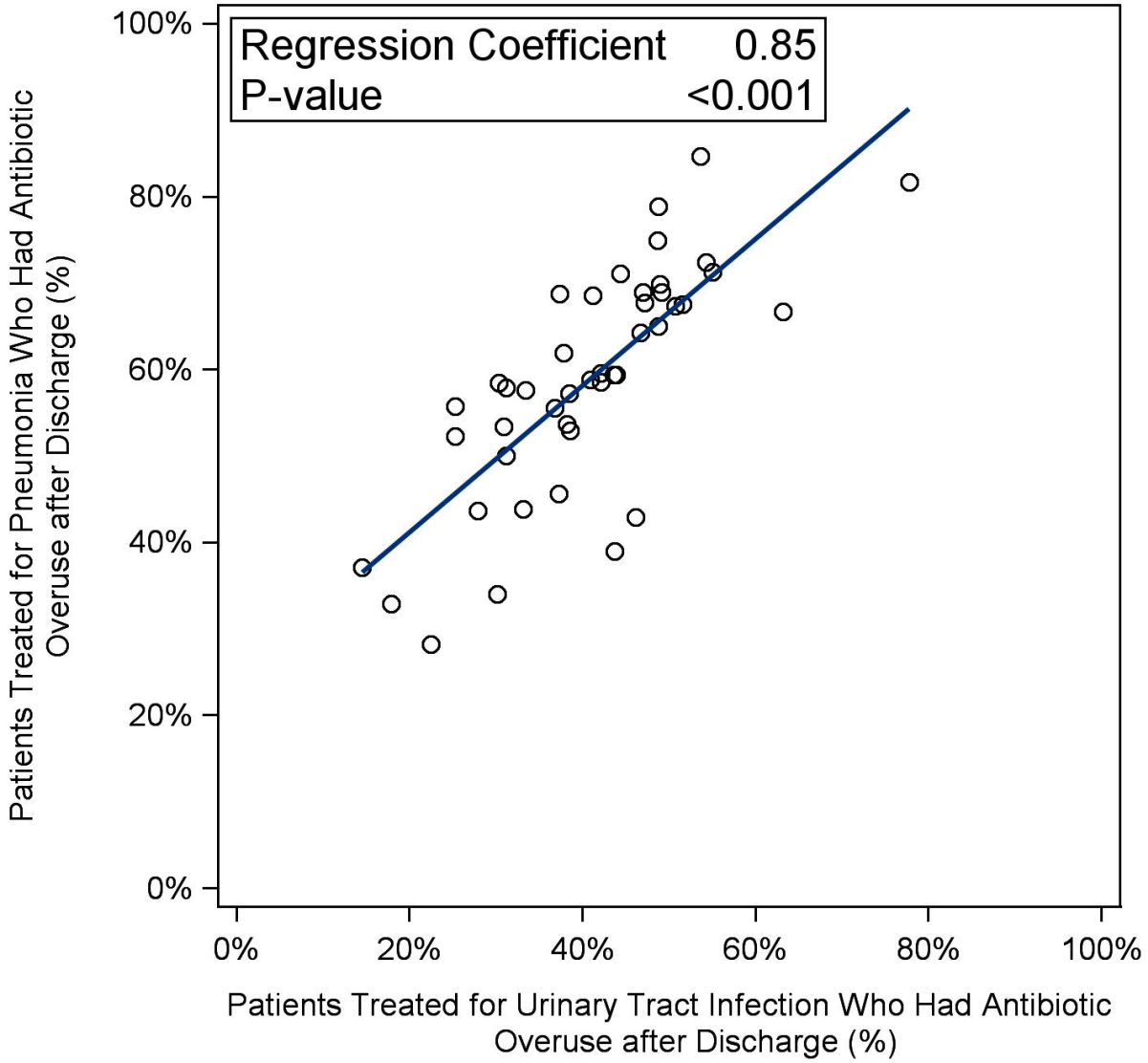
Figure 1. Antibiotic Overuse after Discharge in Patients Treated for Pneumonia or Urinary Tract Infection, by Hospital, (N=46 hospitals)



Vaughn VM, *Clinical Infectious Diseases*. 2020

STRONGLY CORRELATED ACROSS CONDITIONS

Figure 2. Antibiotic Overuse after Discharge in Patients Treated for UTI vs. Patients Treated for Pneumonia, by Hospital, (N=44 hospitals)



Vaughn VM, *Clinical Infectious Diseases*. 2020

Common causes for antibiotic overuse at discharge

Dr. Nate Soper

Reviewed 100 patients discharged with antibiotics from short stay units→78% had antibiotic misuse at discharge

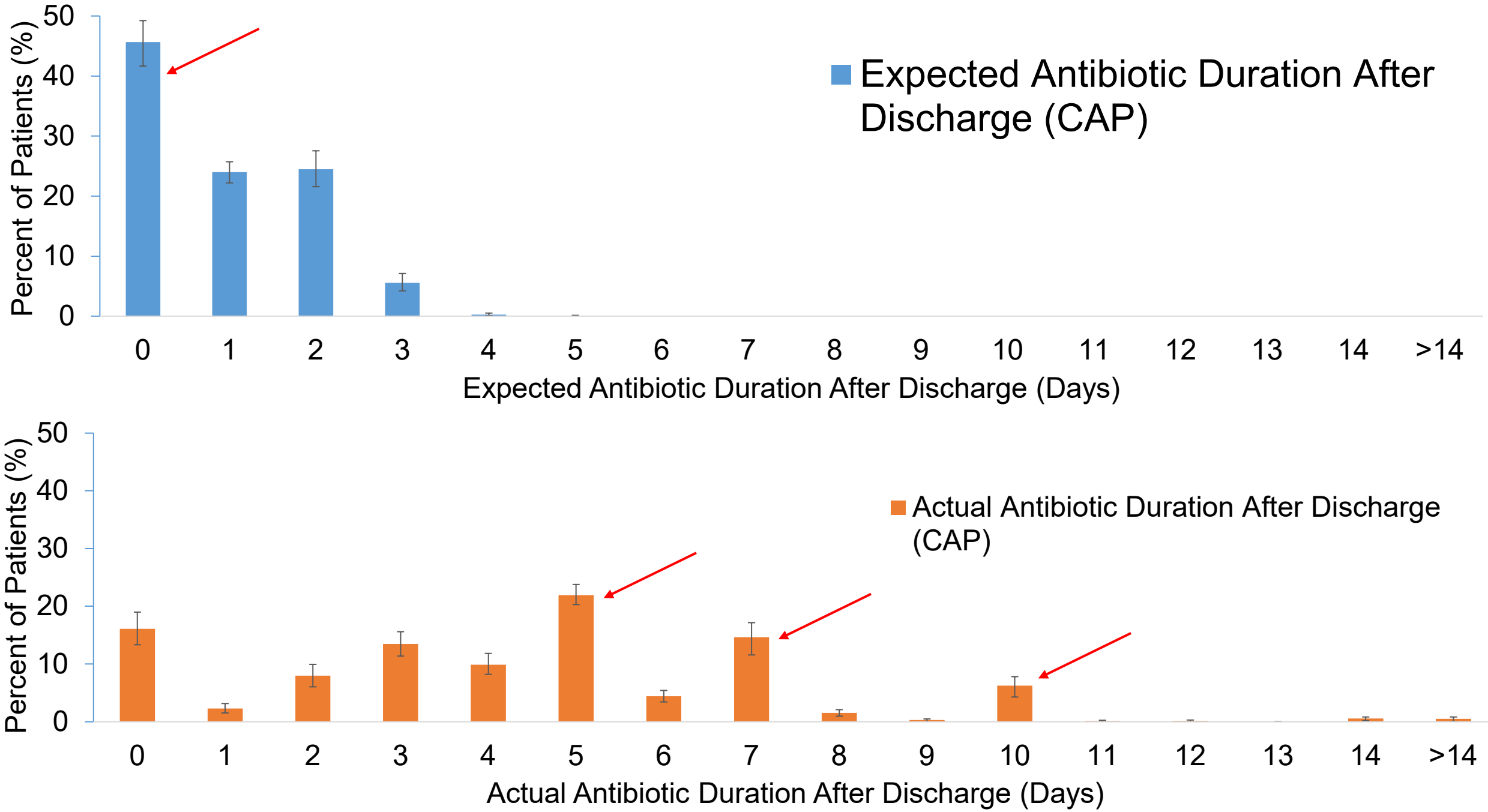
27% consultant recommended misuse

18% didn't account for source control procedure

2+2=5

11% miscalculated days 14% didn't account for inpatient days

Soper NS, *ICHE*. 2021



Vaughn VM et al. *Annals of Internal Medicine. 2019*

Antibiotic Overuse at Discharge

- Types of Overuse at Discharge
- Framework for Improvement
- Pathways to Better Antibiotic Use at Discharge

Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework

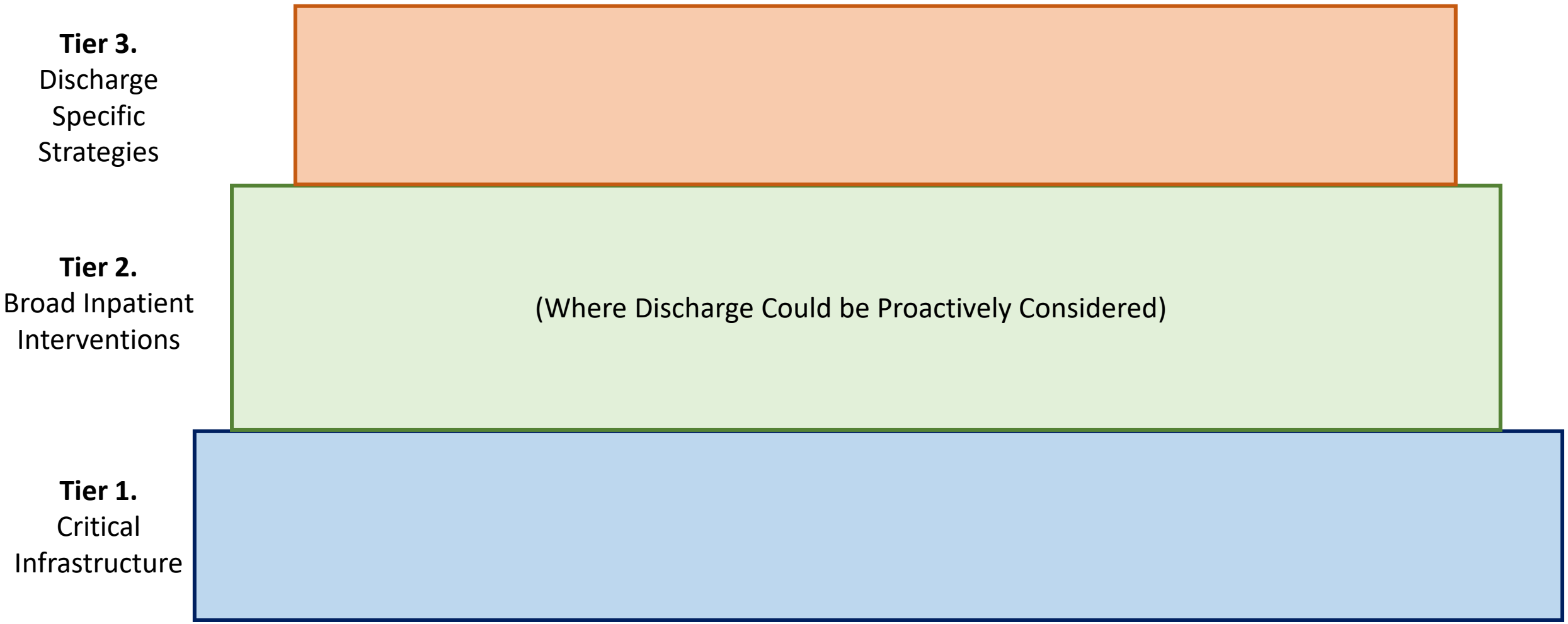
Clin Infect Dis. 2021 Sep 23;ciab842. doi: 10.1093/cid/ciab842. Online ahead of print.

Antibiotic Overuse and Stewardship at Hospital Discharge: The Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework

Valerie M Vaughn [1 2 3], Adam L Hersh [4], Emily S Spivak [5]

Vaughn VM, Hersh AL, Spivak ES, The ROAD Home Framework. *Clinical Infectious Diseases*. 2021.

ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge



ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

Tier 1. Critical Infrastructure	Dedicated Stewardship Resources since the Joint Commission Requirement	Hospital Policy Requiring Documentation of Intended Duration in Discharge Summary	Updated UTI Guideline in Prior Year	Education on UTI and ASB
			Updated Pneumonia Guideline in Prior Year	Education on Pneumonia

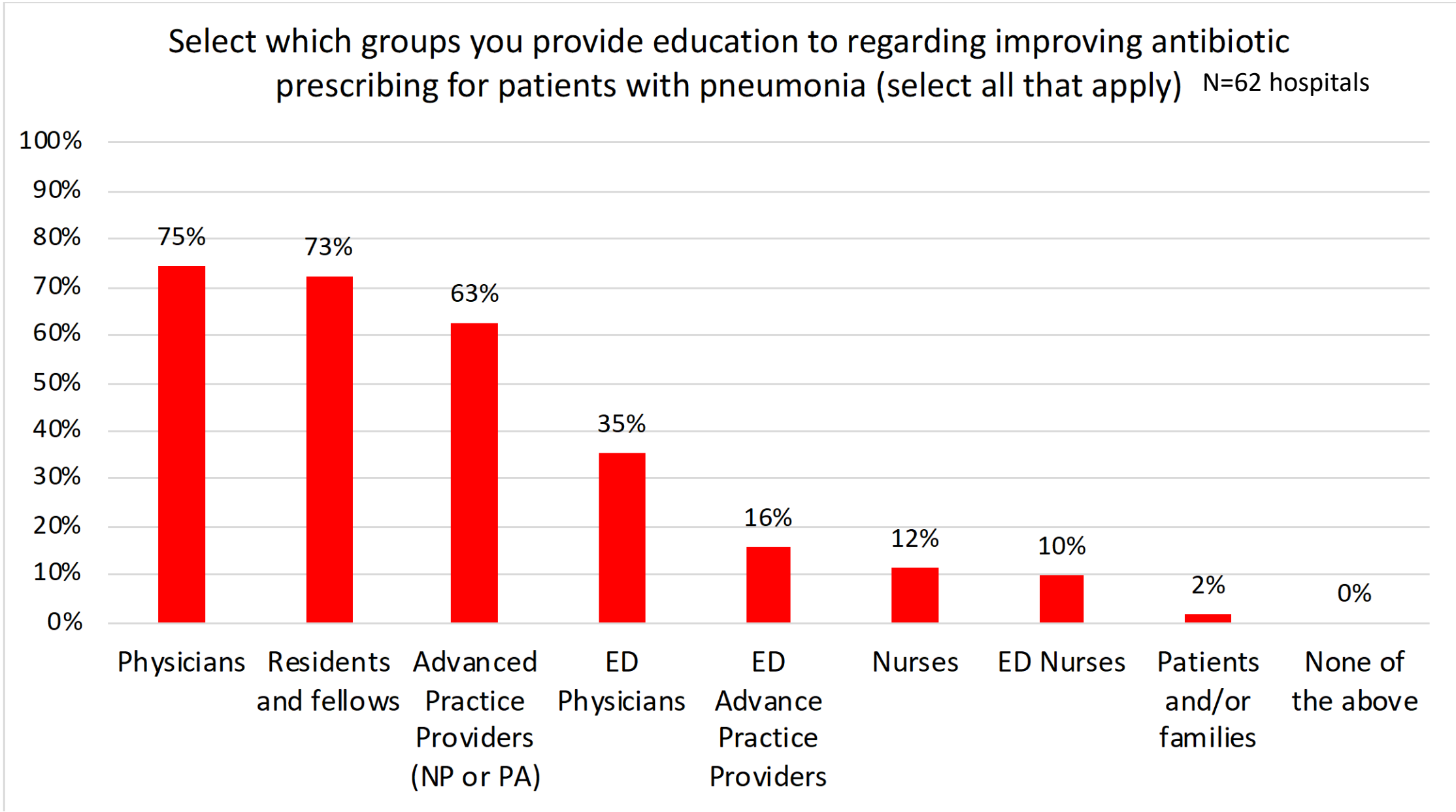
ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

Tier 1. Critical Infrastructure	Dedicated Stewardship Resources since the Joint Commission Requirement (31%)	Hospital Policy Requiring Documentation of Intended Duration in Discharge Summary (15%)	Updated UTI Guideline (51%)	Education on UTI and ASB (87%)
			Updated Pneumonia Guideline (59%)	Education on Pneumonia (95%)

ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

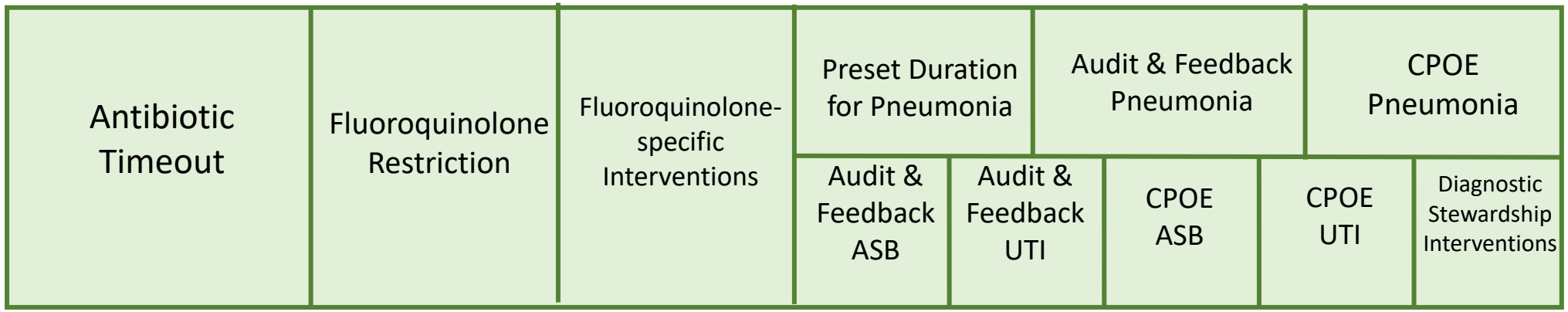
Fall 2019—>Spring 2021

Tier 1. Critical Infrastructure	Dedicated Stewardship Resources since the Joint Commission Requirement (31%→not asked)	Hospital Policy Requiring Documentation of Intended Duration in Discharge Summary (15%→18%)	Updated UTI Guideline (51%→21%)	Education on UTI and ASB (87%→85%)
			Updated Pneumonia Guideline (59%→66%)	Education on Pneumonia (95%→82%)



ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

Tier 2.
Broad Inpatient Interventions



ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

Tier 2.
Broad Inpatient Interventions

<table>
<tr><td rowspan="2">Antibiotic Timeout (31%)</td><td rowspan="2">Fluoroquinolone Restriction (31%)</td><td rowspan="2">Fluoroquinolone-specific Interventions (3, 2-4) (100%)</td><td>Preset Duration for Pneumonia (56% said yes)</td><td colspan="2">Audit & Feedback Pneumonia (80%)</td><td colspan="2">CPOE Pneumonia (100%)</td></tr>
<tr><td>Audit & Feedback ASB (59%)</td><td>Audit & Feedback UTI (67%)</td><td>CPOE ASB (26%)</td><td>CPOE UTI (67%)</td><td>Diagnostic Stewardship Interventions (1, 0-2) (67%)</td></tr>
</table>

ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

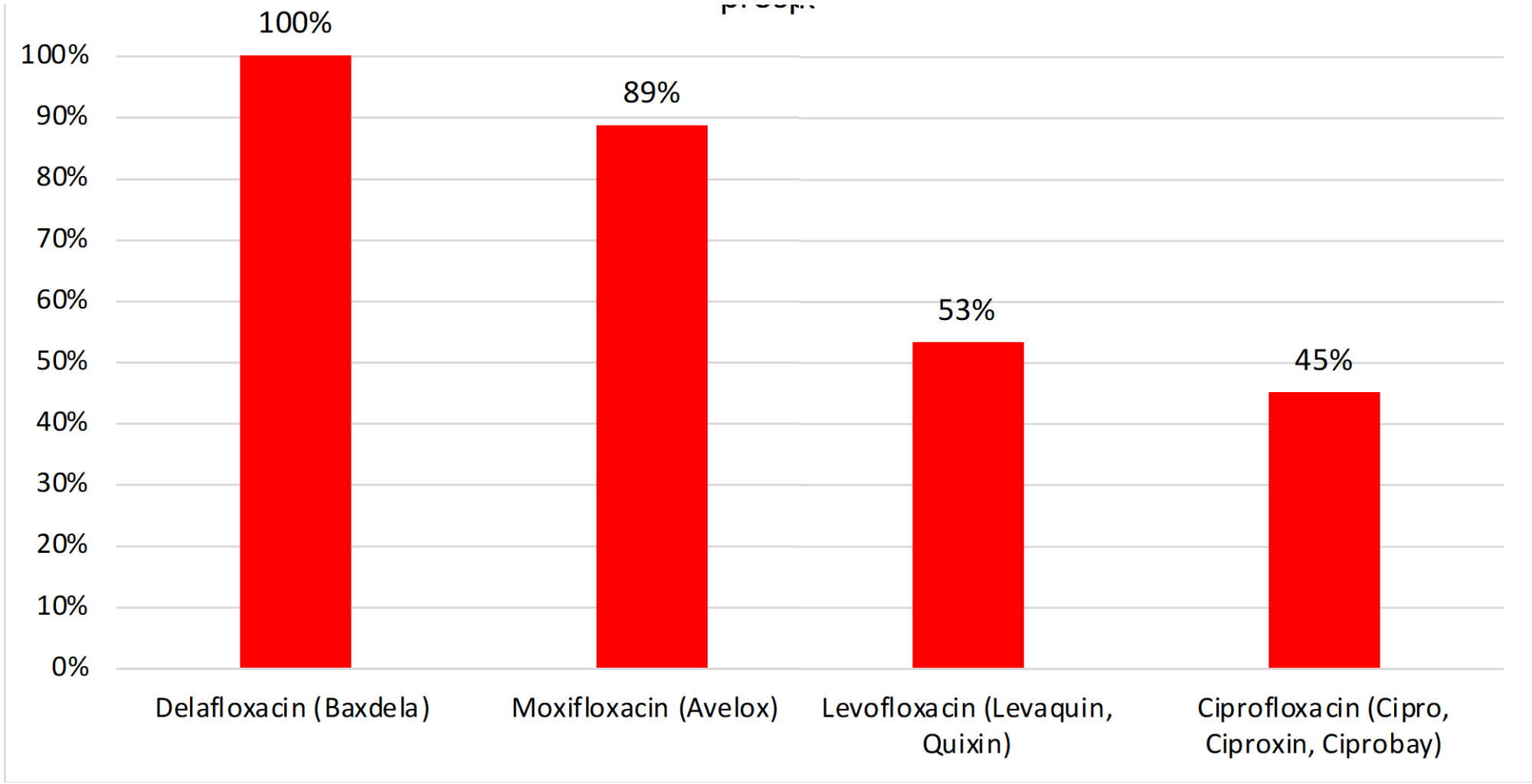
Fall 2019 Presence—>Spring 2021

Tier 2.
Broad Inpatient Interventions

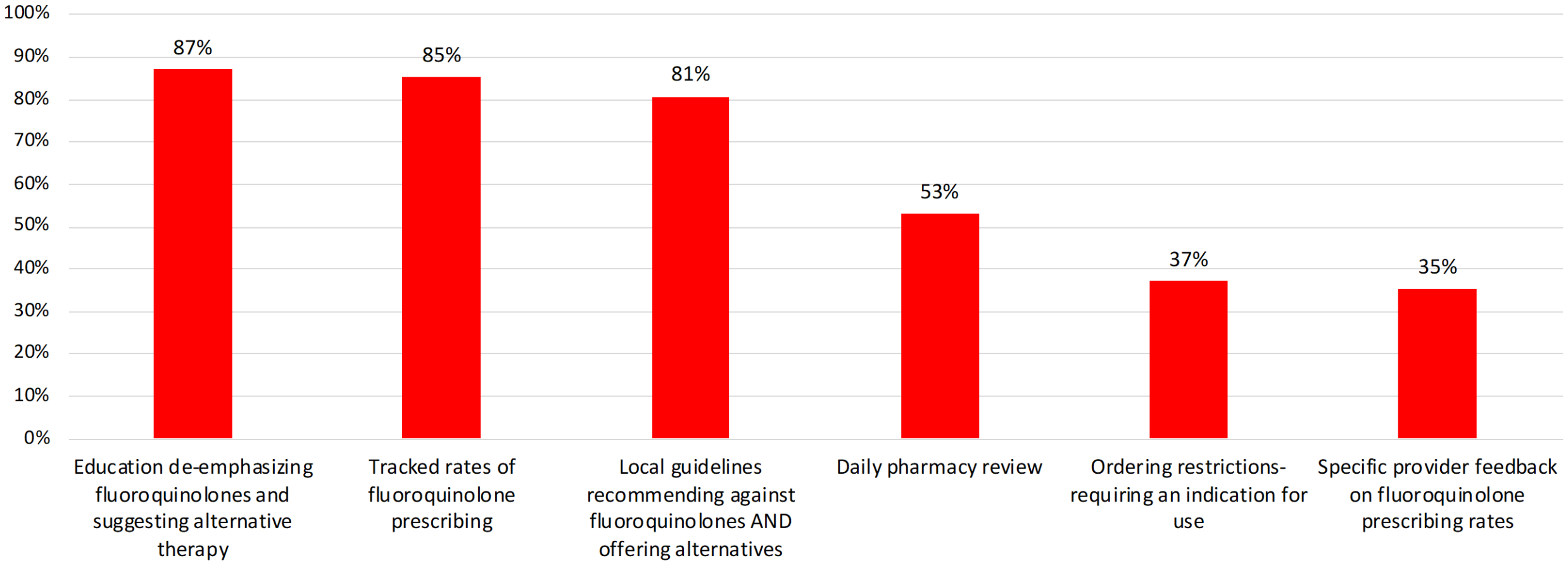
Antibiotic Timeout (31%→40%)	Fluoroquinolone Restriction (31%→43.5%)	Fluoroquinolone-specific Interventions (3, 2-4) (100% →100%)	Preset Duration for Pneumonia (56%→50% "yes")		Audit & Feedback Pneumonia (80%→73%)		CPOE Pneumonia (100%→84%)	
			Audit & Feedback ASB (59%→68%)	Audit & Feedback UTI (67%→61%)	CPOE ASB (26%→37%)	CPOE UTI (67%→74%)	Diagnostic Stewardship Interventions (1, 0-2) (67% →98%)	

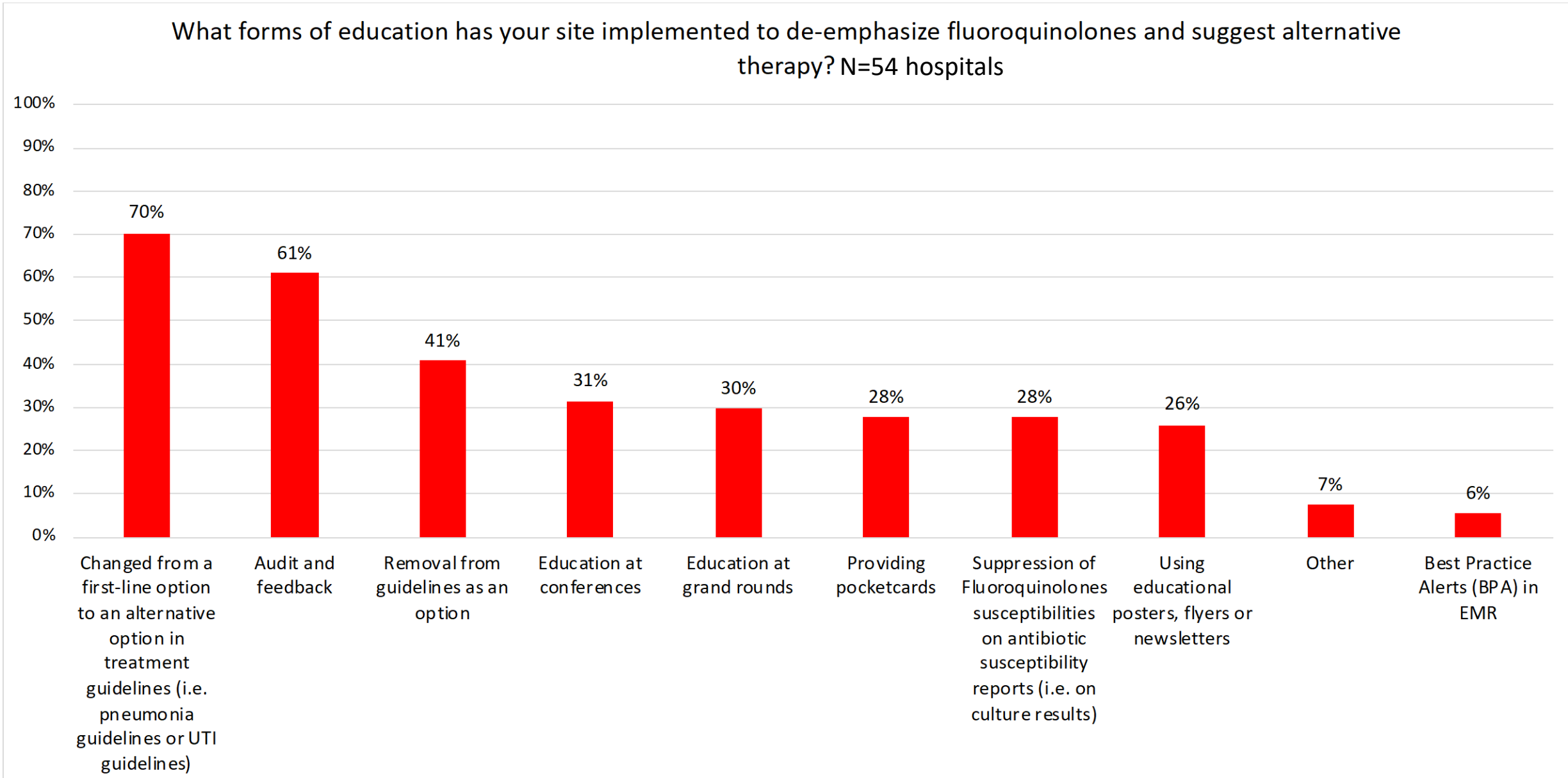
Which fluoroquinolones are restricted at your hospital?

N=62 hospitals



In the past two years, has your hospital performed any of the following to try to reduce overall fluoroquinolone prescribing? (Check all that apply) N=62 hospitals





ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

Tier 3.
Discharge Specific Strategies

Discharge Intervention De-emphasizing Fluoroquinolones	Antibiotic Use Data on Discharge Antibiotics	Review of Outpatient Antibiotics before Discharge

ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

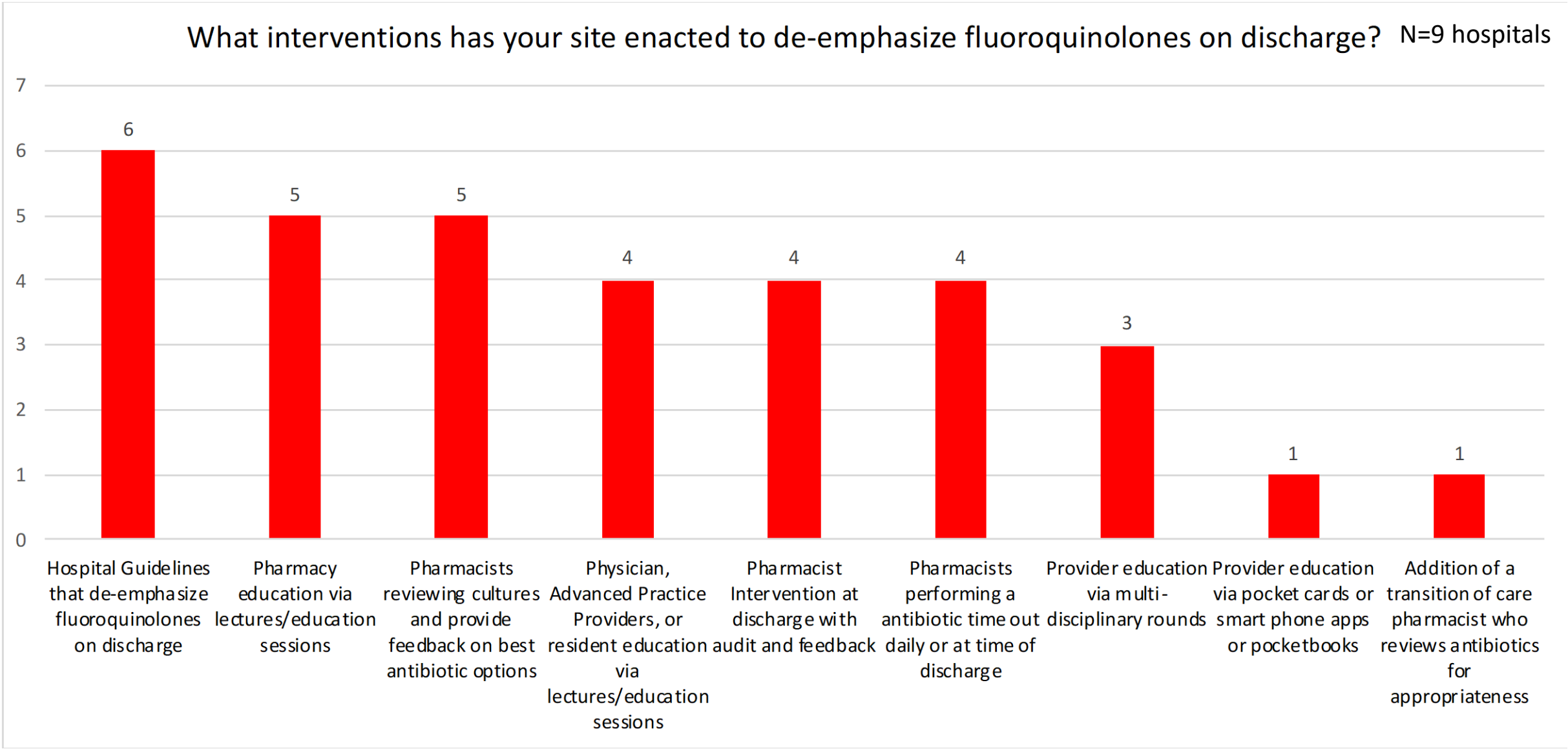
Tier 3. Discharge Specific Strategies	Discharge Intervention De-emphasizing Fluoroquinolones (15%)	Antibiotic Use Data on Discharge Antibiotics (5%)	Review of Outpatient Antibiotics before Discharge (8%)

ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge

Tier 3.
Discharge Specific Strategies

Discharge Intervention De-emphasizing Fluoroquinolones (15%→15%)	Antibiotic Use Data on Discharge Antibiotics (5%→8%)	Review of Outpatient Antibiotics before Discharge (8%→16%)

Fall 2019→Spring 2021



Major Findings

- Only 4 interventions were associated with less antibiotic overuse at discharge
  - Less D/C Antibiotic Overuse Both UTI and Pneumonia
    - **Review of Outpatient Antibiotics before Discharge**→
      - ~46% fewer antibiotic overuse days at discharge
  - Less D/C Antibiotic Overuse UTI Only
    - Discharge Intervention De-emphasizing Fluoroquinolones (↓31.9%)
    - Fluoroquinolone Restriction (↓28.5%)
    - Fluoroquinolone-specific Interventions (↓12.9%/intervention)
- One associated with MORE antibiotic overuse at discharge
  - Preset Duration for Pneumonia (↑44.1%)

Review of Abx before D/C

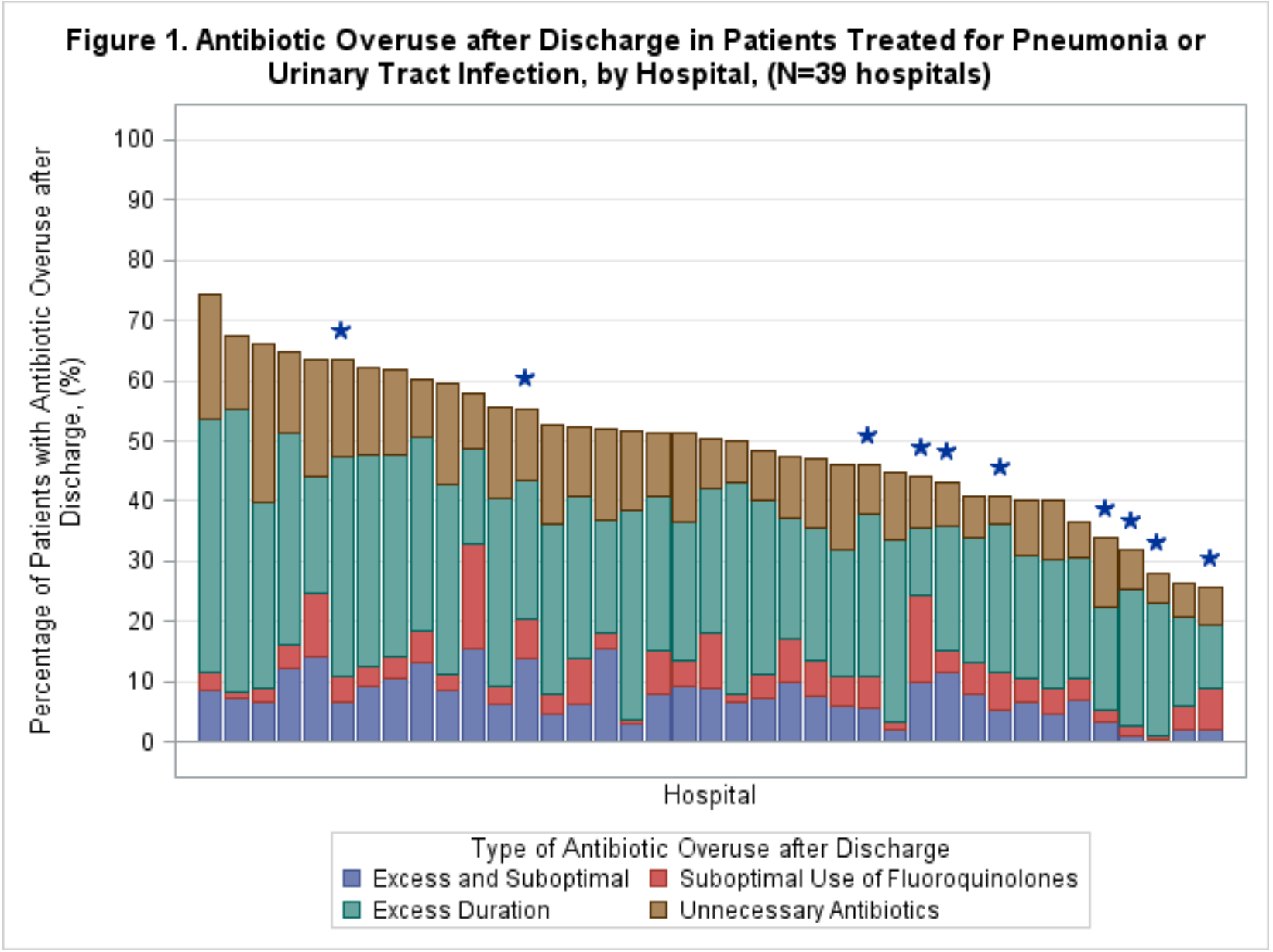
All 3 Hospitals Involved Clinical Pharmacists

Major Findings- multivariable analyses

- More stewardship interventions → better antibiotic use at discharge
  - Each additional stewardship intervention:
    - 4.3% relative reduction in days of antibiotic overuse at discharge

- BUT, discharge-directed stewardship (Tier 3) interventions had bigger effect
  - 12.4% relative reduction in days of antibiotic overuse at discharge

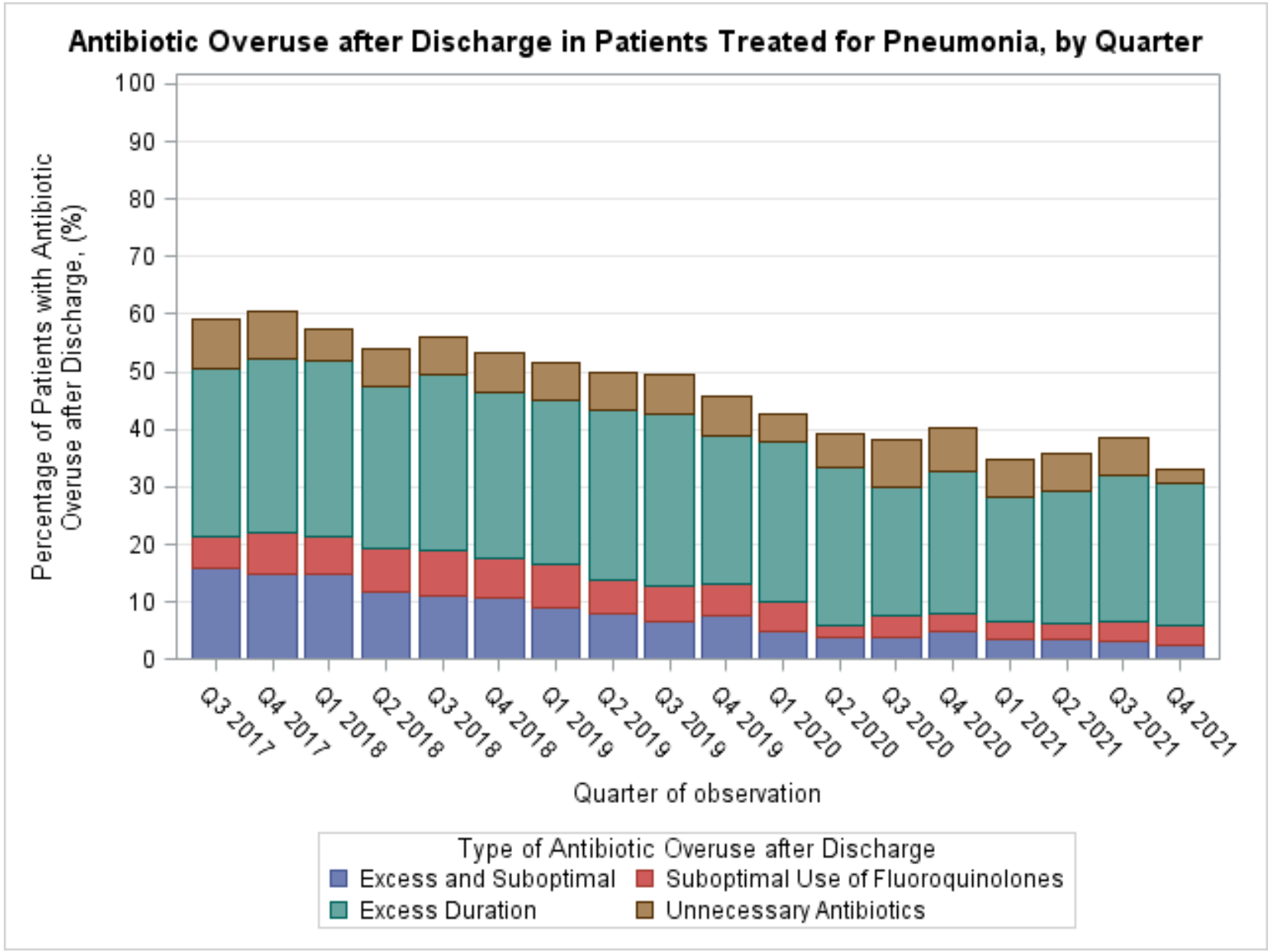
Tier 3 (Discharge-Specific Intervention)



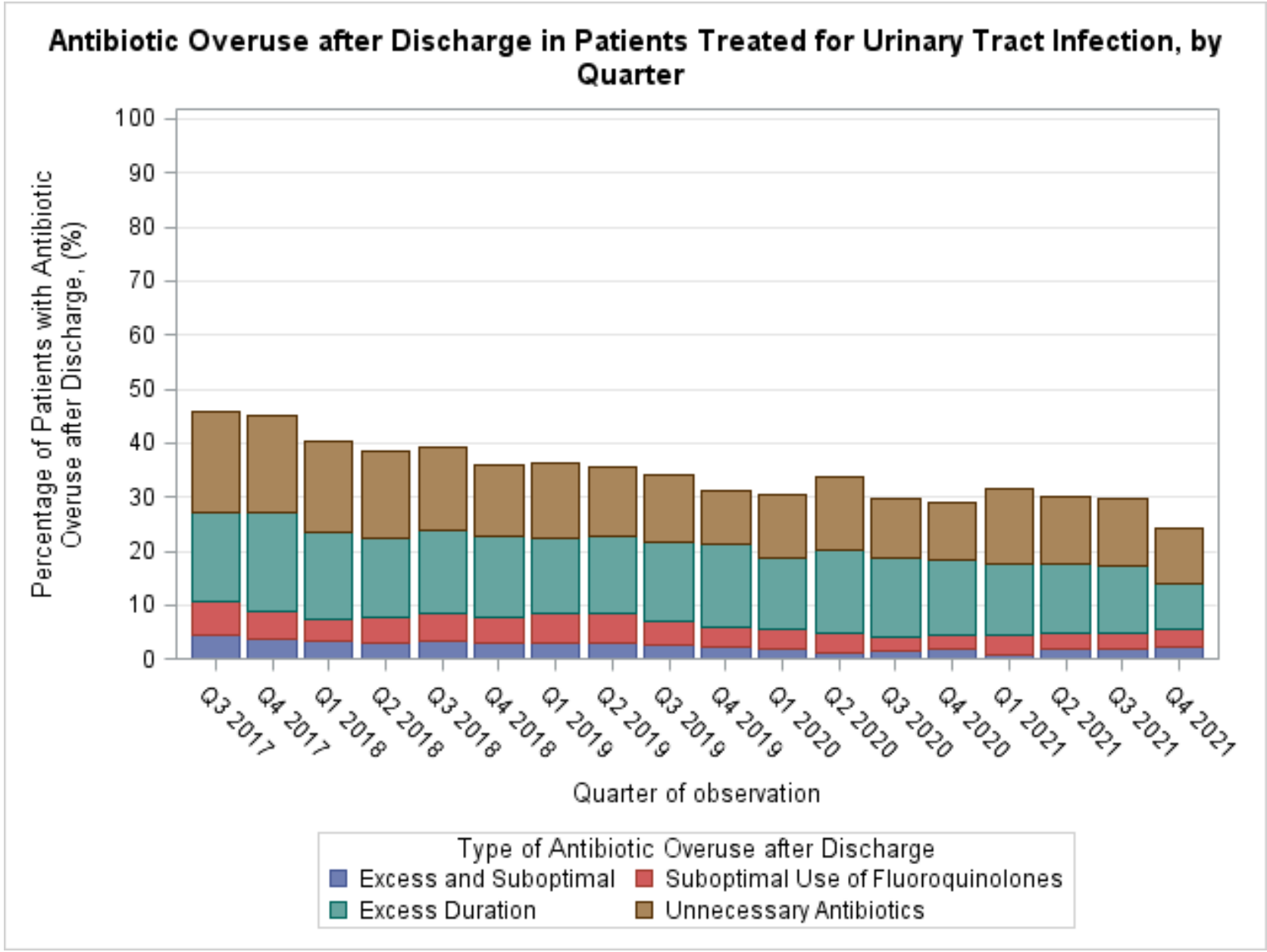
Antibiotic Overuse at Discharge

- Types of Overuse at Discharge
- Framework for Improvement
- Pathways to Better Antibiotic Use at Discharge

Antibiotic Overuse at Discharge Has Decreased for Pneumonia



Antibiotic Overuse at Discharge Has Decreased for UTI

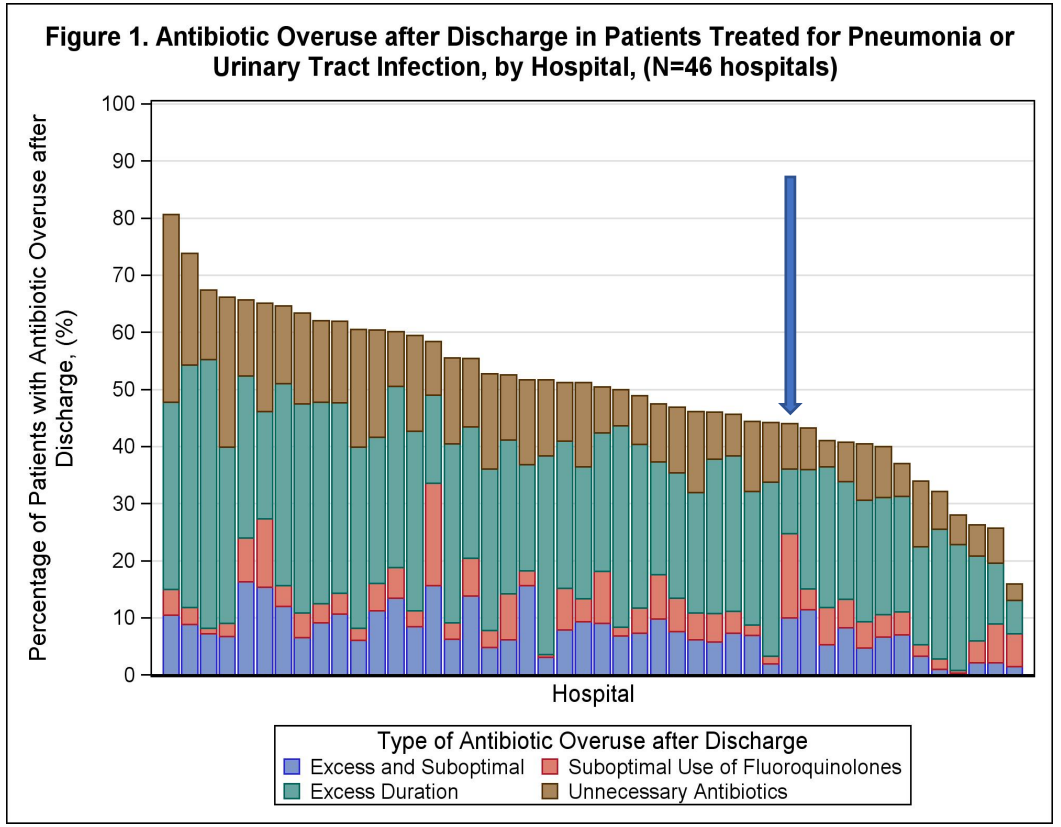


Two Pathways to Improving Antibiotic Use at Discharge

Focus on Discharge

- Hospitals with fewer resources for inpatient antibiotic stewardship can improve antibiotic use at discharge by:
  - Implementing robust Tier 3 "discharge-specific" strategies
    - E.g., pharmacist review of antibiotics before discharge (using a TOC pharmacist or team inpatient pharmacists)

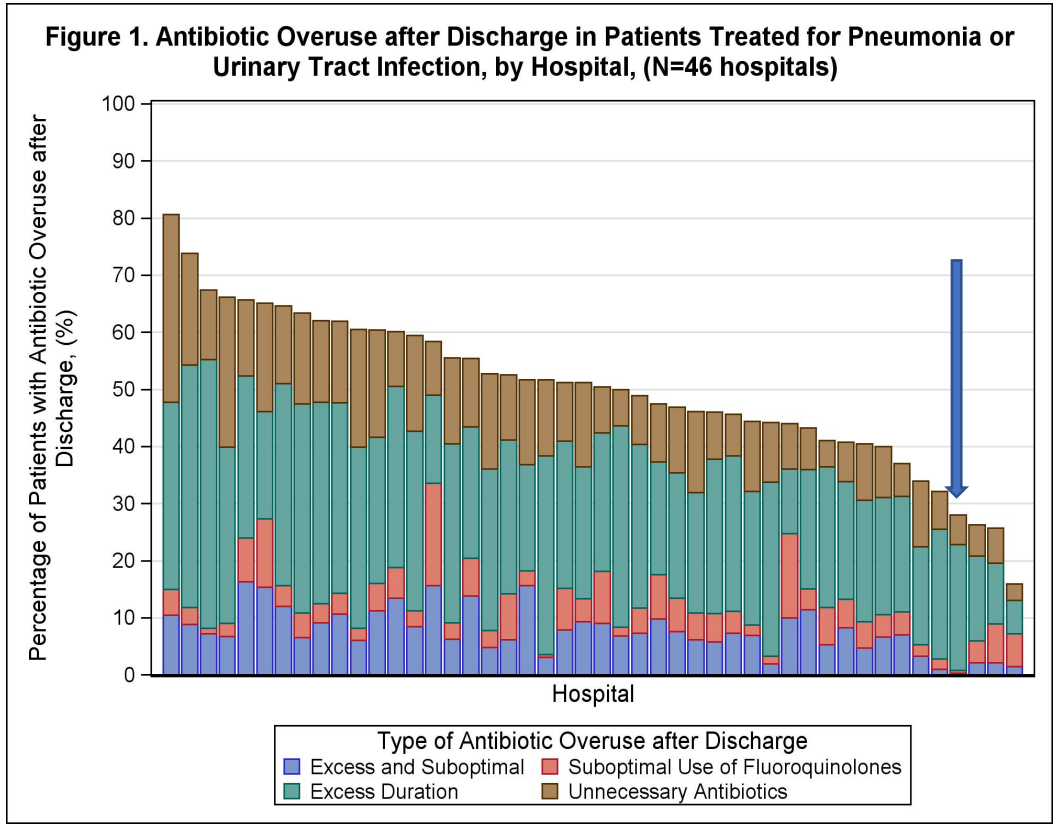
Few Tier 1 and Tier 2 strategies but 2 (of 3) Discharge-specific strategies



Robust Inpatient Stewardship (keeping discharge in mind)

- Hospitals that already have robust inpatient stewardship interventions can improve antibiotic use at discharge by:
  - Incorporating discharge into Tier 1 and 2 Strategies
    - Pharmacists pro-actively discussed discharge antibiotics during audit and feedback
    - Discharge recommendations included in disease-specific guidelines
    - Discharge recommendations included in antibiotic/disease-specific education

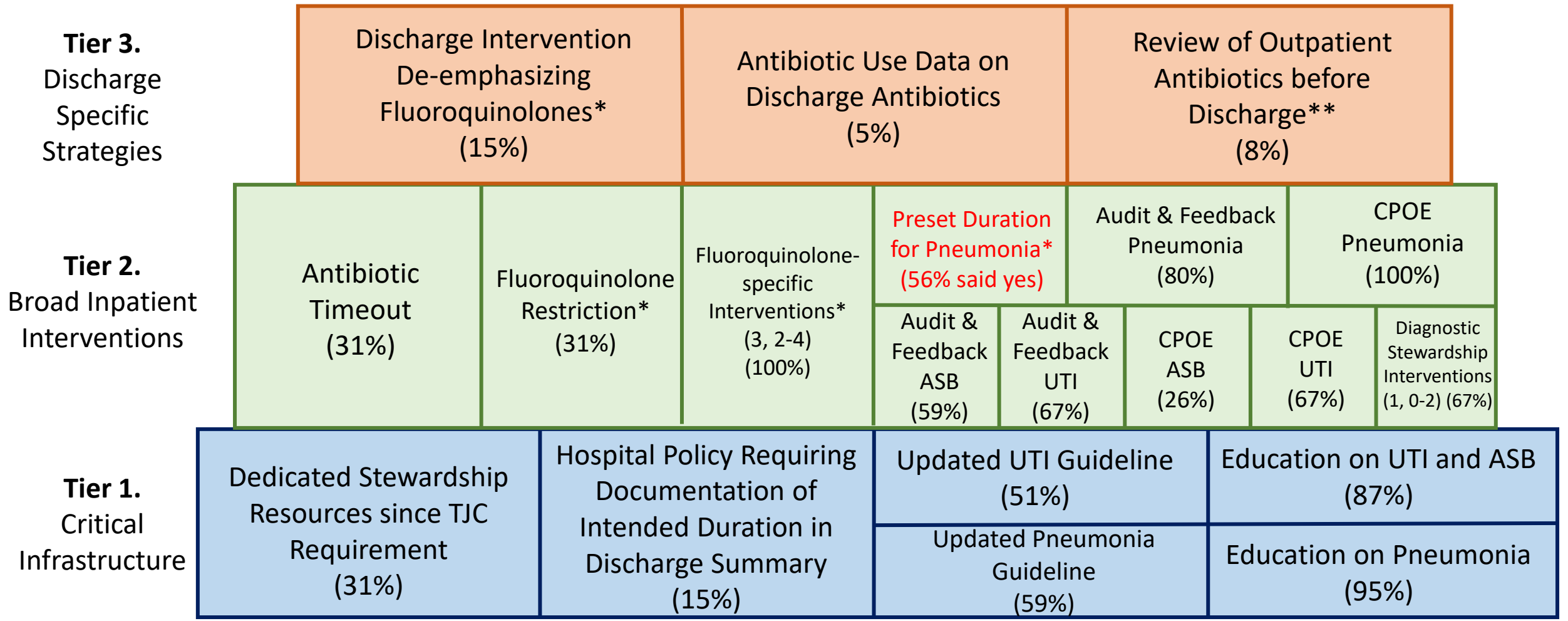
Lots of Tier 1 and Tier 2, No discharge-specific strategies



Summary

- Antibiotic overuse at discharge common
  - Unnecessary antibiotics
  - Excess duration
  - Avoidable fluoroquinolones
- Biggest effect on discharge
  - Pharmacist review at d/c (biggest **reduction**)
  - Automatic duration at discharge (biggest **increase**)
- Two pathways to success
  - Discharge specific strategies (e.g., pharmacist audit at discharge)
  - Planning inpatient strategies with discharge in mind (e.g., discuss during audit and feedback, include in guidelines/education)

Figure 1. ROAD Home Tiered Strategies for Improving Antibiotic Use at Hospital Discharge



Tiered strategies for improving antibiotic use at hospital discharge are shown. Smaller boxes target specific disease states (i.e., pneumonia or UTI). Numbers in each box represent the proportion of HMS hospitals reporting the noted strategy or the median and interquartile range of strategies reported.

*Having a preset duration for pneumonia was associated with higher antibiotic overuse at discharge. Hospitals may consider removing or shortening preset duration.

Abbreviations: ROAD (Reducing Overuse of Antibiotics at Discharge), UTI (urinary tract infection), ASB (asymptomatic bacteriuria), CPOE (computerized order entry)