

One Size Doesn't Fit All:

Tailoring and the Implementation of Discharge Antibiotic Stewardship Interventions

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Antibiotic Stewardship at Discharge



Valerie Vaughn, MD, MSc

- Quantifying Overuse
- Reasons for Overuse
- Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework for Improving Antibiotic Prescribing



Julie Szymczak, PhD

- ROAD Home Trial: Testing a Participatory Tailored Approach

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HMS

MICHIGAN HOSPITAL
MEDICINE SAFETY CONSORTIUM

Collaborative Quality Initiative

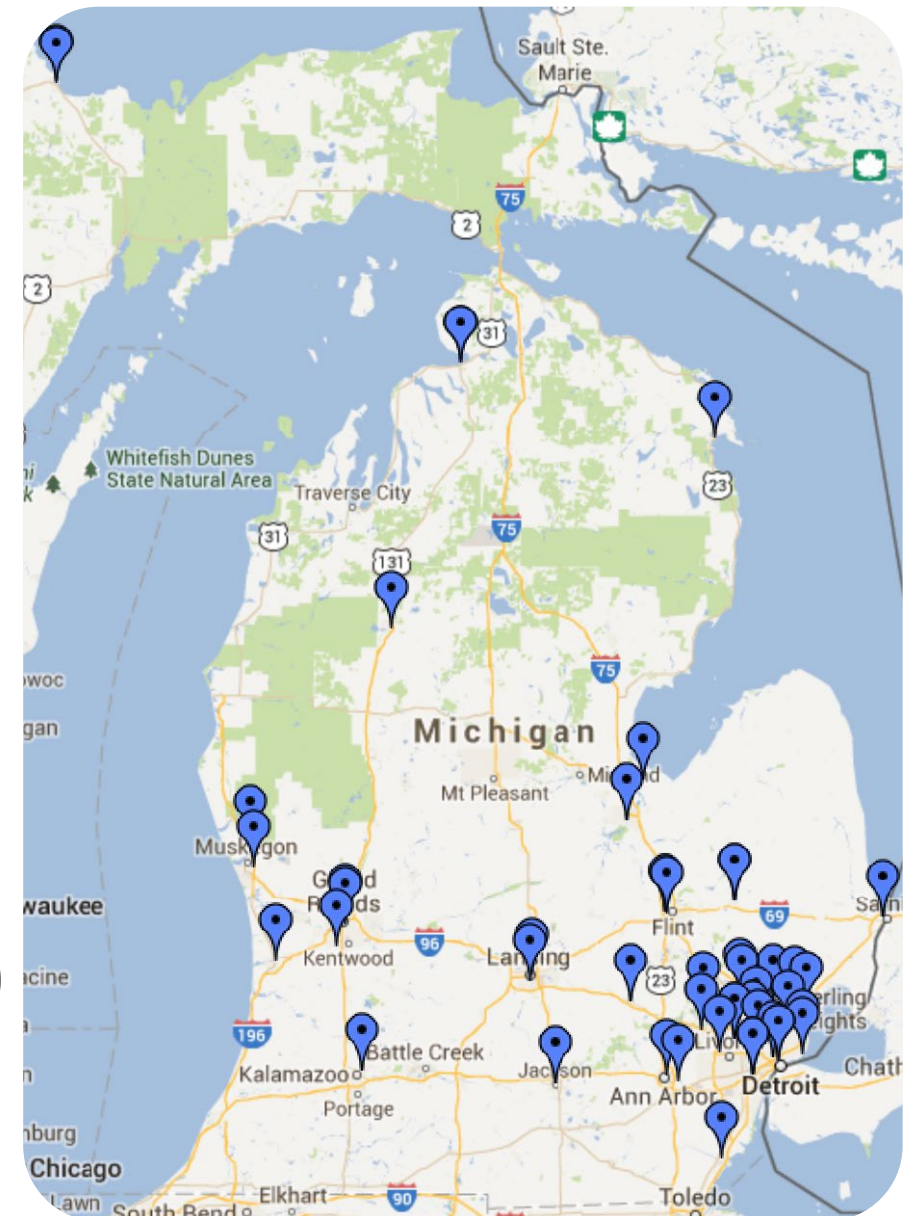
- 69 hospitals in Michigan
- Academic, community, small, large
- Improve care of hospitalized patients

Cohort of non-ICU, medical patients

- Positive Urine Culture
- Community-acquired Pneumonia

Medical record review (70,000 patients)

- Signs, symptoms
- Discharge prescribing



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

A Multihospital Cohort Study 6481 patients, 43 hospitals

Two-thirds of patients received excess antibiotic therapy

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

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

A Multihospital Cohort Study 6481 patients, 43 hospitals

Two-thirds of patients received excess antibiotic therapy

93% of excess antibiotic duration occurs at discharge

TYPES OF ANTIBIOTIC OVERUSE AT DISCHARGE



Unnecessary Antibiotics

Given for a non-infectious or non-bacterial syndrome



Excessive Duration

Antibiotic needed, but prescribed for longer than necessary



Avoidable Fluoroquinolones

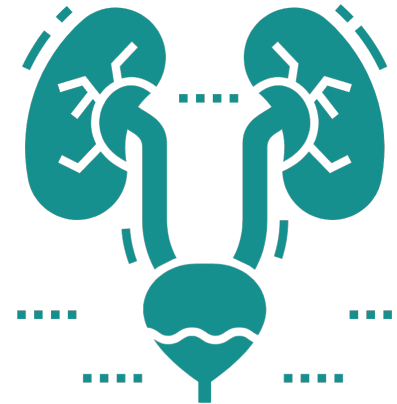
Antibiotic needed, but safer alternative exists

ANTIBIOTIC OVERUSE AT DISCHARGE IS COMMON

Assessment of antibiotic use at discharge in 21,825 patients treated for pneumonia or urinary tract infection across 46 hospitals (July 2017-July 2019)



57% had antibiotic overuse at discharge



39% had antibiotic overuse at discharge

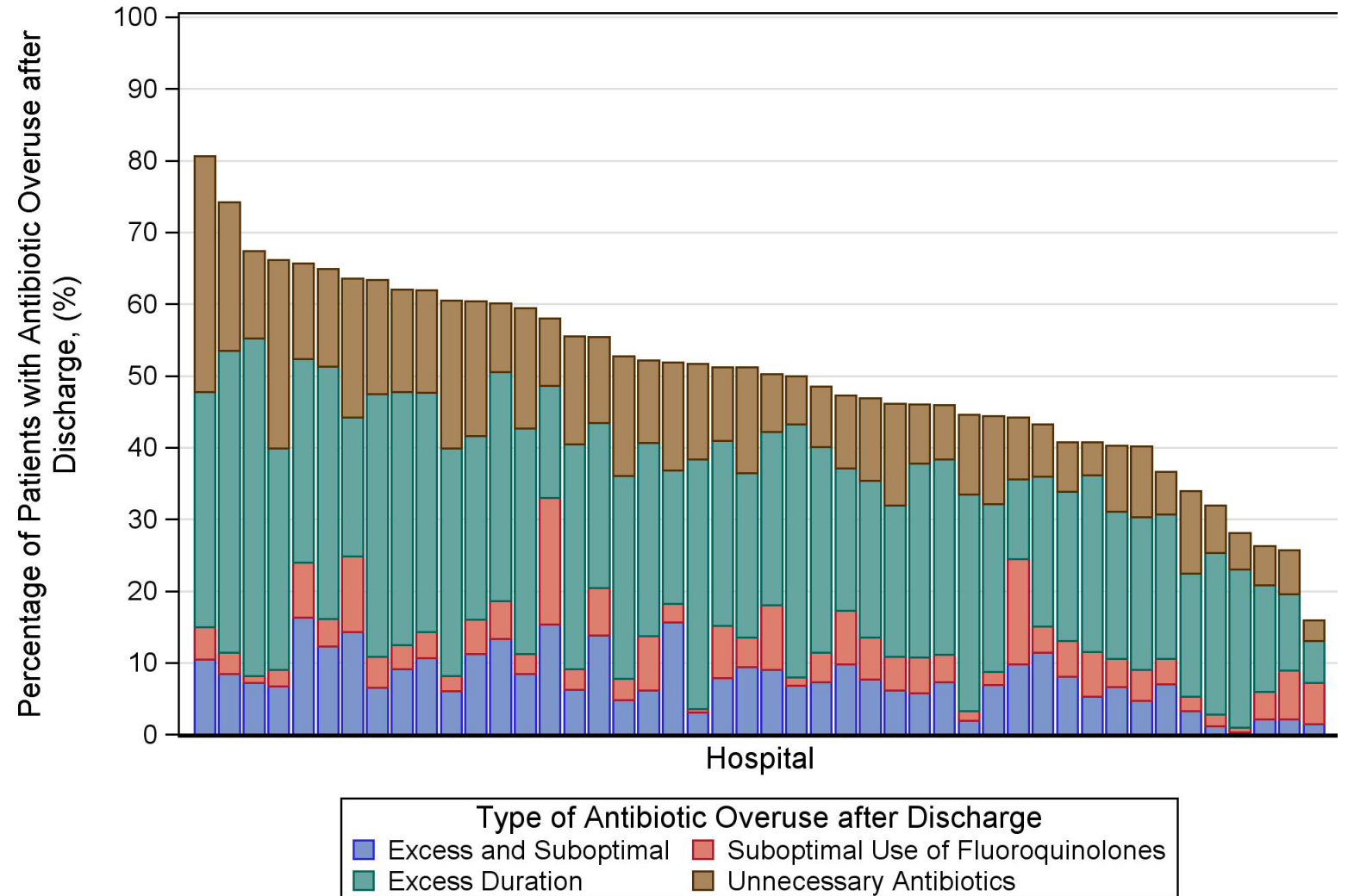
ANTIBIOTIC OVERUSE AT DISCHARGE IS ASSOCIATED WITH PATIENT HARM

- Antibiotic side effects (e.g., *C. difficile*)
- Increased antibiotic resistance (self)
- Increased antibiotic resistance (communities, nursing homes)
- Unnecessary central line/midline (OPAT) and associated harms

Vaughn VM, et al. *Clinical Infectious Diseases*. 2020
Vaughn VM, et al. *Annals of Internal Medicine*. 2019
Gontjes KJ et al. *JAMA Network Open*. 2022

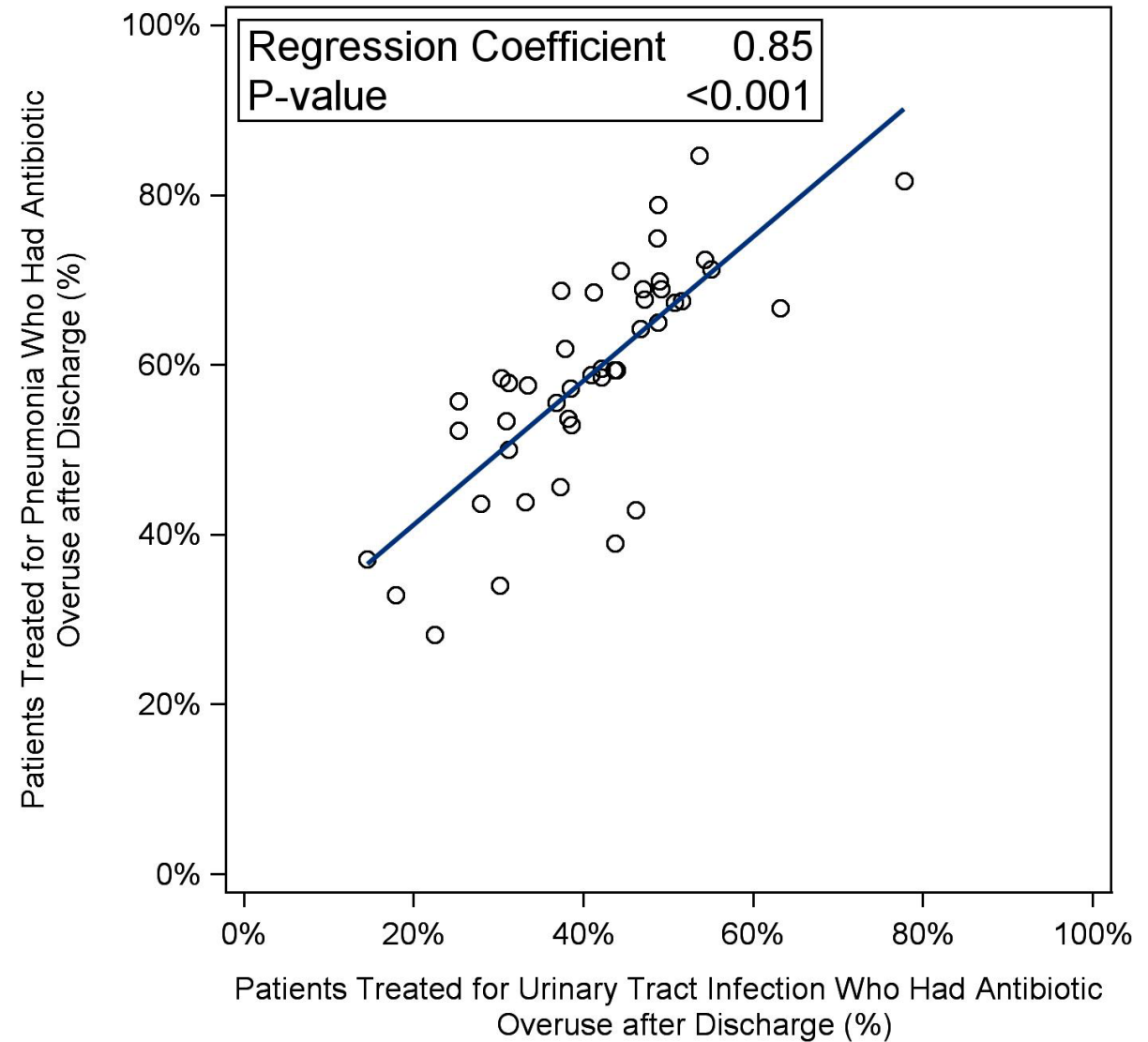
5-FOLD VARIATION ACROSS HOSPITALS

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



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)



Inpatient Antibiotic Stewardship Strategies may NOT be Effective at Discharge



11%

fewer patients received a fluoroquinolone in hospitals targeting **inpatient** fluoroquinolone use



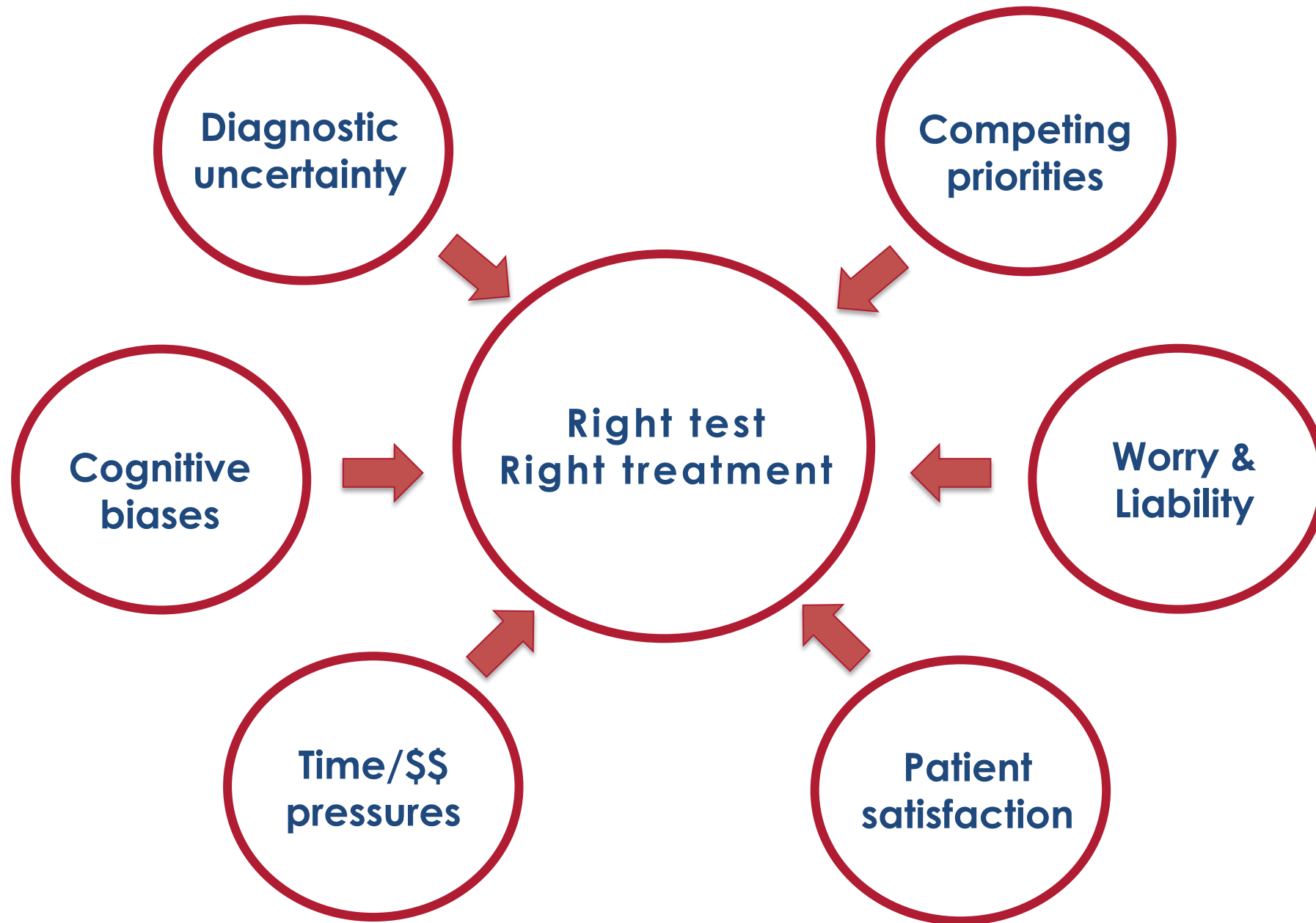
Double

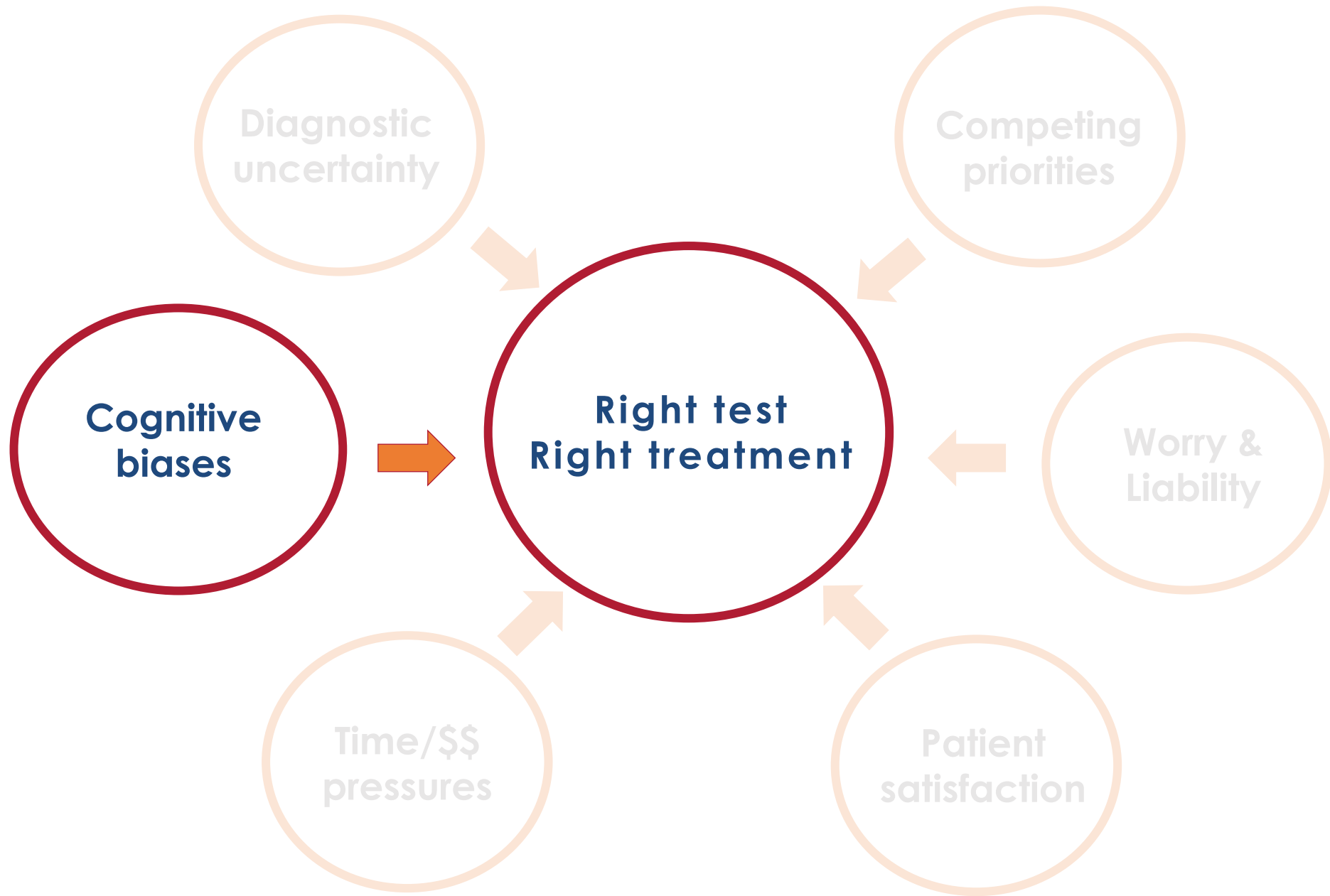
the number of patients were **newly started** on a fluoroquinolone **at discharge**

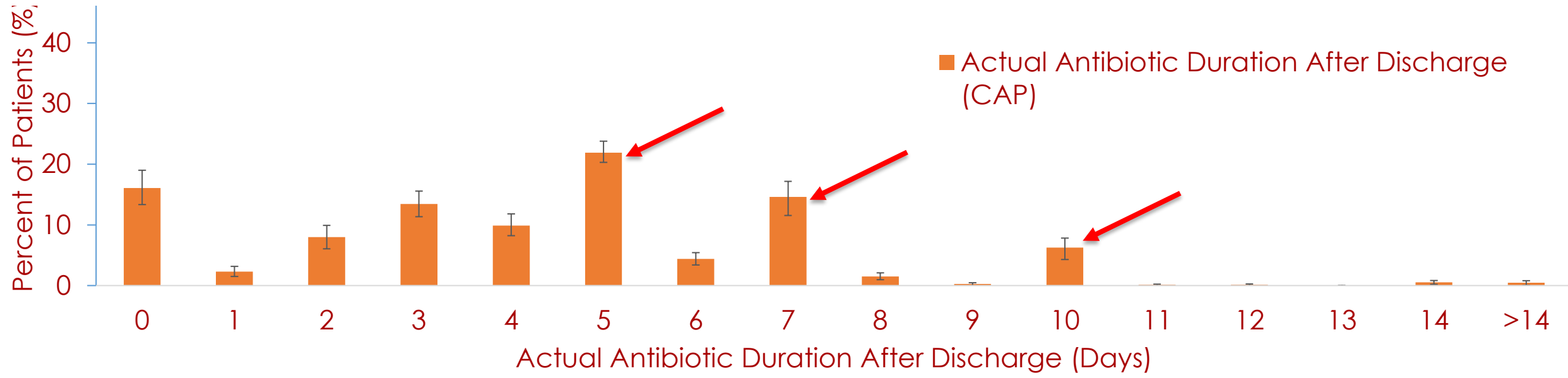
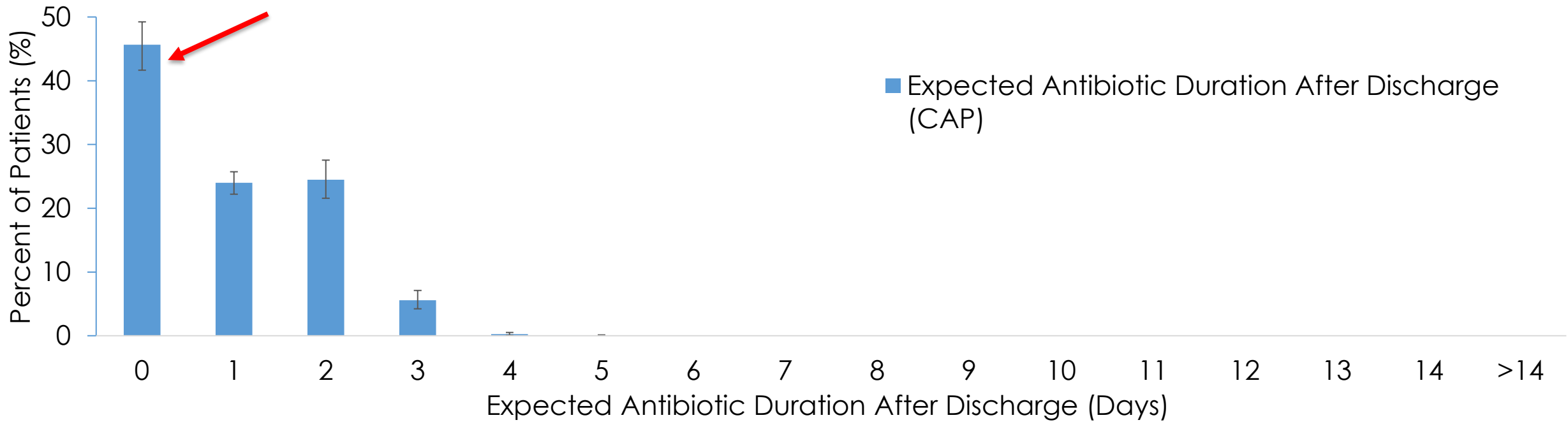
Why???

Antibiotic Stewardship at Discharge

- Quantifying Overuse
- Reasons for Overuse
- Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework for Improving Antibiotic Prescribing
- ROAD Home Trial: Testing a Participatory Tailored Approach







Reference [1. Summary](#) [2. Dose Adjustments](#) [3. Black Box Warning](#)

Links:
Summary [Show Antimicrobial Summary](#) ▾
Report:
Product:

CIPROFLOXACIN HCL 250 MG ORAL TAB [View Available Strengths](#)

Sig Method: **Specify Dose, Route, Frequency** Use Free Text Taper/Ramp Combination Dosage

Dose: mg [250 mg](#) [500 mg](#) [750 mg](#)

Prescribed Dose: 250 mg
Prescribed Amount: 1 tablet

Route: [oral](#)

Frequency: [BID](#)

⚠ Duration: [⚠](#) [Doses](#) [Days](#) [5 days](#) [7 days](#) [10 days](#) [14 days](#) [30 days](#) [2 months](#)

Starting: Ending: [⚠](#)

⚠ Dispense: Days/Fill: [Full \(0 Days\)](#) [30 Days](#) [90 Days](#)

Quantity: [⚠](#) tablet Refill: [⚠](#)

Total Supply: **Unable to calculate**

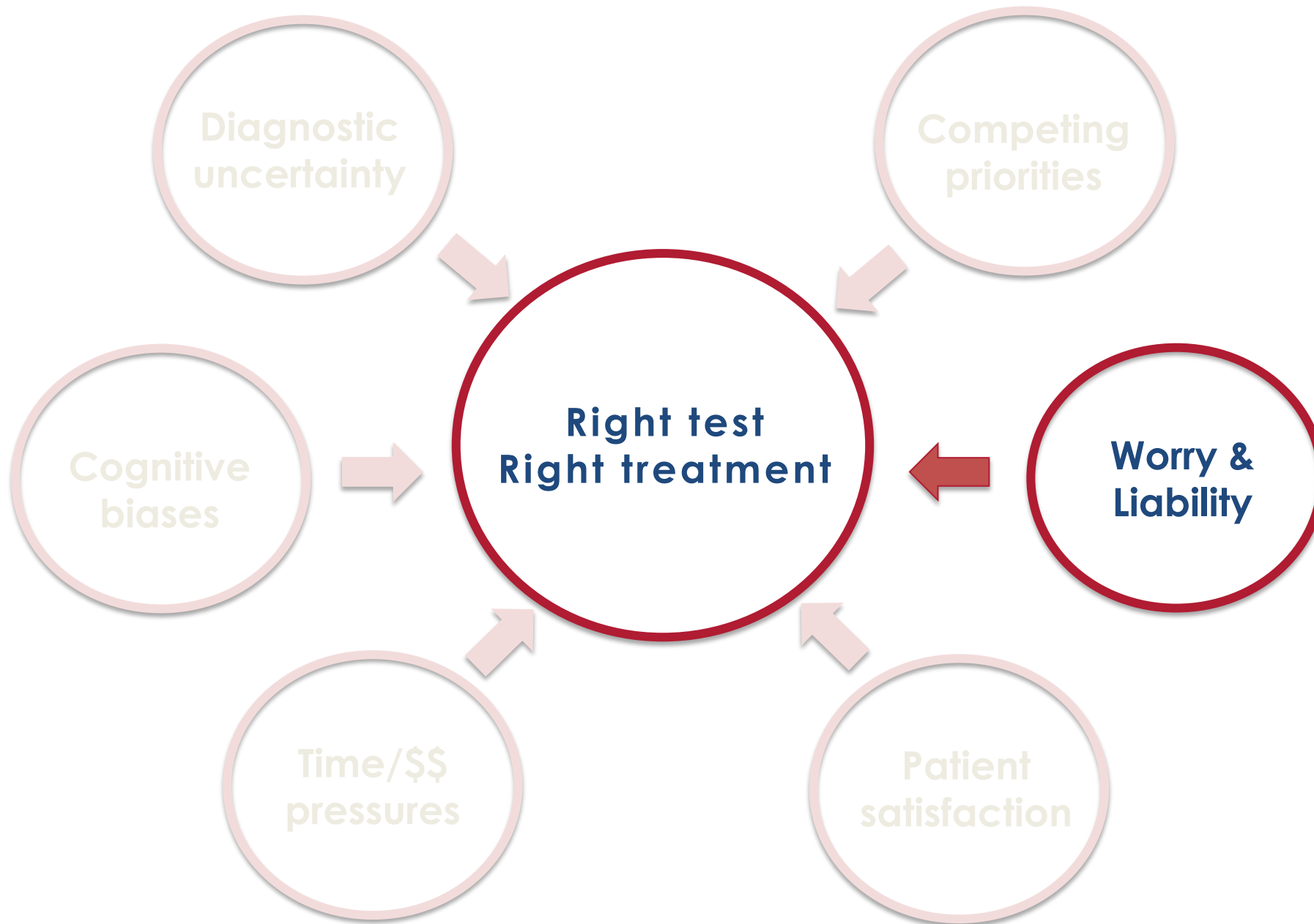
Dispense As Written

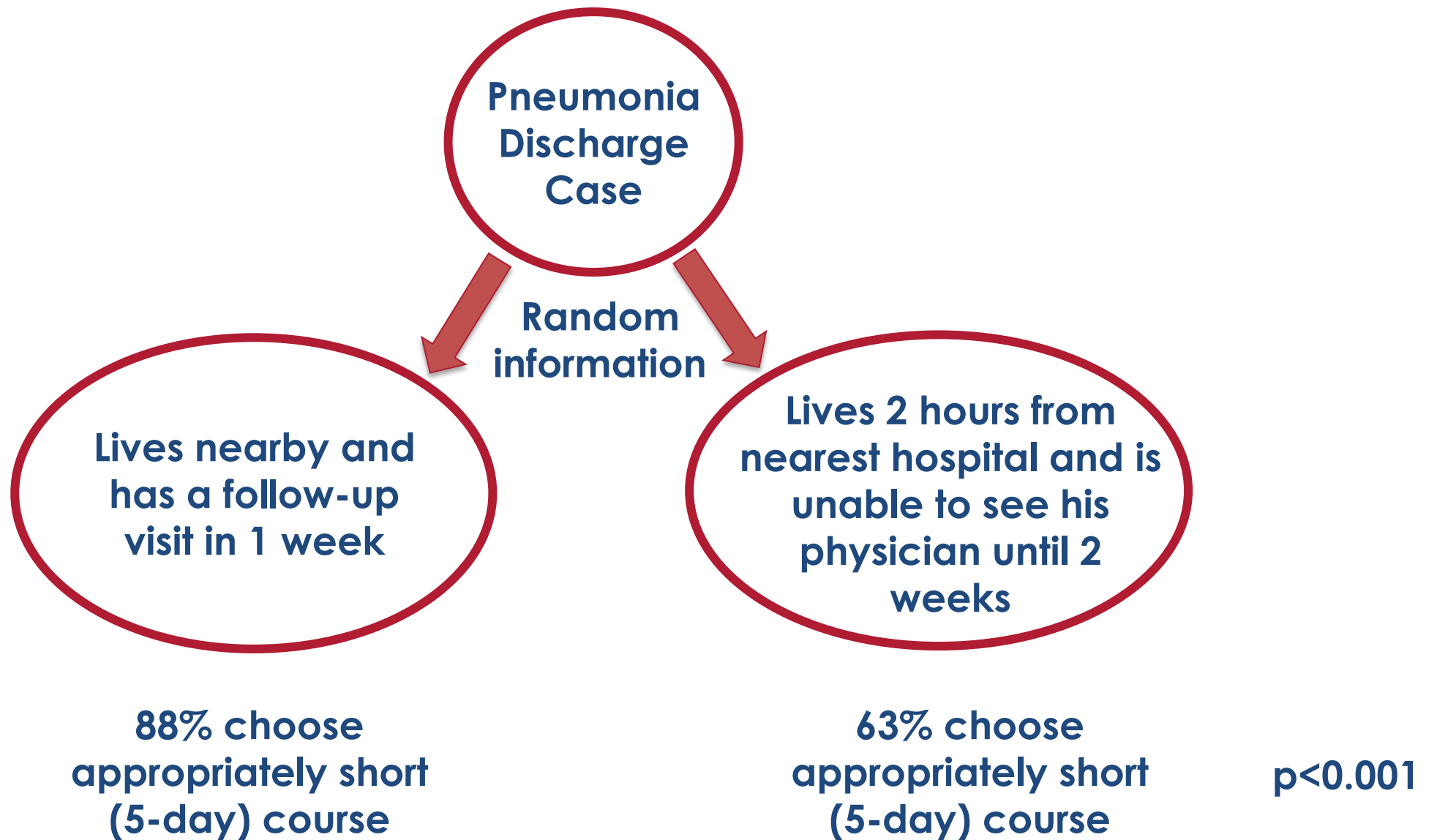
⚠ Patient Sig: **Take 1 tablet (250 mg) in the morning AND 1 tablet (250 mg) before bedtime by mouth. Take until gone.**

[+](#) [abc](#) [↶](#) [↷](#) [?](#) [?](#) [+](#) [📄](#) [↶](#) [↷](#) [↶](#) [↷](#)

Take until gone.

ⓘ The sig contains both discrete and free text elements. Please review the final sig above.





Antibiotic Stewardship at Discharge

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What works – Discharge Specific Interventions

- Prospective audit and feedback at discharge
 - ID pharmacist
 - Clinical pharmacist
 - TOC/discharge pharmacist
- Restriction of certain antibiotics (fluoroquinolones) at discharge
- Orderset with automatic de-escalation

Ciarkowski CE et al. *Open Forum Infectious Diseases*, 2020.
Daniels & Weber, *Infect Control Hosp Epidemiol*, 2021;
Giesler et al., *Am J Infect Control*, 2022;
Yogo et al., *Infect Control Hosp Epidemiol*, 2017;
Schuler et al., *Pediatrics*, 2016;
Mercuro et al., *JAMA Netw Open*, 2022

Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework

Tier 3=3 points
Discharge-specific Interventions

Discharge Intervention De-emphasizing Fluoroquinolones* (15%)	Antibiotic Use Data on Discharge Antibiotics (5%)	Review of Outpatient Antibiotics before Discharge** (8%)
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Tier 2=2 points
Broad Interventions

Antibiotic Timeout (31%)	Fluoroquinolone Restriction* (31%)	Fluoroquinolone-specific Interventions* (3, 2-4) (100%)	Preset Duration for Pneumonia* (56% said yes)		Audit & Feedback Pneumonia (80%)		CPOE Pneumonia (100%)	
			Audit & Feedback ASB (59%)	Audit & Feedback UTI (67%)	CPOE ASB (26%)	CPOE UTI (67%)	Diagnostic Stewardship Interventions (1, 0-2) (67%)	

Tier 1= 1 point
Critical Infrastructure

Dedicated Stewardship Resources	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%)	

Focus on
discharge

Integrate discharge
stewardship into
inpatient stewardship

Do it all

Multiple Pathways to
Improving Antibiotic Use
at Discharge

Do it all

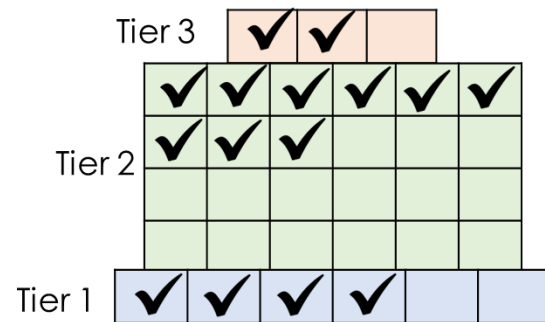
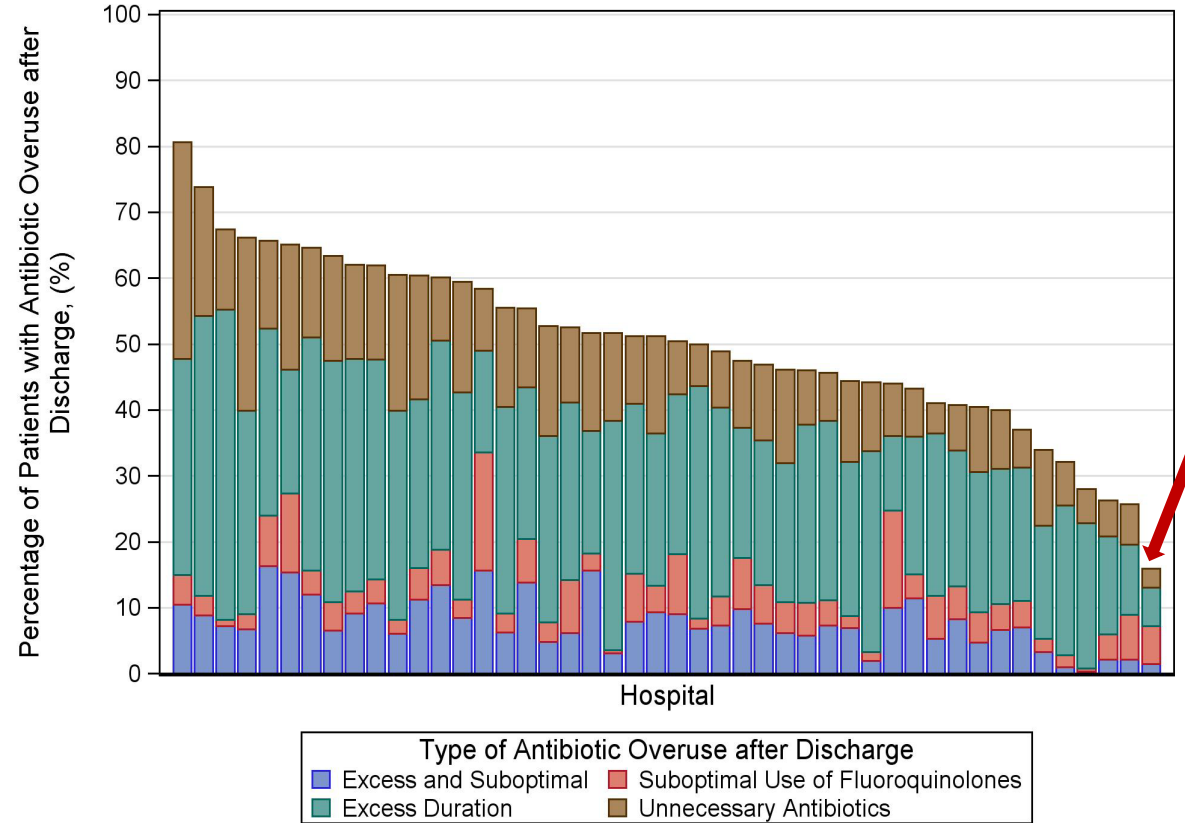


Figure 1. Antibiotic Overuse after Discharge in Patients Treated for Pneumonia or Urinary Tract Infection, by Hospital, (N=46 hospitals)



Strong Inpatient Stewardship (keeping discharge in mind)

- Hospitals that already have robust inpatient stewardship interventions
- Proactively incorporate discharge into Tier 1 and Tier 2 Strategies

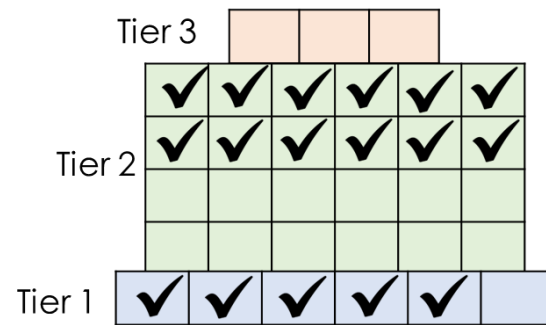
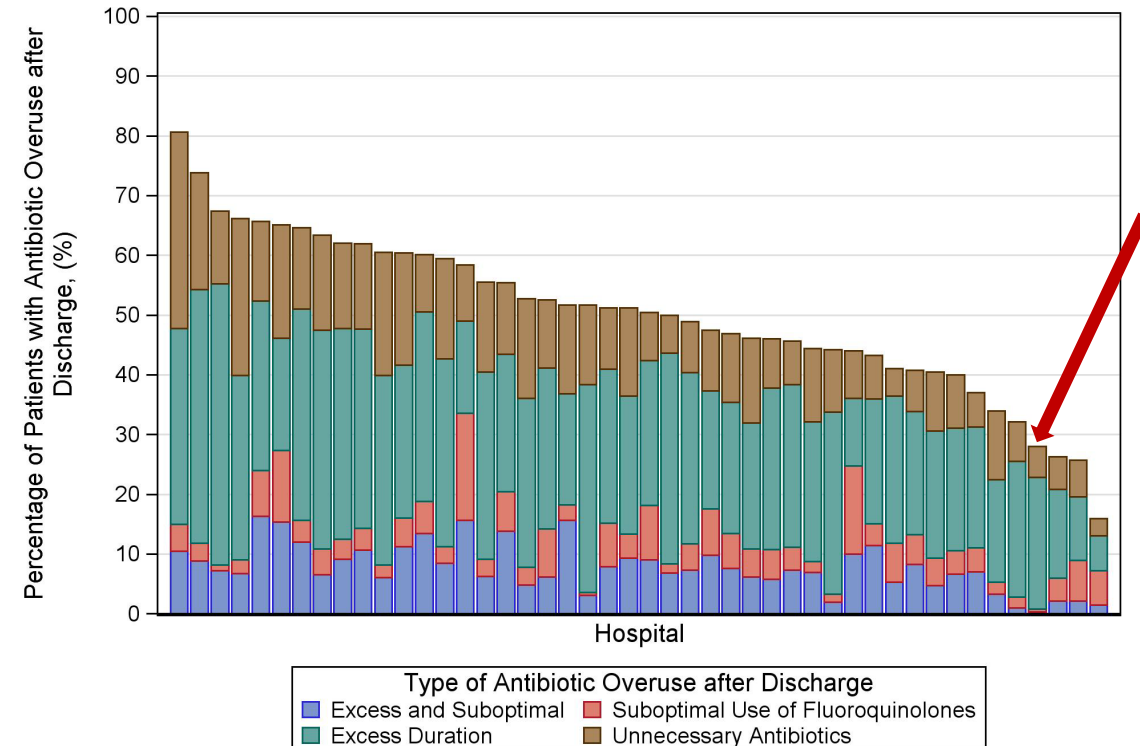


Figure 1. Antibiotic Overuse after Discharge in Patients Treated for Pneumonia or Urinary Tract Infection, by Hospital, (N=46 hospitals)



Focus on Discharge

- Hospitals with fewer resources for inpatient antibiotic stewardship
- Implement robust Tier 3 “discharge-specific” strategies

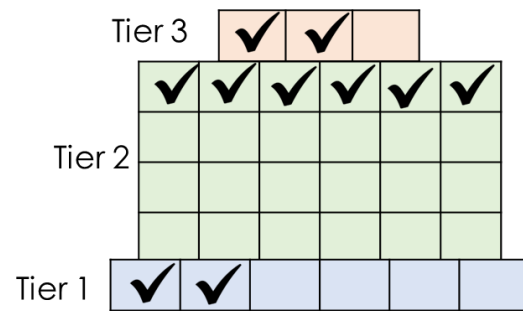
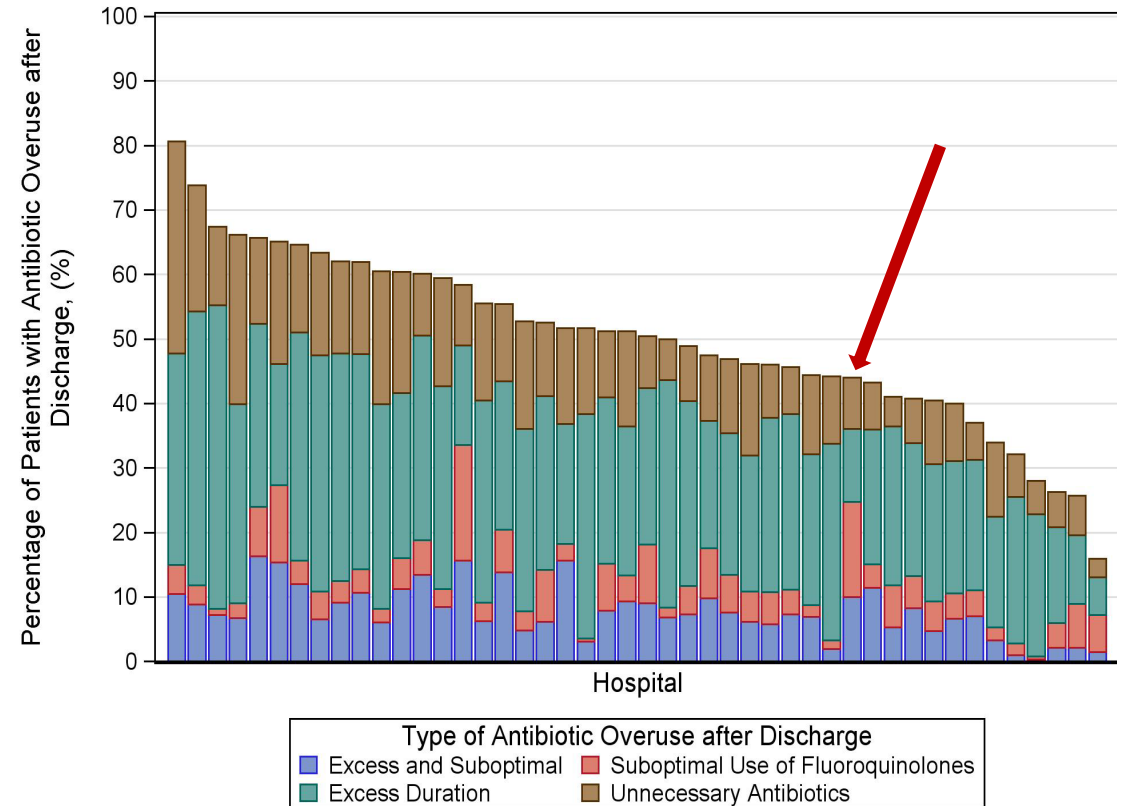


Figure 1. Antibiotic Overuse after Discharge in Patients Treated for Pneumonia or Urinary Tract Infection, by Hospital, (N=46 hospitals)



There are Multiple
Pathways to
Improve Antibiotic
Use at Discharge



There are Multiple
Pathways to
Improve Antibiotic
Use at Discharge



Which pathway
should a hospital
take?



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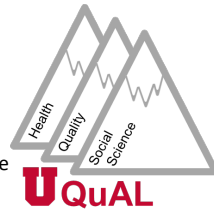
Reducing Overuse of Antibiotics at Discharge: The ROAD Home Trial – AHRQ 1R01HS029482

A Parallel Cluster Randomized Trial of a Participatory Tailored Approach to Improve Discharge Antibiotic Prescribing

MPIs: Vaughn VM, Szymczak JE
Gandhi TN, Hersh AL, Lindenauer P, Neetz R, Petty LA, Presson AP



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STUDY PROTOCOL

Open Access



Protocol for a parallel cluster randomized trial of a participatory tailored approach to reduce overuse of antibiotics at hospital discharge: the ROAD home trial

Julia E. Szymczak^{1*}, Lindsay A. Petty², Tejal N. Gandhi², Robert A. Neetz³, Adam Hersh⁴, Angela P. Presson¹, Peter K. Lindenauer⁵, Steven J. Bernstein^{6,7,8}, Brandi M. Muller¹, Andrea T. White⁹, Jennifer K. Horowitz¹⁰, Scott A. Flanders¹⁰, Justin D. Smith¹¹ and Valerie M. Vaughn^{7,9,10,11*}

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Implementation gap in stewardship.

Need to design for equity so all patients gain access to benefits of stewardship.

What works – Discharge Specific Interventions

- Prospective audit and feedback at discharge
 - ID pharmacist
 - Clinical pharmacist
 - TOC/discharge pharmacist
- Restriction of certain antibiotics (fluoroquinolones) at discharge
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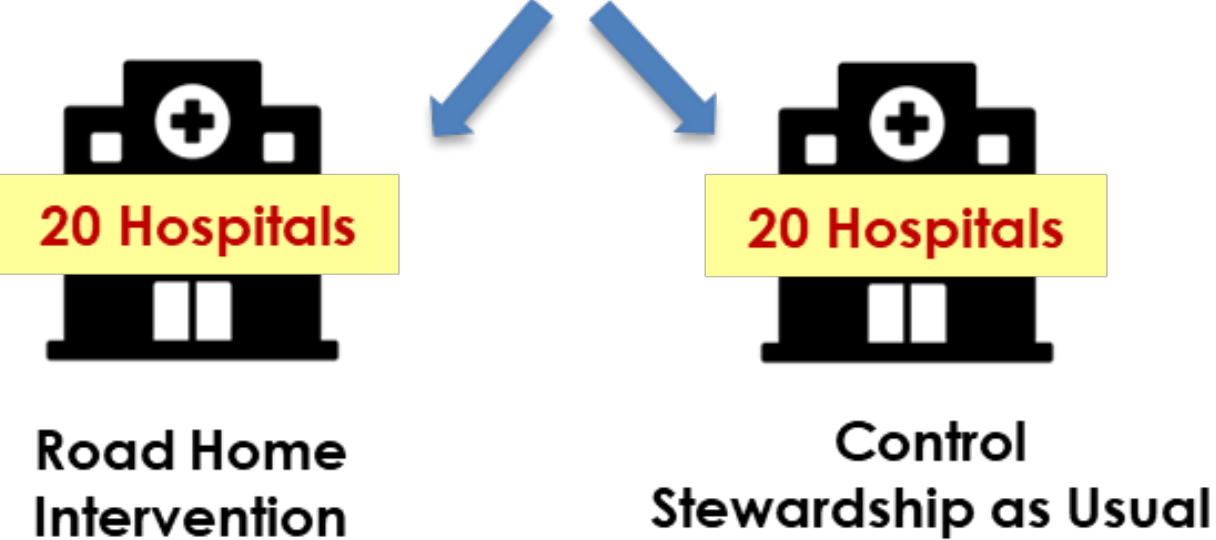
But what about

- Prospective audit and feedback at discharge
 - Your hospital doesn't have any ID pharmacists
 - Your clinical pharmacists are too busy to do discharge antibiotic stewardship
 - You can't afford a TOC/discharge pharmacist
- Restriction of certain antibiotics (fluoroquinolones) at discharge
 - Fluoroquinolone prescriptions at discharge aren't a problem at your hospital
 - Discharge prescriptions are sent to outside pharmacies where they can't be audited
 - Your hospital culture/policies don't allow for restriction
- Order set with automatic de-escalation
 - Your clinicians don't use order sets
 - Your EHR doesn't have great functionality



HMS Hospitals

Cluster Randomization



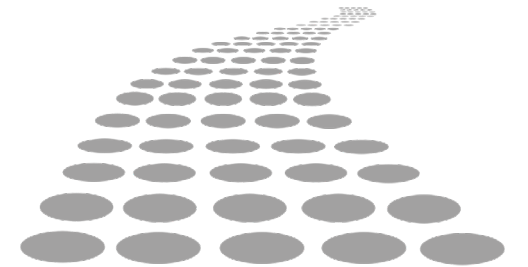
The ROAD Home Strategy

Multicomponent implementation strategy

The ROAD Home Strategy

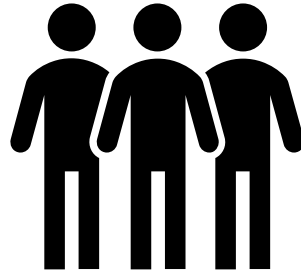
Multicomponent implementation strategy

- Evaluative techniques to understand hospital context
- Tailoring of stewardship to that context
- External facilitation
- Active participation from hospitals to select interventions while taking into account barriers to stewardship



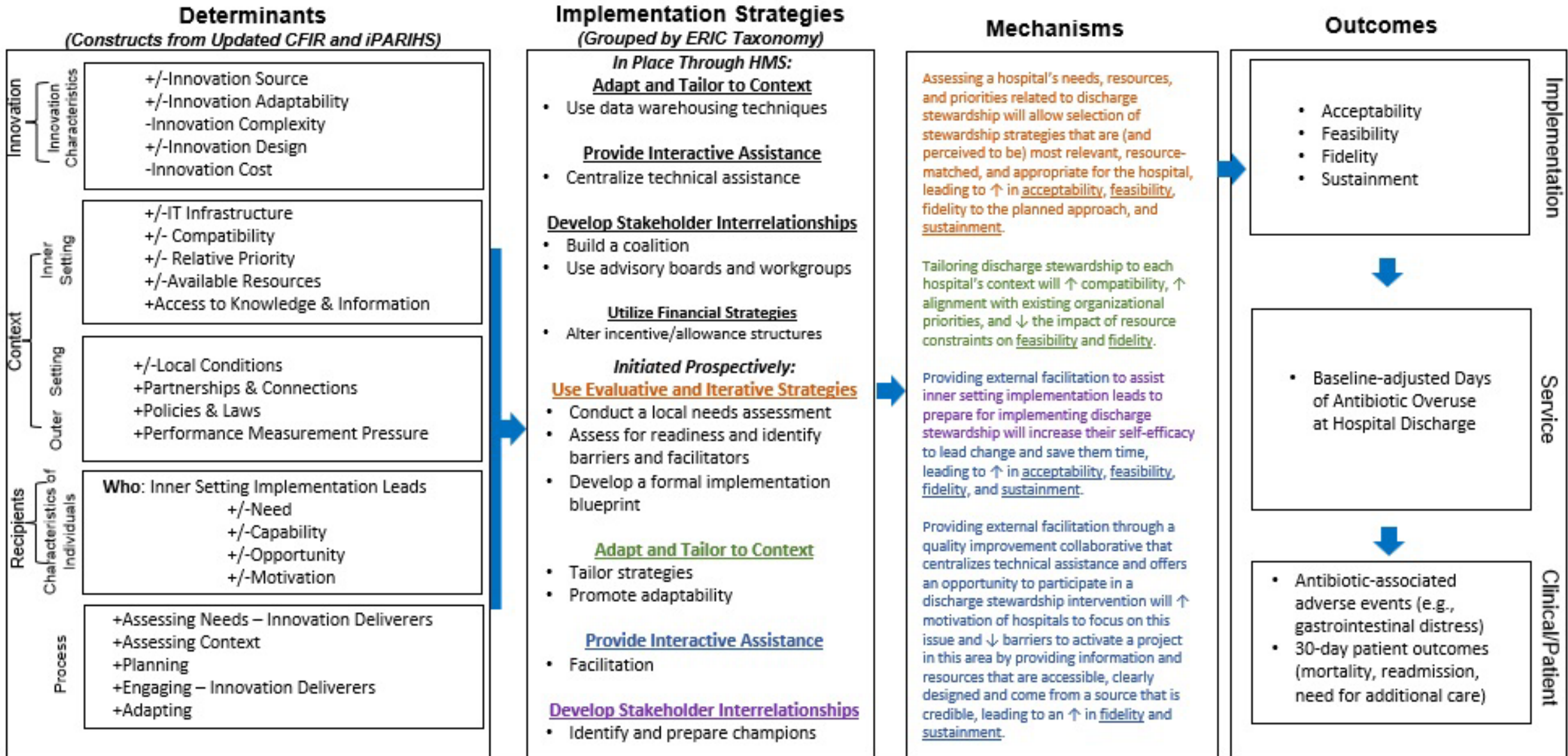
Inner Setting Implementation Leads

- HMS Physician Champion
- HMS Abstractor (typically RN)
- +/- Pharmacist, Administrator, QI Staff, others

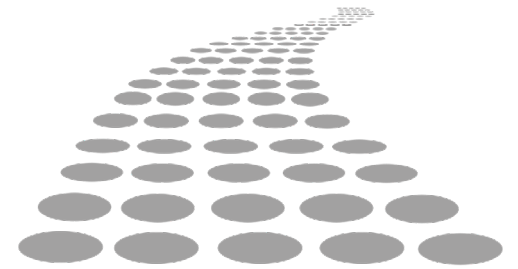


ROAD Home Trial Team

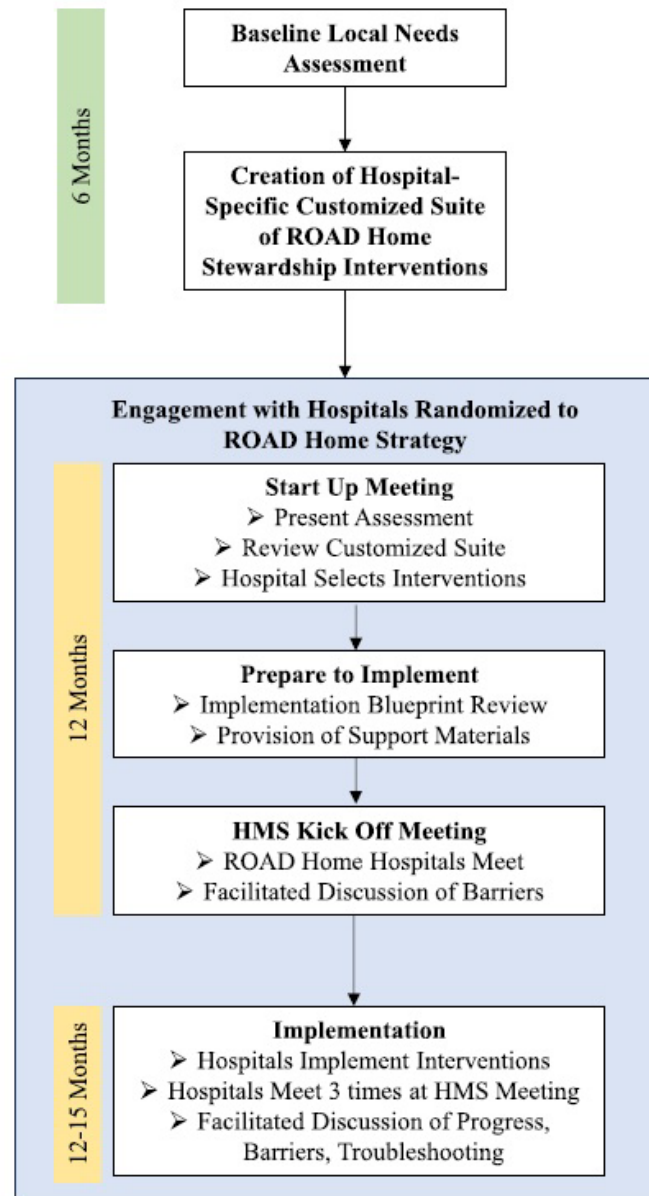
- External facilitators
 - 3 MDs (hospitalist w/ASP experience, ID physician w/ASP experience)
 - 1 PharmD from rural hospital
- Concurrent mixed methods process evaluation team
 - PhD sociologist
 - Analyst



How does tailoring in ROAD Home work?

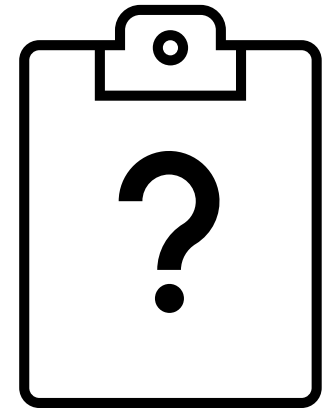


ROAD Home Study Team Pre-Strategy Preparation

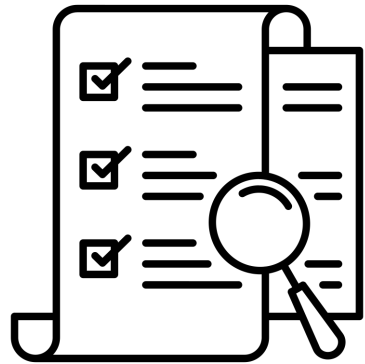


Step 1. Baseline Needs Assessment

- Audit of antibiotic use at discharge
- HMS Annual Survey
 - Stewardship interventions in use
 - Existing resources and infrastructure
 - Hospital priorities
 - Anticipated barriers to implementation



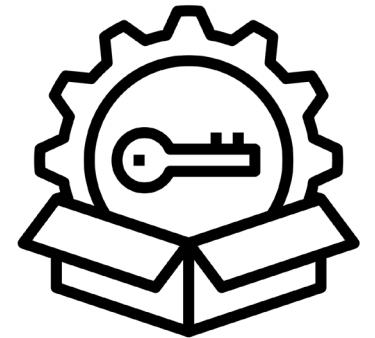
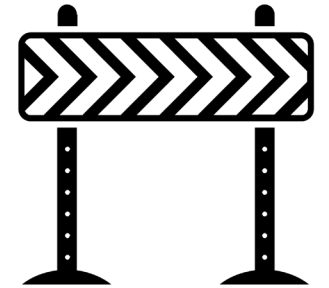
Step 2. Review Performance & Needs



- Review hospital performance
- Review Tier 1 interventions
 - Education, Guidelines
- Consider hospital priorities
- Consider feasibility
 - Ranked interventions easiest to hardest

Step 3. Develop Tailored Suite

- Identify interventions the hospital could consider based on needs, barriers, resources
 - ≥ 3 points
- Doesn't have to be brand new intervention
- What could be modified?
 - Update guidelines
 - Expanding existing intervention (e.g. audit and feedback) to new condition, new prescriber group, new time of day
- 2 ROAD Home investigators go through process to cross-check, ensure reliability

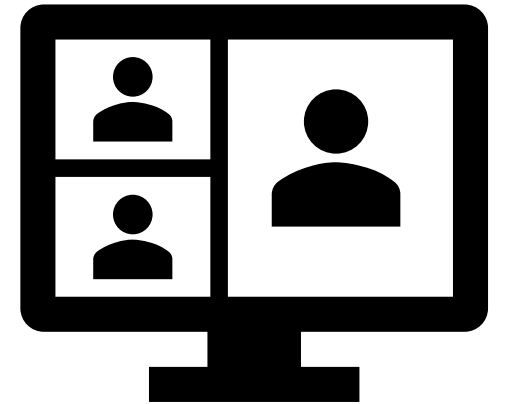


Your hospital had low inappropriate fluoroquinolone use at discharge but lots of excess antibiotic duration at discharge and unnecessary antibiotic use for asymptomatic bacteriuria at discharge. Based on these data and your survey responses, we suggest: developing a diagnostic stewardship intervention with your microbiology laboratory and updating your stewardship guidelines to include discharge recommendations.

	Strategy You're Already doing Well	Strategy We Recommend Adding or Changing	Strategy You Could Do, but may be Unnecessary	Strategy You Could Do, but there are Barriers		
Tier 3=3 points Discharge Specific Strategies	<u>Discharge Intervention De-emphasizing Fluoroquinolones</u> Fluoroquinolone use is not a problem at your hospital.	<u>Antibiotic Use Data on Discharge Antibiotics</u> You do not have these data but noted IT support as a barrier	<u>Audit and Feedback (Prospective Review) of Discharge Antibiotics</u> You do not do this but note that pharmacists are a limited resource			
Tier 2=2 points Broad Inpatient Interventions (proactive discharge)	<u>Antibiotic Timeout</u> You do not have. An option, though we recommend others	<u>Fluoroquinolone Restriction</u> Fluoroquinolone use is not a problem at your hospital.	<u>Other Fluoroquinolone Specific Interventions</u> Fluoroquinolone use is not a problem at your hospital.	<u>Audit & Feedback of Inpatient Antibiotics</u>	<u>Computerized Physician Order Entry</u> You do not use this but also noted IT support as a barrier	<u>Diagnostic Stewardship Interventions</u> Asymptomatic bacteriuria is a major issue at discharge, and you noted great access to microbiology
Tier 1=1 point Critical Infrastructure	<u>Dedicated Stewardship Resources</u>	<u>Hospital Policy Requiring Documentation of Intended Duration in Discharge Summary</u>	<u>Guidelines</u> You have guidelines but we recommend updating them to include specific discharge prescribing recommendations		<u>Education</u>	

Step 4. Supported Selection of Strategies

- Meet with hospitals to discuss tailored suite
- Hospitals select what interventions to implement
 - Must select at least 3 points of interventions

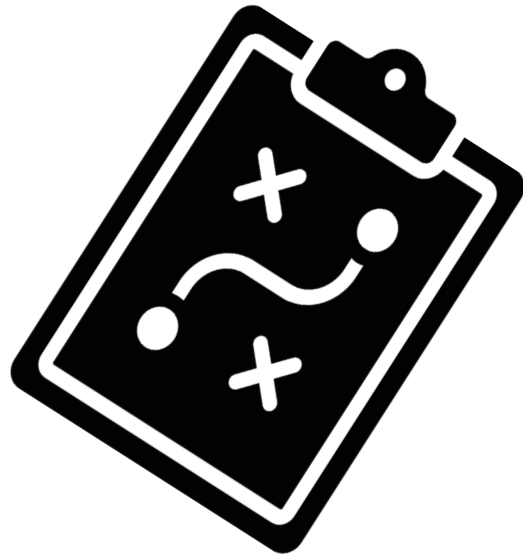


Facilitation in ROAD Home



- IKEA effect
- Encourage selection of strategies most likely to work but don't dictate
- Elicit
 - Concerns about feasibility, anticipated barriers
 - Adaptations to context that may be needed (e.g. systems)
 - Toolkit needs
 - Other stakeholders who need to be engaged

Step 5. Prepare for Implementation



- Implementation blueprint
 - ROAD Home Investigator reviews
 - Will use blueprint to monitor fidelity during intervention period
- Access to adaptable tools
 - Guidelines, educational materials, checklists, pocket cards, etc.
- Kick-off meeting at HMS in-person meeting

Self-Directed ROAD Home Implementation Blueprint
 Please fill out completely and return to ROAD Home Study Team.

Goals – ROAD Home Strategies (3 points)

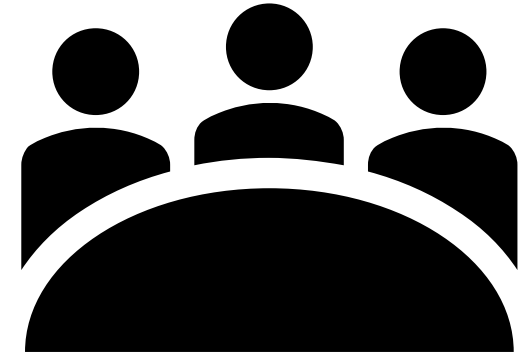
1. Updated Guidelines – Discharge Specific Recommendations (Tier 1, 1 point)
2. Audit & Feedback - Add Proactive Discussion of Discharge Antibiotics (Tier 2, 2 points)

Dates of Intervention Period: [DATES SELECTED BY HOSPITAL AND STUDY TEAM] Total Duration of Intervention: 12 months

Goal and Deadline	Action Step	Responsible Individual(s)	Planned Timeline	Anticipated Barriers	Strategies to Address Barriers
Update Guidelines to Include Discharge-Specific Recommendations <u>Update Guidelines by [DATE]</u>	Gain consensus on oral de-escalation guidelines	ASP Lead; Pharmacy Stakeholders; Formulary Committee	Complete by [DATE]	-Disagreement about antibiotic selections to highlight in guidelines	-Engage guideline stakeholders early -ROAD Home team to provide updated evidence and materials
	Modify text in existing guidelines to state “recommended duration 3-5 days (including discharge prescription)”	ASP Lead; Pharmacy Stakeholders; Guideline Committee; IT	Complete by [DATE]	-Prioritization of this guideline change in a timely fashion	-Engage guideline gatekeepers early -Align with other planned guideline changes
	Modify text in existing guidelines to include new oral de-escalation guidelines	ASP Lead; Pharmacy Stakeholders; Guideline Committee; IT	Complete by [DATE]	-Late disagreement with suggested changes	-Ensure all stakeholder engaged during consensus stage
	Circulate informational message letting key stakeholders know about changes made to guidelines	Site Coordinator	Ongoing Monthly, [DATES]	-Email overload -Reaching part-time or rotating staff	-Alternatives to email – QR code at meetings or on signs -Have messages come from leadership with supportive note
Audit and Provide Feedback – Add Proactive Discussion of Discharge Antibiotics <u>Start Conversations by [DATE]</u>	Determine messages about discharge antibiotics that can be integrated into already-existing daily audit and feedback	ASP Lead; ASP staff; Floor Pharmacist	Complete by [DATE]	-Additional effort needed from ASP -Some reluctance to add work	-Find ways to incorporate into existing ASP workflows -Engage floor pharmacists as champions
	Set a goal for number of proactive discussions to have per week	ASP lead; Physician Lead; other ASP stakeholders	Complete by [DATE]	-Group may disagree with how many recommendations to target	-Select an initial goal, modify up or down based on experience

Step 6. External Facilitation

- Monitor implementation blueprint
- Availability to trouble shoot as needed
 - Low intensity facilitation
- 2 meetings of all intervention hospitals at HMS regular meetings



Evaluating Impact

Primary (Service) outcome

Baseline-adjusted days of antibiotic overuse at discharge

Secondary (Clinician/Patient) outcomes

30-day patient outcomes

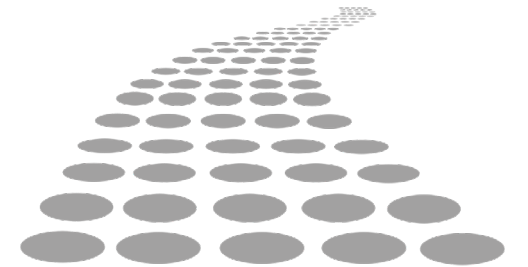
Antibiotic-associated adverse events

Implementation outcomes

Observations, Document Analysis, Interviews, Surveys

Contextual factors shaping implementation

Acceptability, Feasibility, Fidelity, Sustainment



Where are we now?

Recruit Hospitals

Step 1. Baseline Needs Assessment

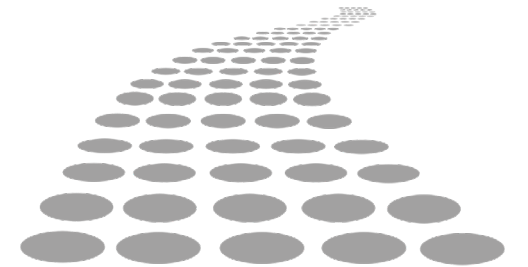
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Step 4. Supported Selection of Strategies

Step 5. Prepare for Implementation

Step 6. External Facilitation



Where are we now?

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~~Step 1. Baseline Needs Assessment~~

~~Step 2. Review Performance and Needs~~

~~Step 3. Developed Tailored Suite~~

Step 4. Supported Selection of Strategies

Step 5. Prepare for Implementation

Step 6. External Facilitation



Summary

- Antibiotic overuse at discharge is common and harmful
- There are multiple pathways to improve discharge antibiotic prescribing
- The ROAD Home Trial is testing a multicomponent implementation strategy to help hospitals identify and select a pathway to improvement tailored to their context

Questions?

