Antimicrobial Stewardship at Transitions of Care

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
@ValerieVaughnMD

No Conflicts of Interest or Disclosures

Disclosures

Not an Infectious Diseases Physician

Will never be able to remember the difference between Avycaz© and Zerbaxa ©

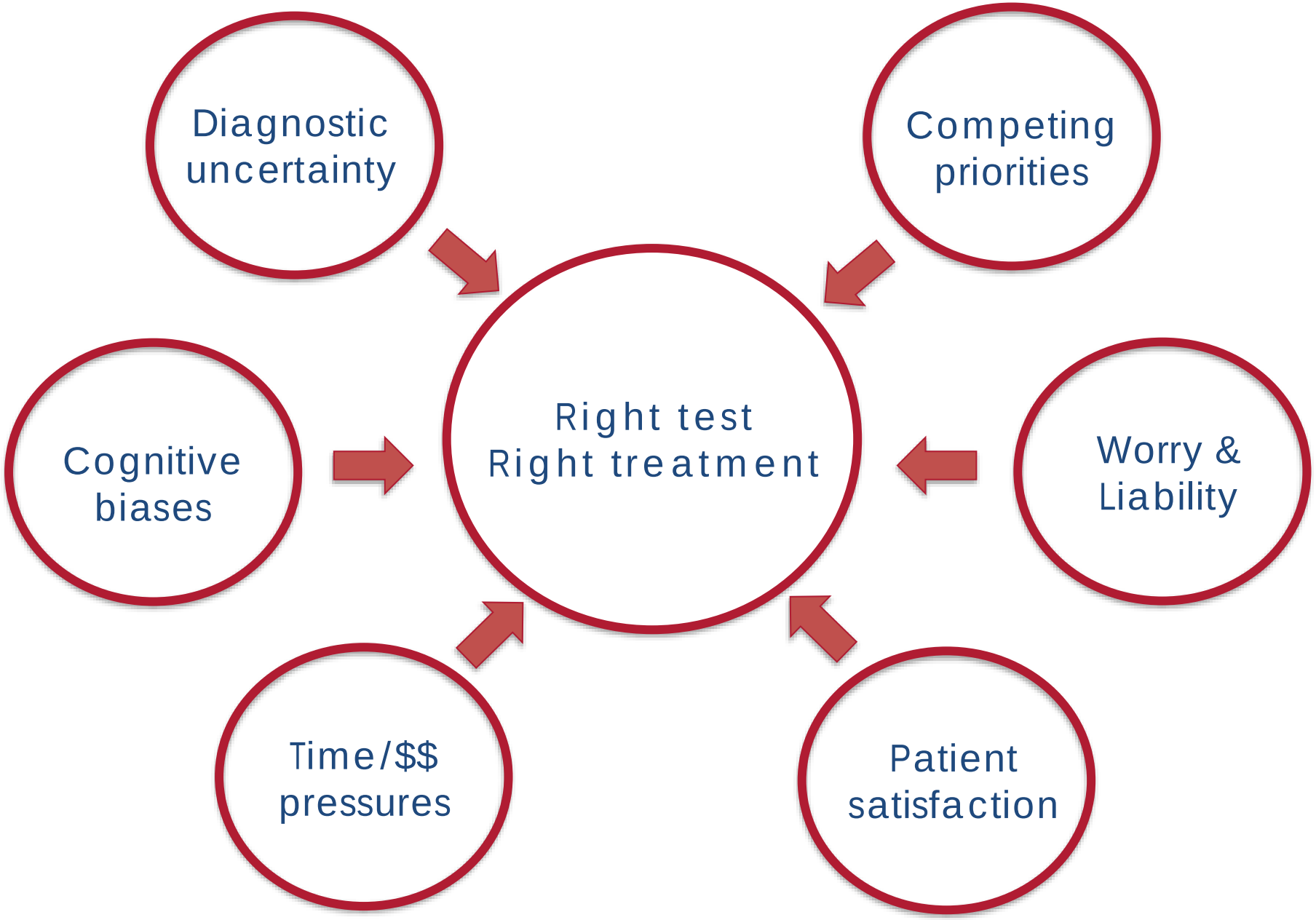
(or how to pronounce them)

Hospitalist

Patient might have an infection?

Consult ID


I keep teaching these hospitalist about stewardship, but I can't get them to prescribe better
Hospitalists aren't my problem, but the ED man… can't do anything with them



80 year-old woman with dementia presents for altered mental status.
She comes in alone from her nursing home and is unable to provide any history.

Physical exam

Stable vital signs, oriented x 1

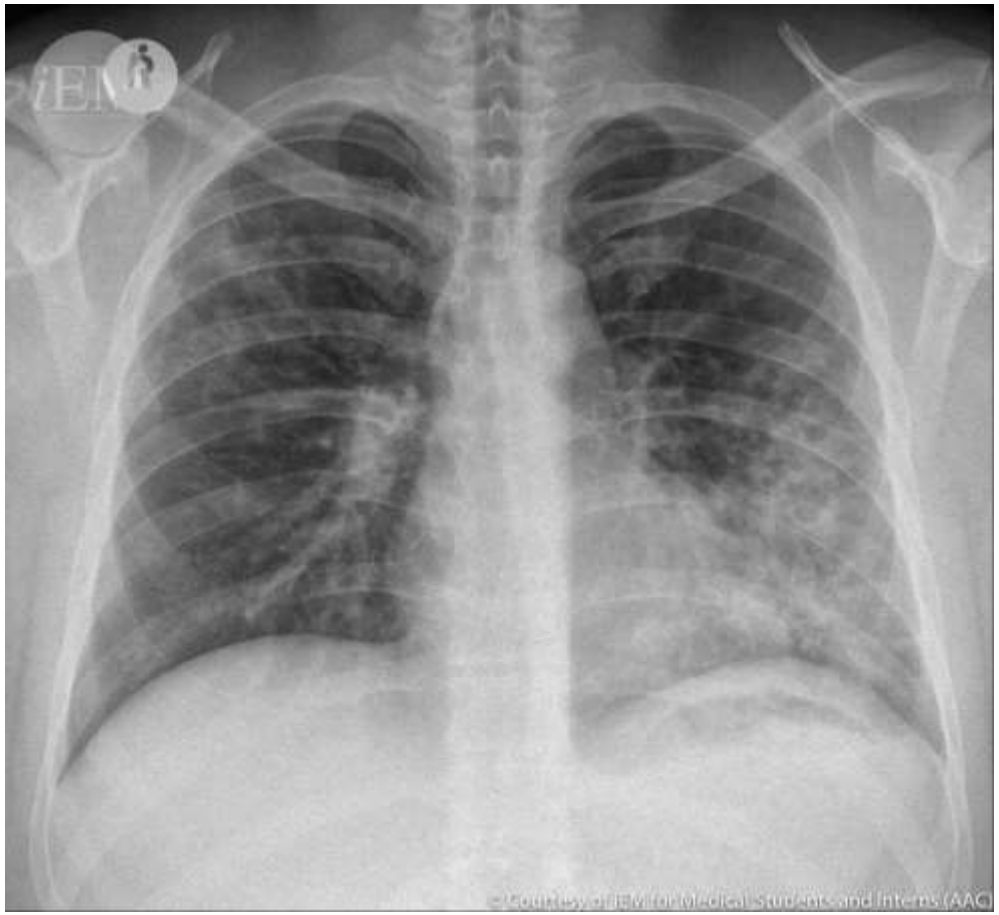
Exam difficult due to poor patient cooperation

Laboratory findings

WBC 10,000 (80% PMNs)

+ LE, + WBC, occ bacteria, numerous squamous cells

(culture pending)



Left lower lobe pneumonia

Poor positioning and effort.
Cannot rule out underlying infection.

Poll

What's your next step?

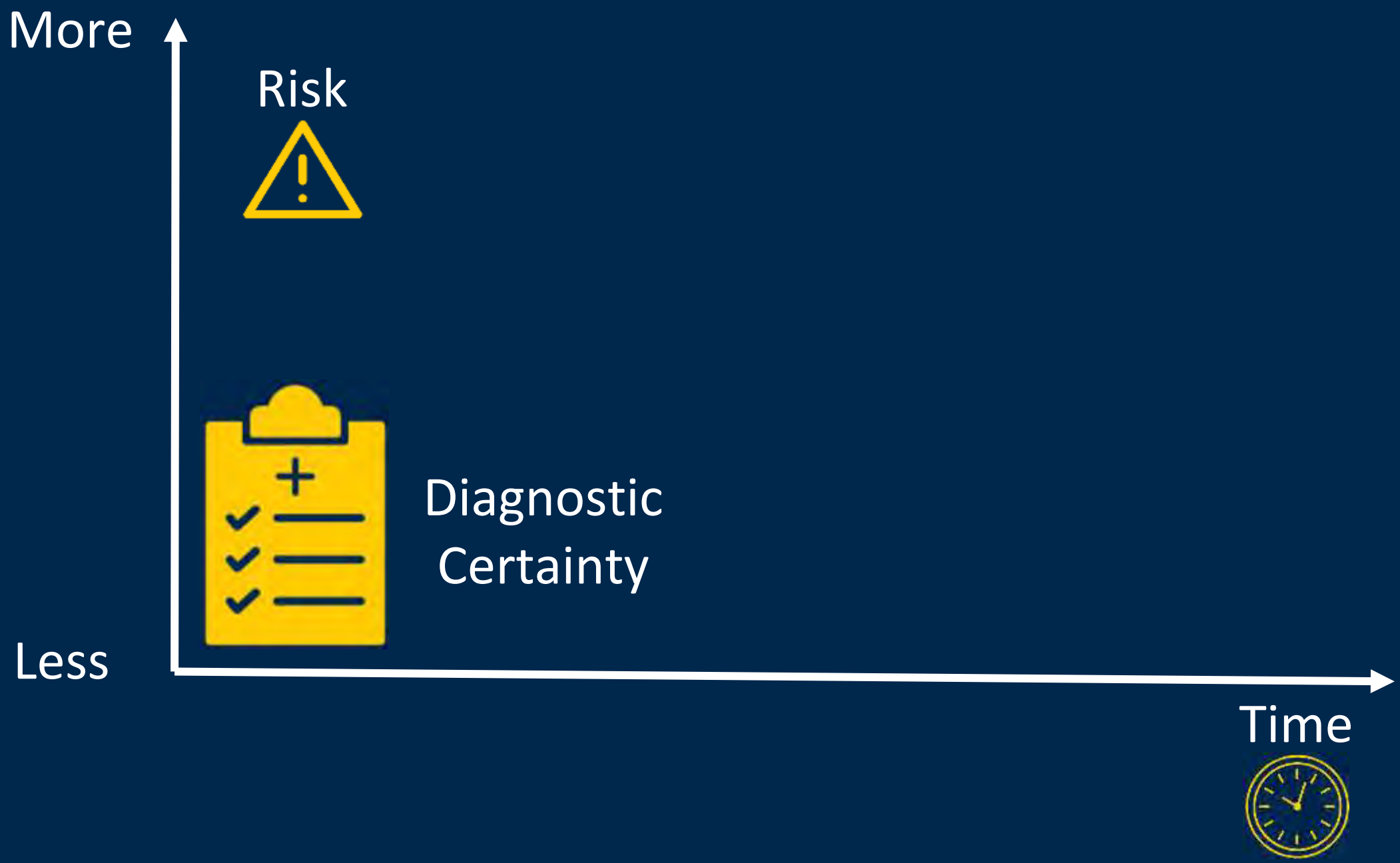
A) Supportive care + Chest CT to evaluate for pneumonia

B) Supportive care + empiric Vanc/Zosyn

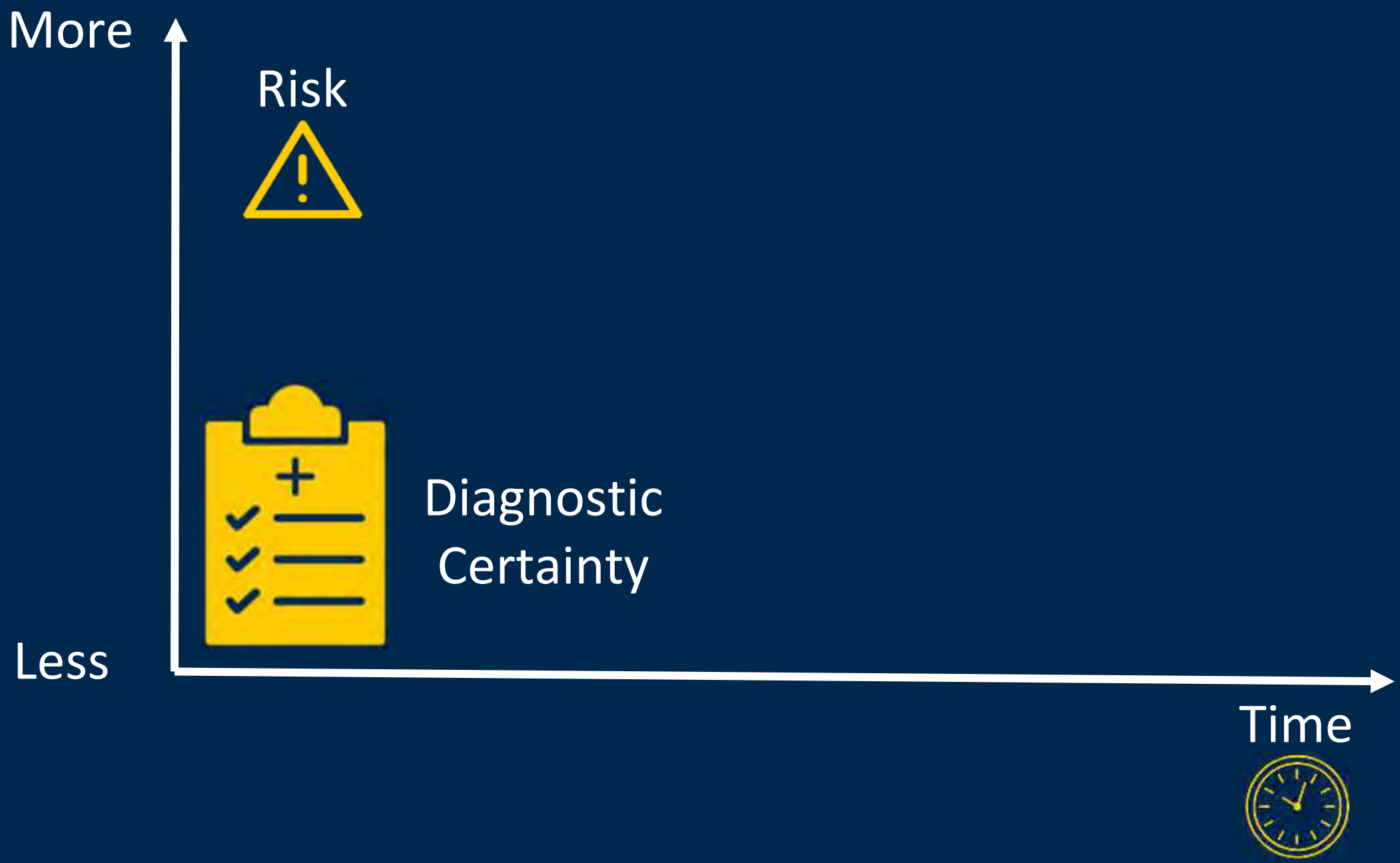
C) Supportive care + empiric ceftriaxone

D) Supportive care + ask the night team to check in 1-2 hours

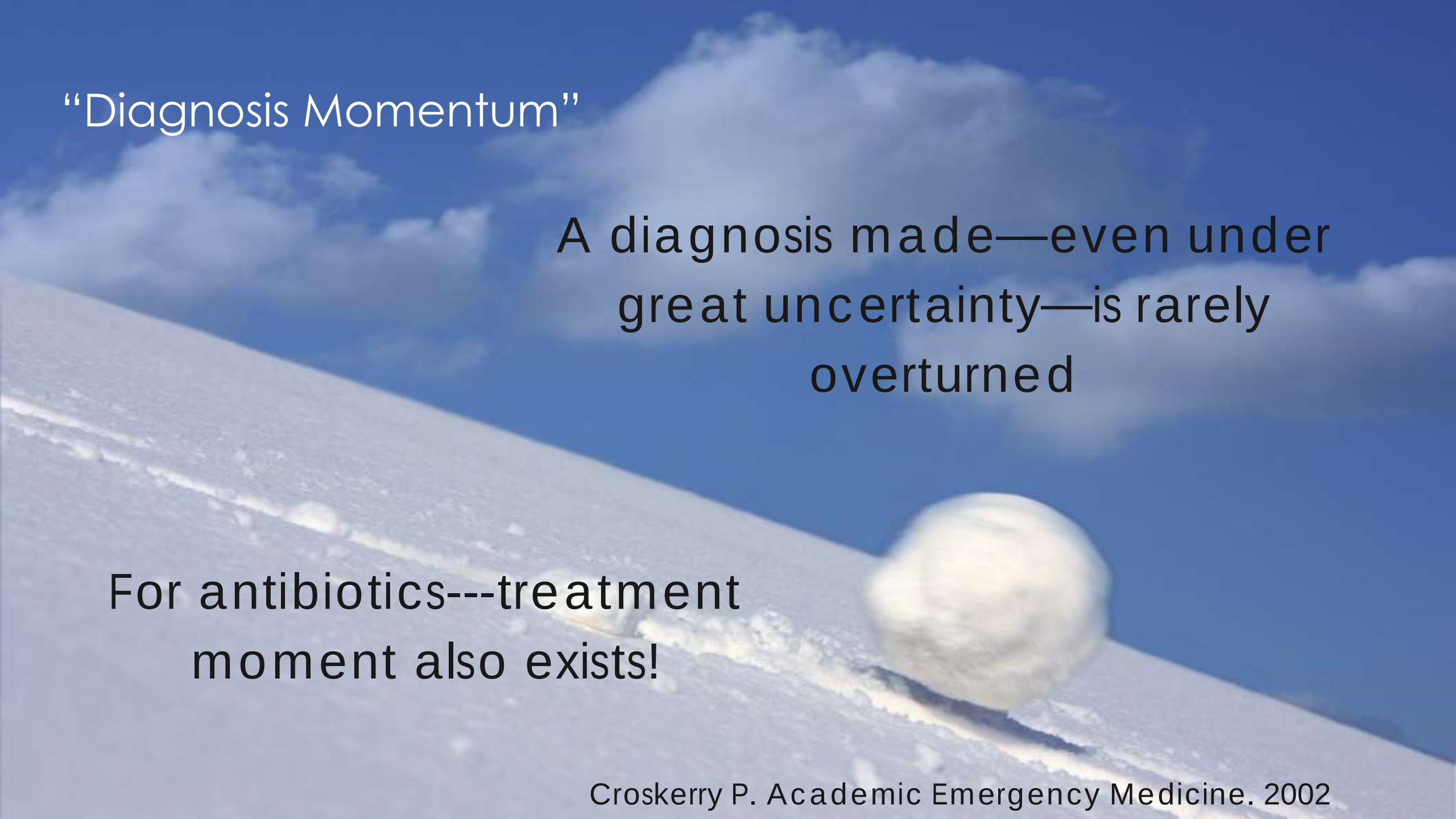
E) Give up, medicine was never supposed to be this hard…


More
Risk
Diagnostic
Certainty
Less
Time


“I never want that Ambien medicine again! It made me feel awful the second I took it!”


More
Risk
Diagnostic
Certainty
Less
Time


More
Less
Time
Diagnostic Certainty
Risk



"Diagnosis Momentum"

A diagnosis made—even under great uncertainty—is rarely overturned

For antibiotics---treatment moment also exists!

Croskerry P. Academic Emergency Medicine. 2002

Antibiotic Stewardship at Discharge

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

Antibiotic Stewardship at Discharge

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

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

Annals of Internal Medicine

ORIGINAL RESEARCH

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

Vaughn, V 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

6481 patients, 43 hospitals

Two-thirds of patients received excess antibiotic therapy

93% of excess antibiotic duration occurs at discharge

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

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

TYPES OF 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
- 39% of hospitalized patients with acute heart failure are "treated" with antibiotics
  - More salt load → additional lasix
  - Longer length of stay
  - Higher readmissions

Gupta A…Vaughn VM. JAMA Internal Medicine. 2024

Frisbee J. et. al OFID. 2019

WHY FLUOROQUINOLONES???

- Adverse events
  - Up to 27% of inpatients
- Large driver of C. difficile infections
  - Even short durations can double the risk of CDI
  - Risk factor for recurrent CDI
  - Decreases in FQ→reduced HO-CDI rates
- Associated with antimicrobial resistance
  - MRSA/VRE, MDR Gram-negative infections
  - Neighborhood FQ consumption→resistant E. coli
- Most Common Antibiotic Prescribed at D/C
  - (used to be—this is now changing!)

Icon from thenoun project.com

Low M. et al. Lancet ID. 2019

Tamma PD. JAMA Internal Medicine. 2017

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)

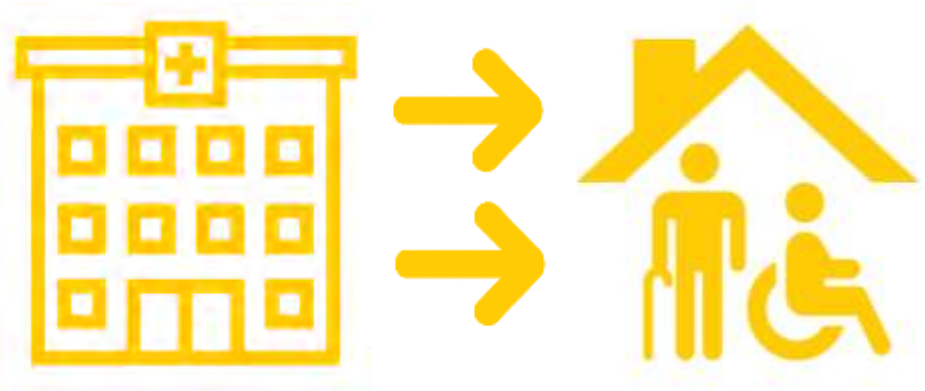
57% had antibiotic overuse at discharge

39% had antibiotic overuse at discharge

Vaughn VM, et al. *Clinical Infectious Diseases*. 2020

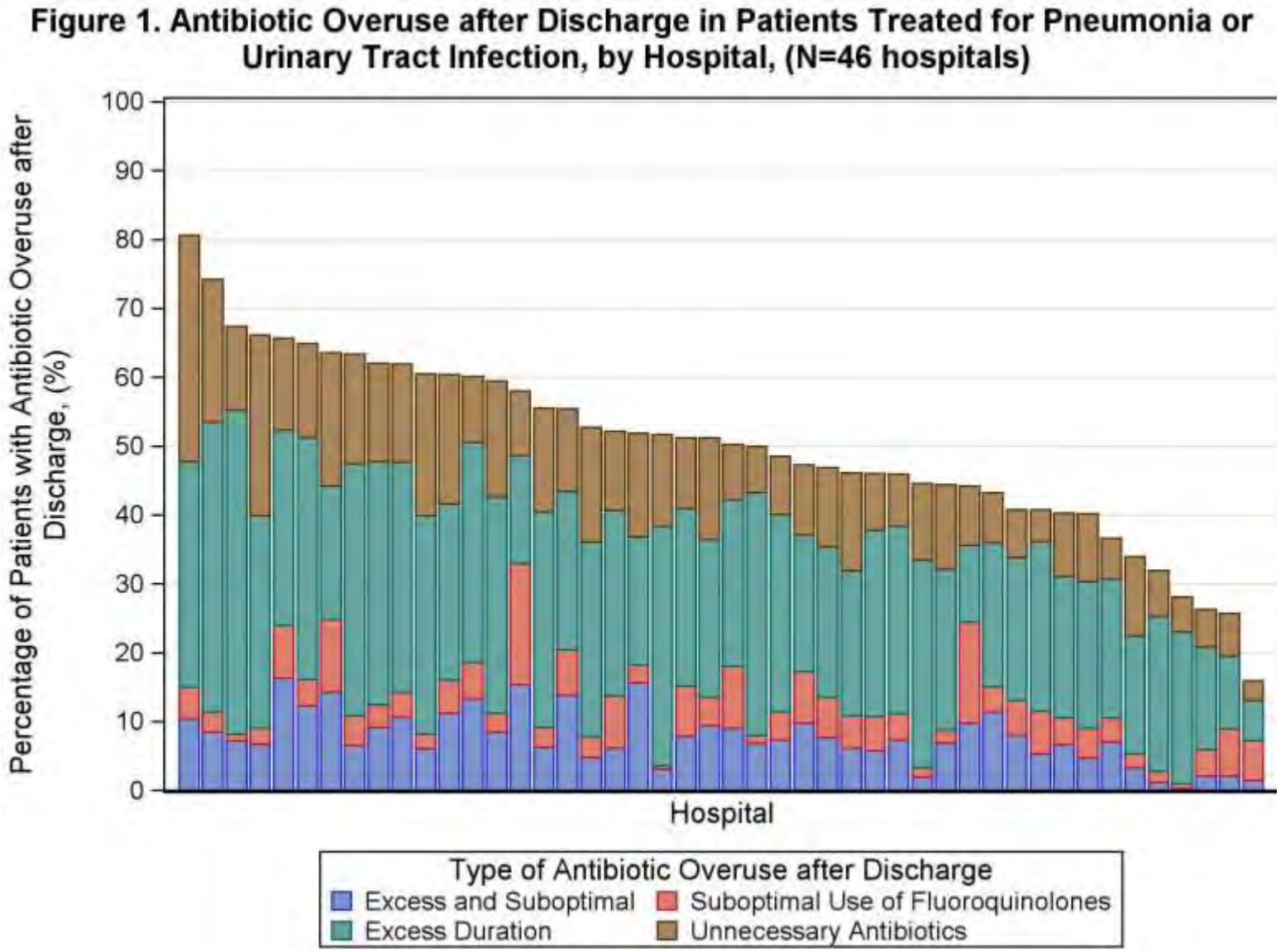
ANTIBIOTIC OVERUSE AT DISCHARGE IS ASSOCIATED WITH PATIENT HARM

- Antibiotic side effects (e.g., *C. difficile*)
- Increased antibiotic resistance (self)
- Increased antibiotic resistance (communities, nursing homes)
- To LTC?
  - Increased risk of 30-day ED visit and 60-day CDI



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
Weber BR et al. *ICHE*. 2018.

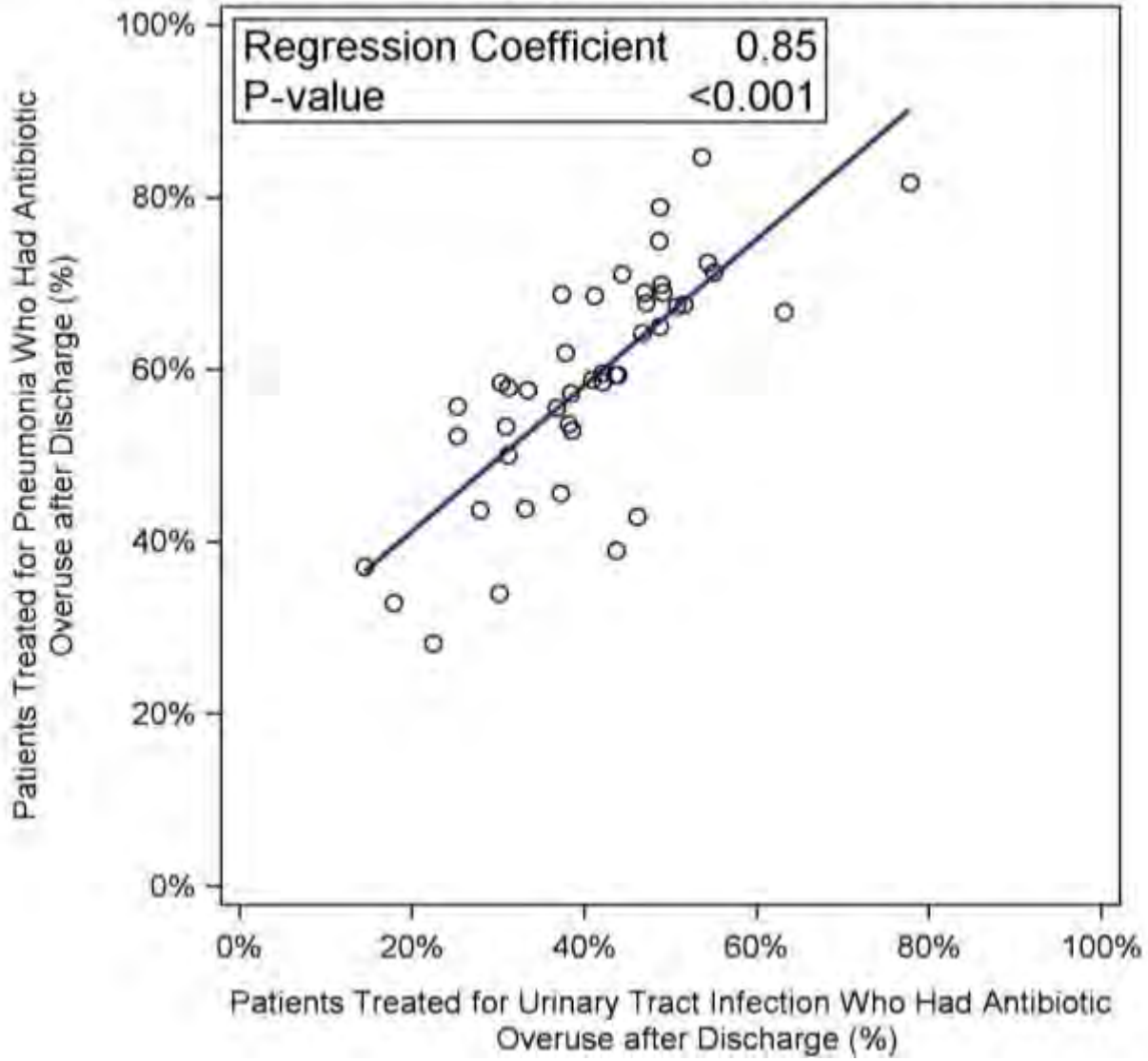
5-FOLD VARIATION ACROSS HOSPITALS



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

Inpatient Antibiotic Stewardship Strategies may NOT be Effective at Discharge

11%

fewer patients received a fluoroquinolone in hospitals targeting inpatient fluoroquinolone use

Double

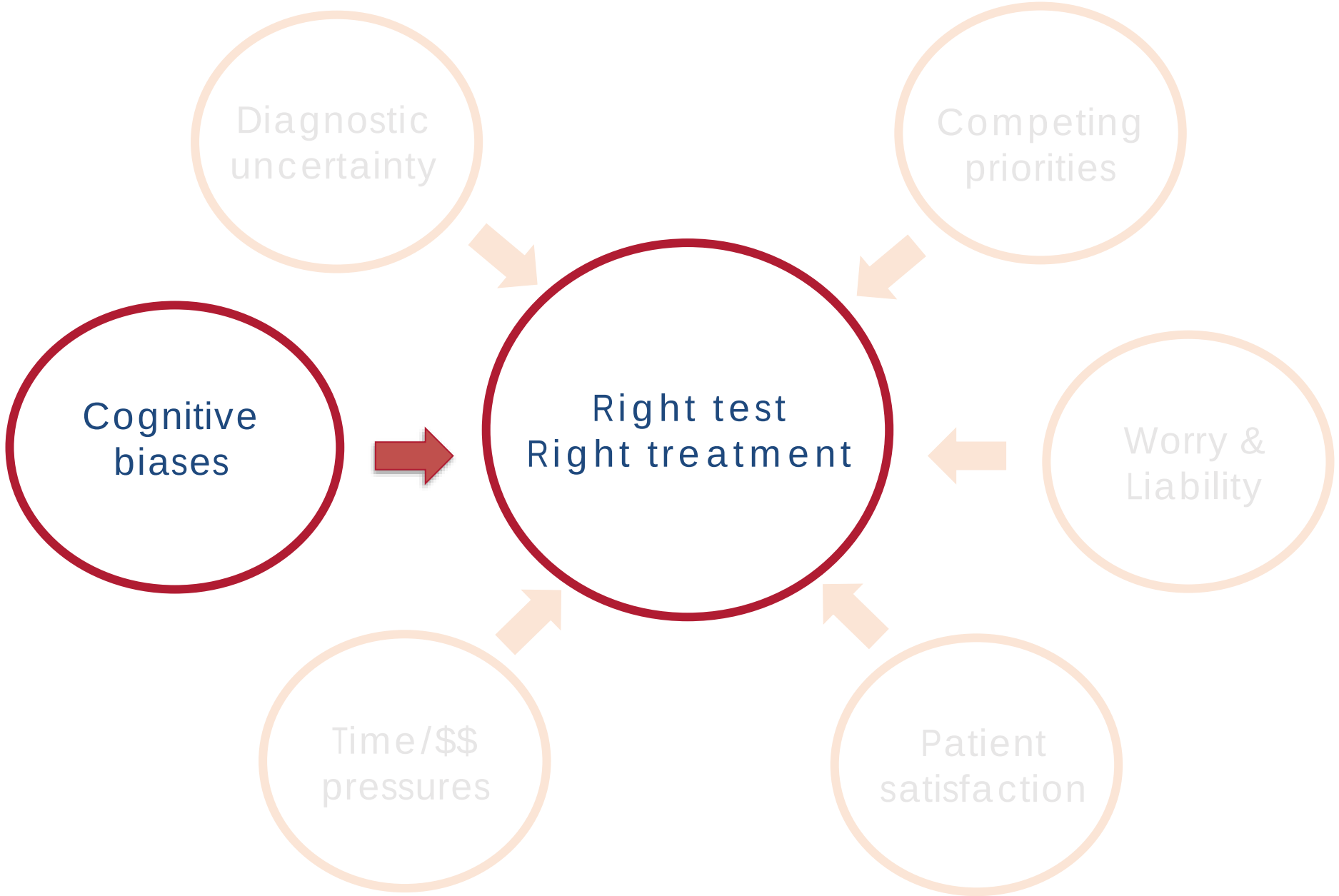
the number of patients were newly started on a fluoroquinolone at discharge

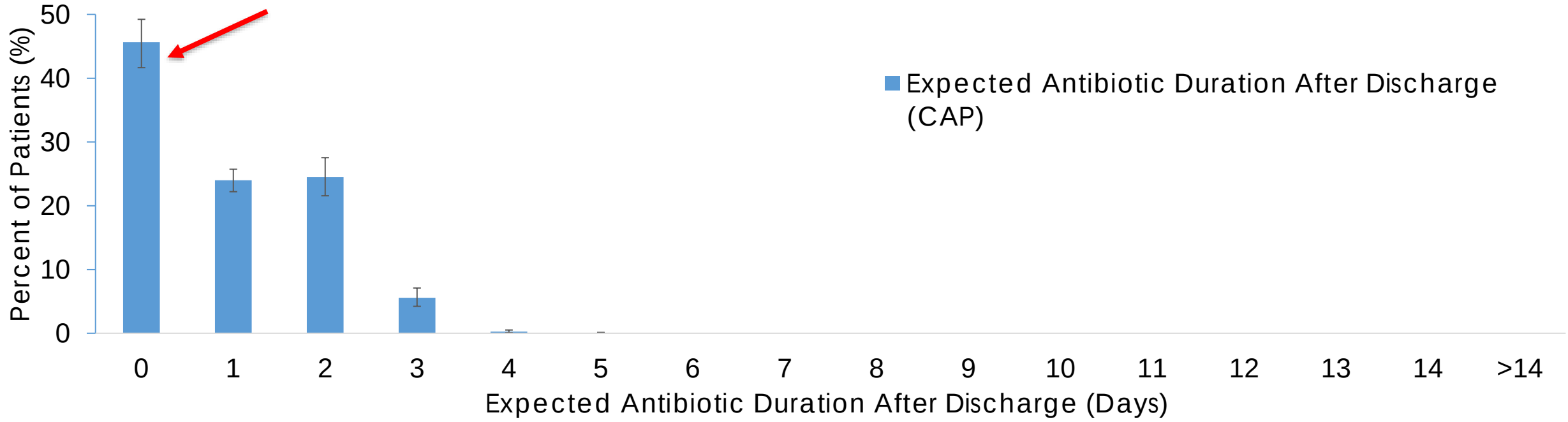
Vaughn VM. *Clinical Infectious Diseases*. 2019.

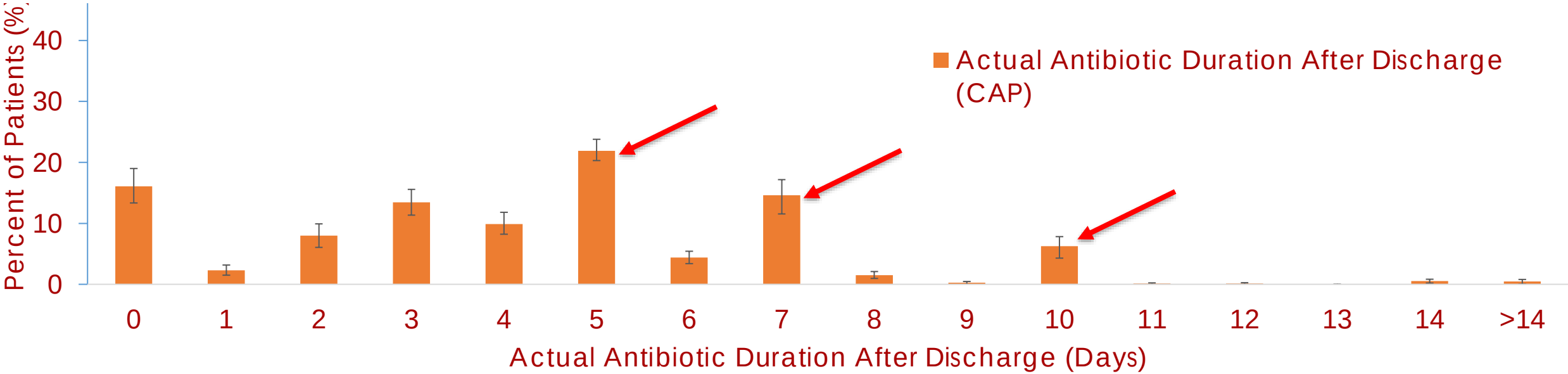
Why???

Antibiotic Stewardship at Discharge

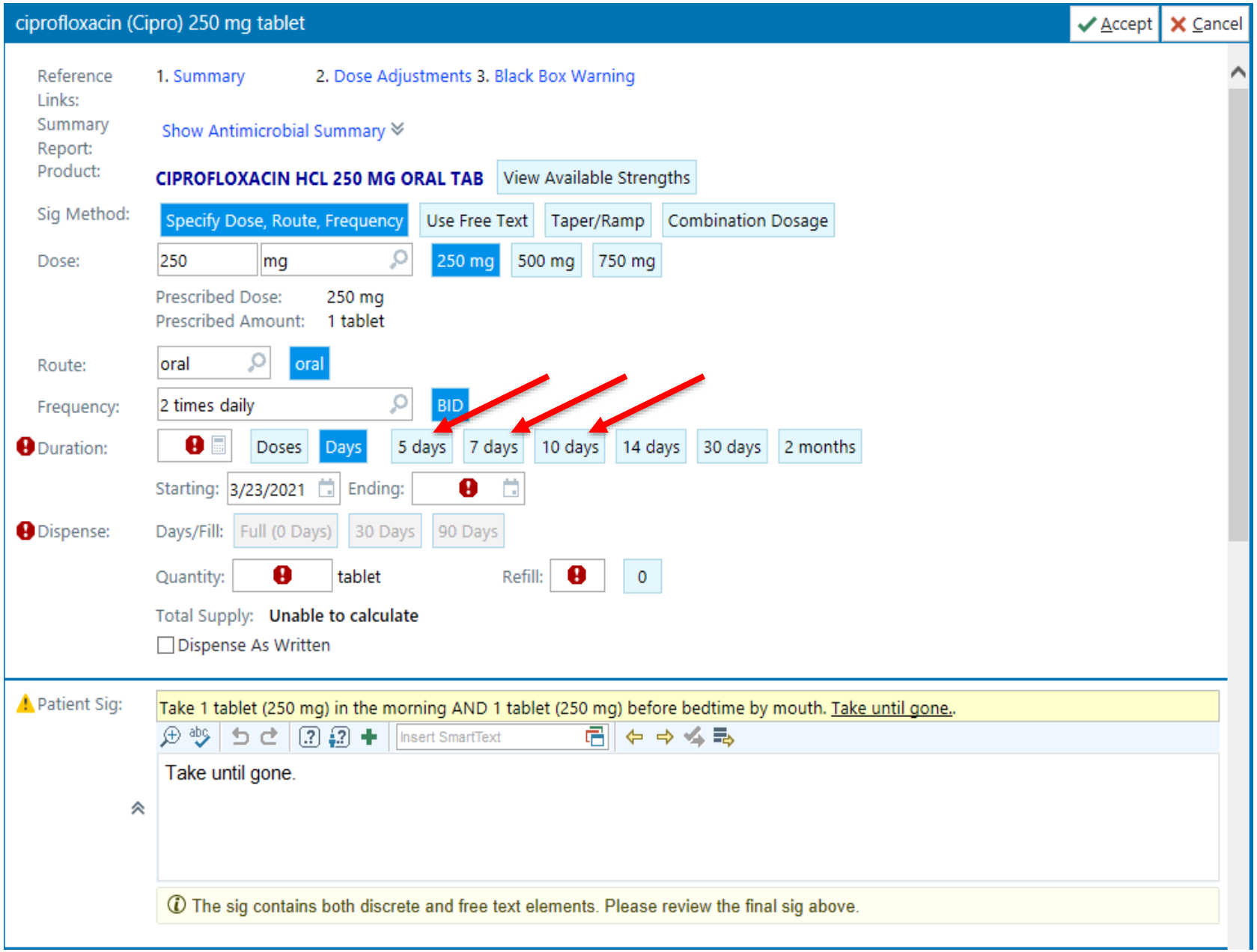
- Quantifying Overuse
- Reasons for Overuse
- Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework for Improving Antibiotic Prescribing

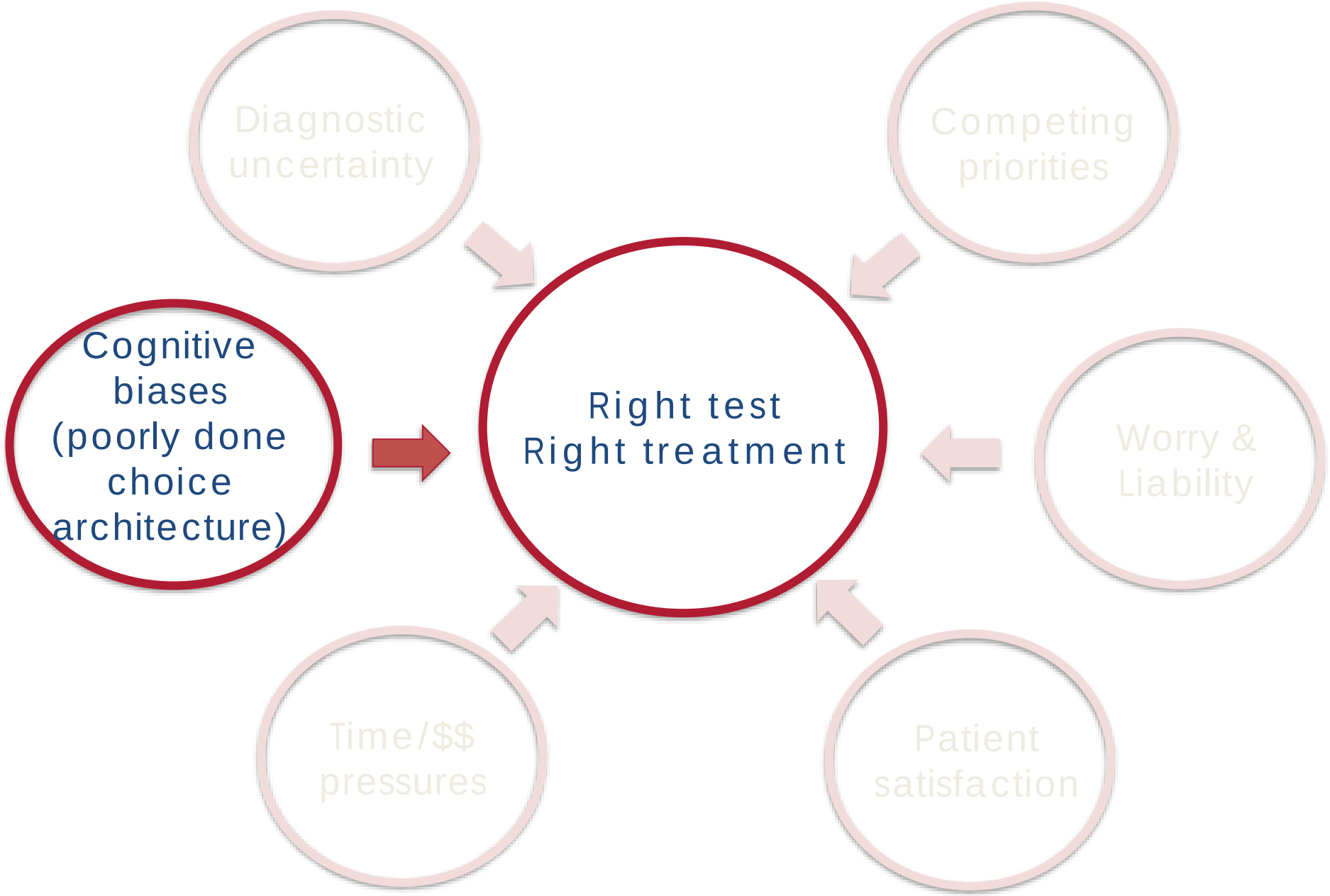






Vaughn VM et al. *Annals of Internal Medicine. 2019*





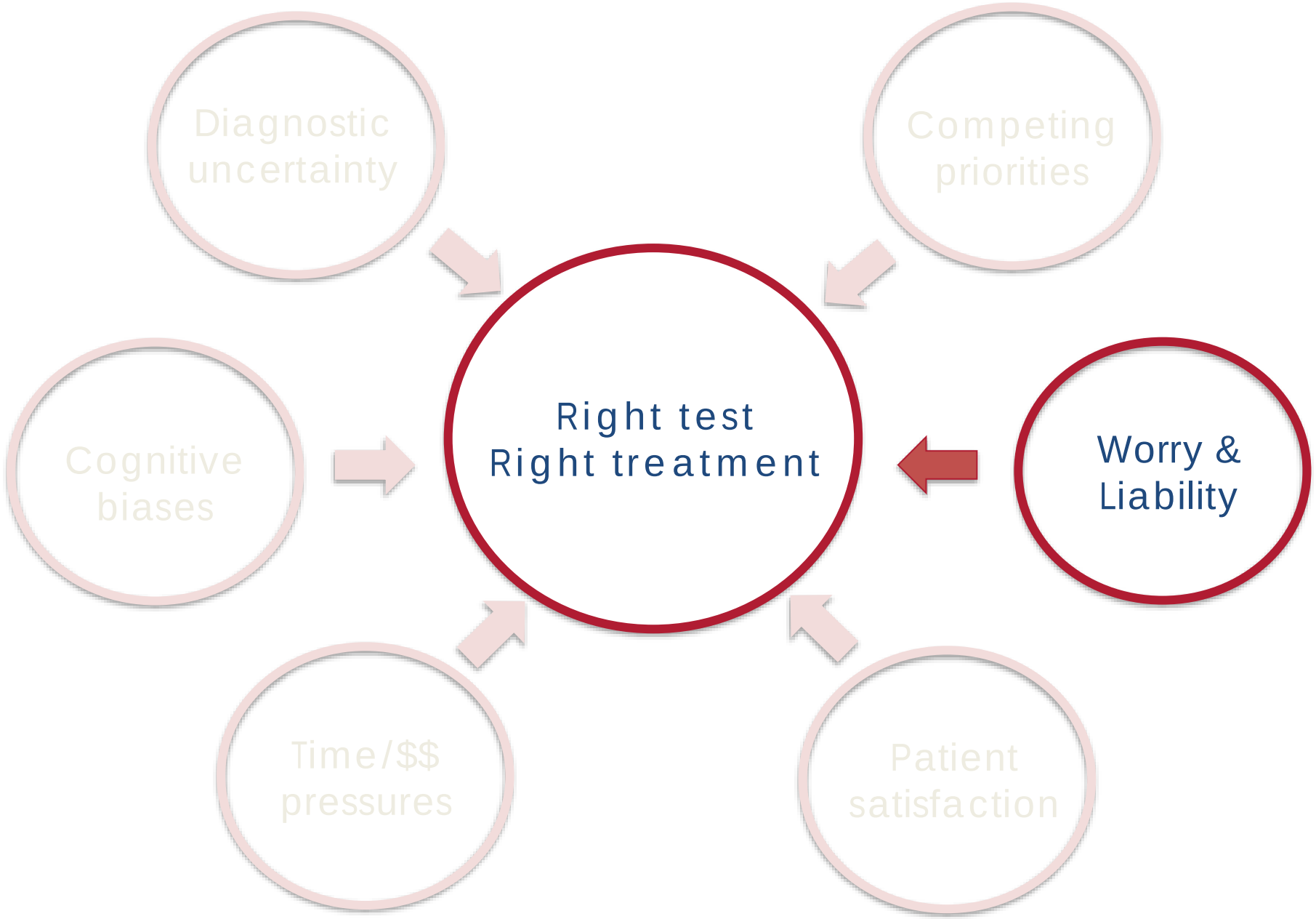
88% (1821/2079) of patients misdiagnosed with CAP in ED were still on antibiotics 3 days later

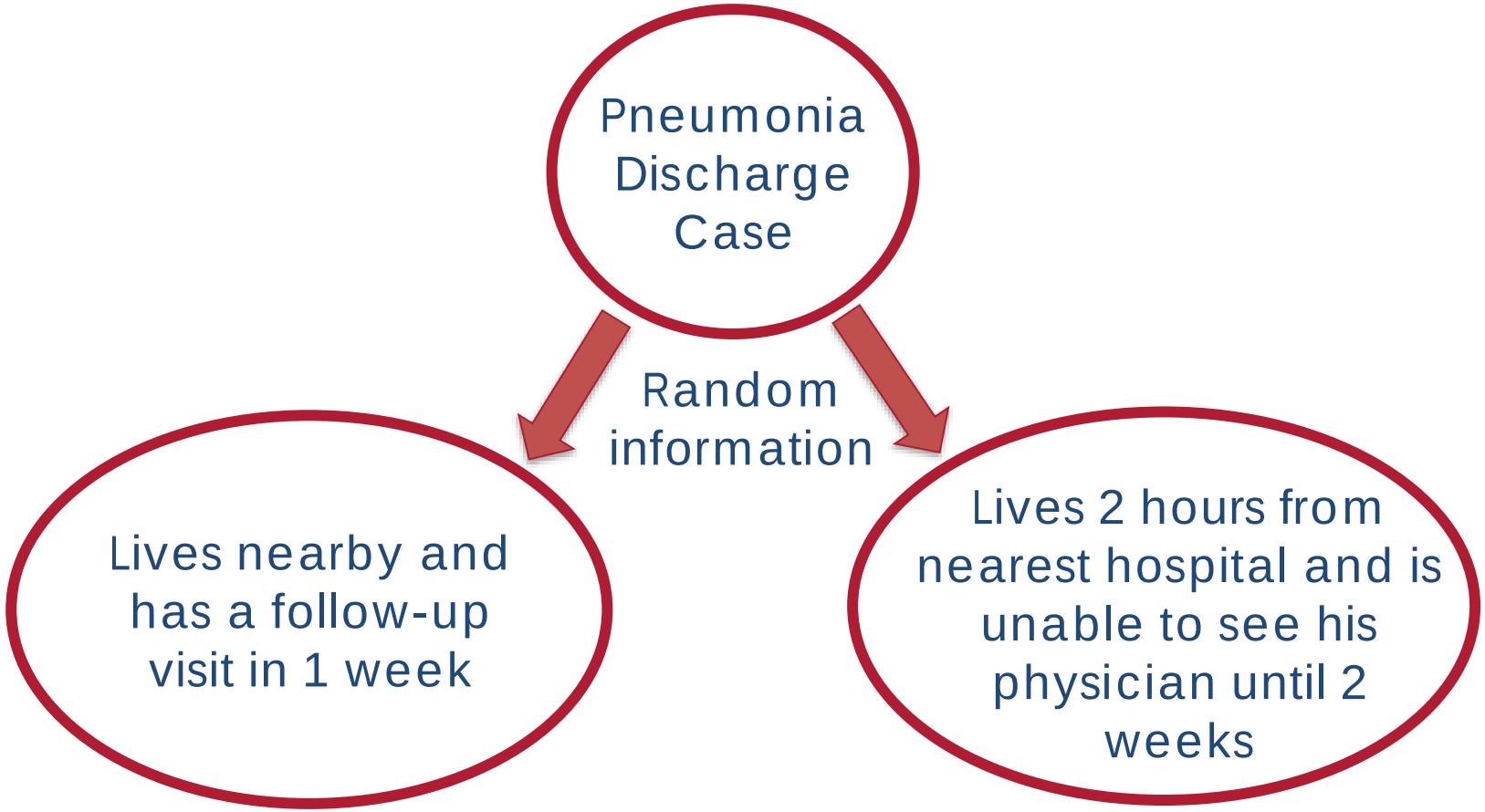
79% (993/1253) of patients misdiagnosed with UTI in ED were still on antibiotics 3 days later

"Diagnosis Momentum"

A diagnosis made, even under great uncertainty, is rarely overturned

Gupta…Vaughn VM. Inappropriate Diagnosis of Pneumonia Among Hospitalized Adults. *JAMA Internal Medicine* 2024.
Petty LA. Assessment of Testing and Treatment of ASB Initiated in the Emergency Department. *Open Forum Infectious Diseases. 2020.*





88% choose appropriately short (5-day) course

63% choose appropriately short (5-day) course

p<0.001

Dunn G…Vaughn VM. *Under review.*

Medical Short Stay Unit

100 patients discharged from SSU on antibiotics

- 82% had antibiotic misuse at discharge
  - Excess duration and SSTI major culprits

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

Icons from thenoun project.com

Soper et al. ICHE. 2021

Antibiotic Stewardship at Discharge

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

What works

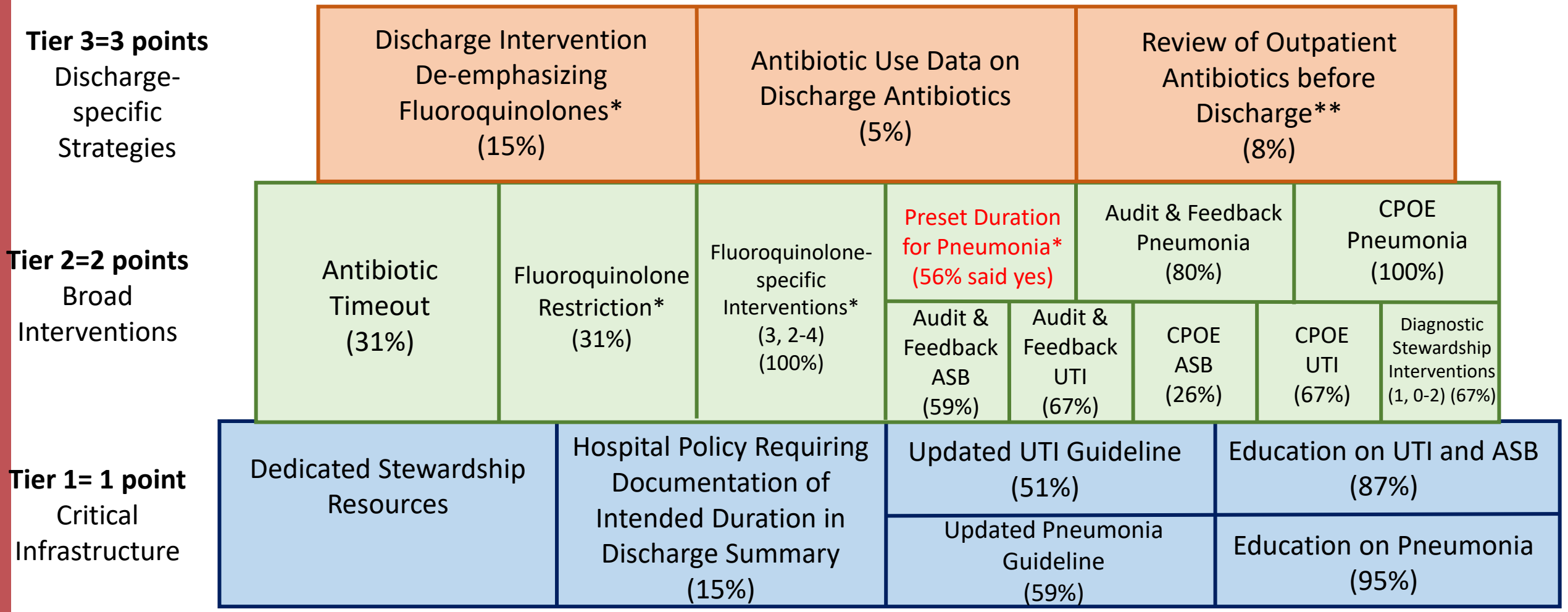
- Prospective audit and feedback at discharge
  - ID pharmacist
  - Clinical pharmacist
  - TOC/discharge pharmacist
- Restriction of certain antibiotics (fluoroquinolones) at discharge
- Orderset with automatic de-escalation

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

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
- Orderset with automatic de-escalation
  - Your clinicians don't use ordersets
  - Your EHR doesn't have great functionality

Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework



Vaughn et al., *Clin Infect Dis*, 2022.

Multiple Pathways to Improving Antibiotic Use at Discharge

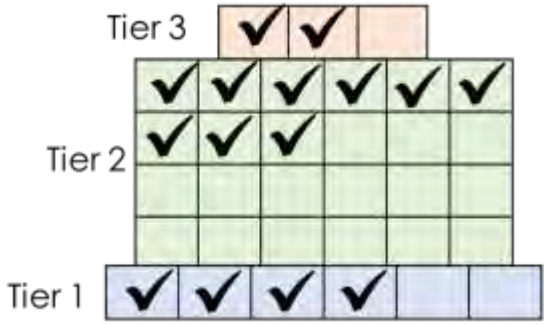
Focus on discharge

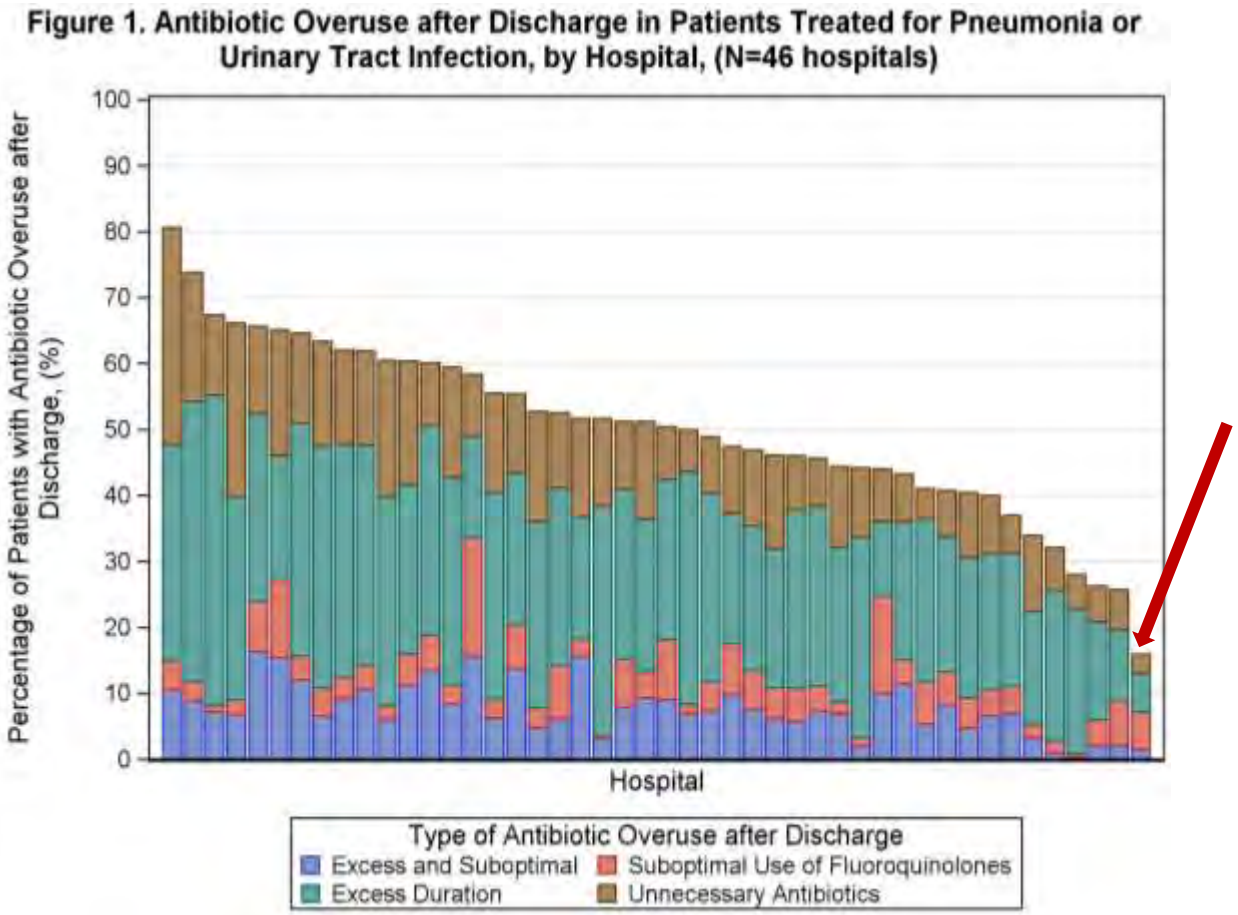
Integrate discharge stewardship into inpatient stewardship

Do it all

Vaughn et al., *Clin Infect Dis*, 2022.

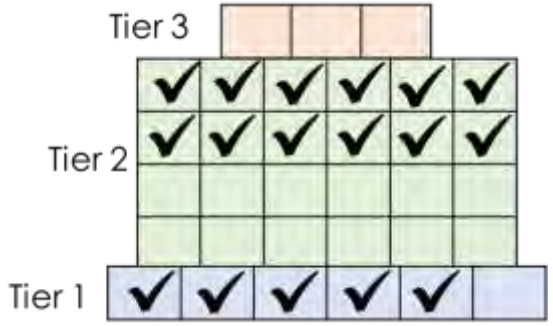
Do it all

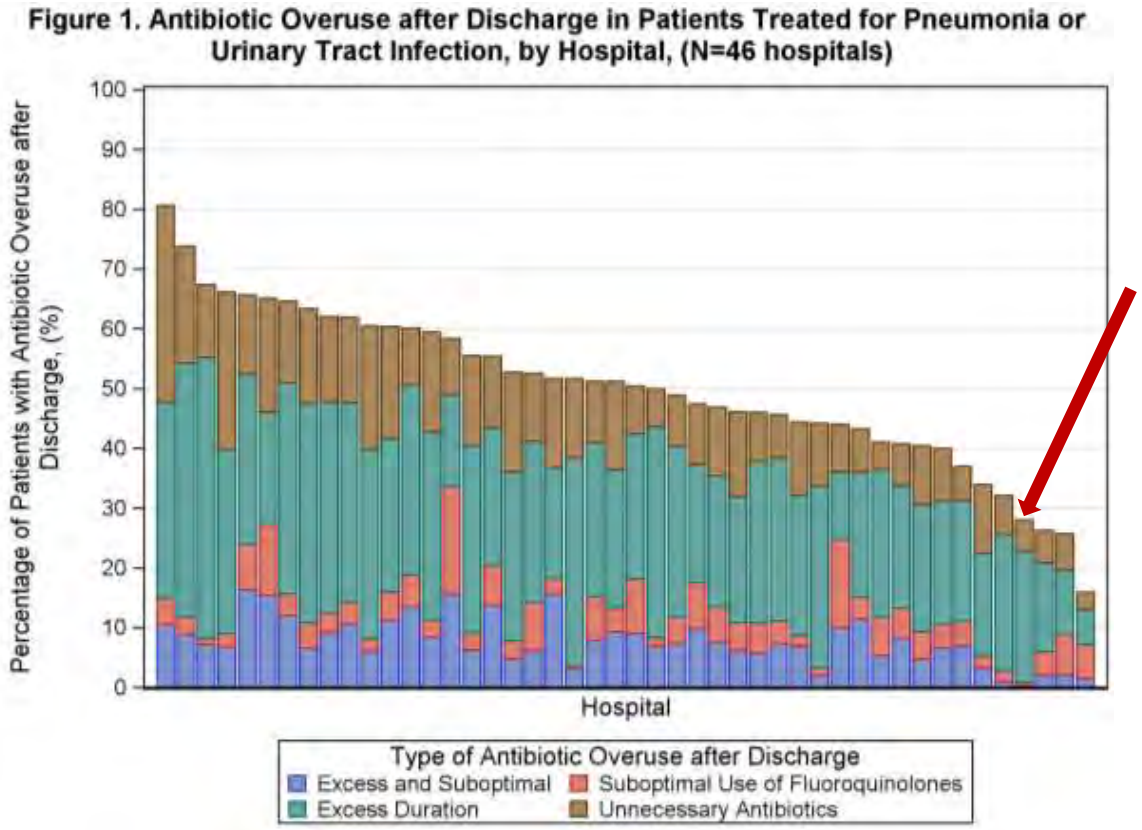




Strong Inpatient Stewardship (keeping discharge in mind)

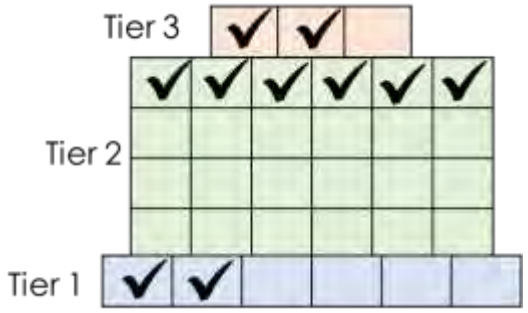
- Hospitals that already have robust inpatient stewardship interventions
- Proactively incorporate discharge into Tier 1 and Tier 2 Strategies

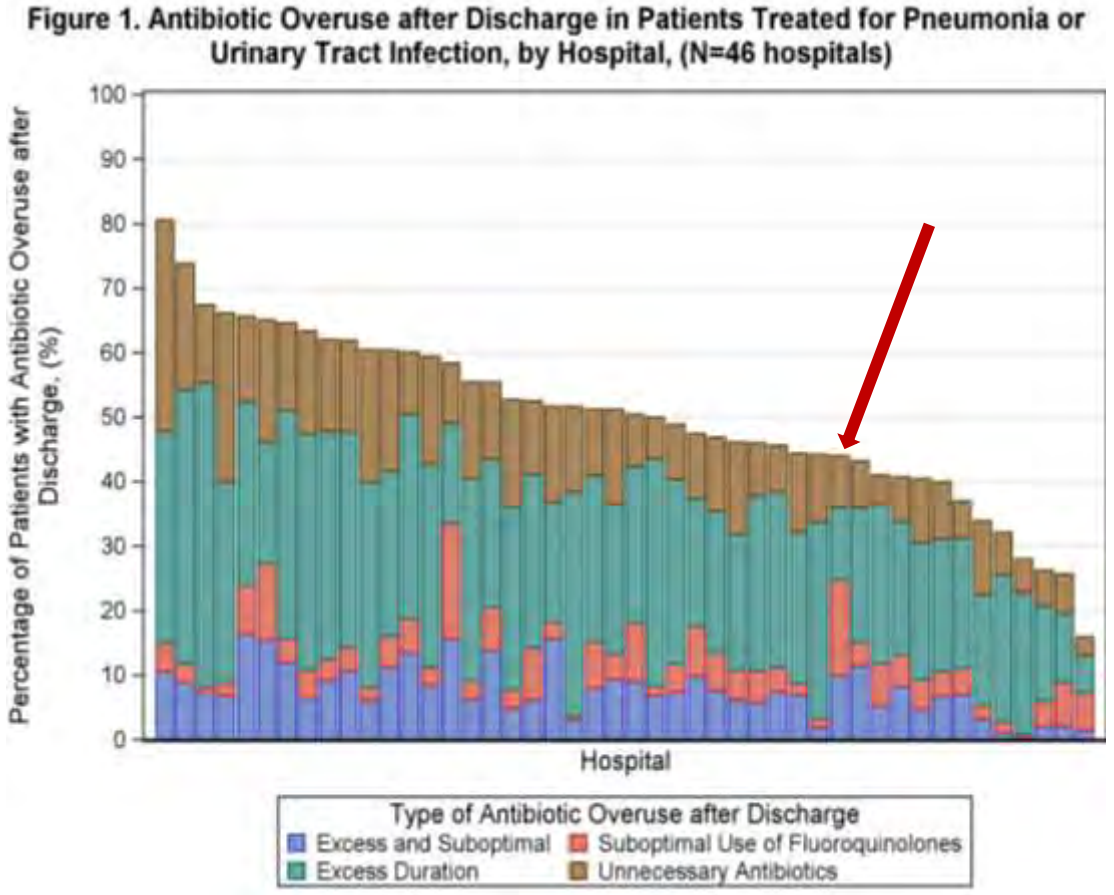




Focus on Discharge

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





What are the most effective strategies to improve antibiotic prescribing at discharge?

Depends on the hospital context!

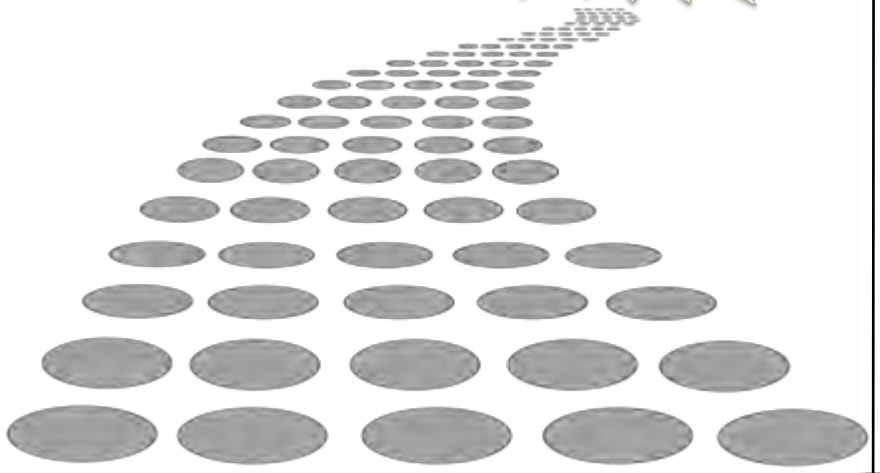
Reducing Overuse of Antibiotics at Discharge: The ROAD Home Trial – AHRQ 1R01HS029482

A Parallel Cluster Randomized Trial of an Adaptive Intervention to Improve Discharge Antibiotic Prescribing

Antibiotic Stewardship: One Size Does not Fit All

Different **Pathways to…..**

Success!



The ROAD Home Trial

HMS Hospitals

↓

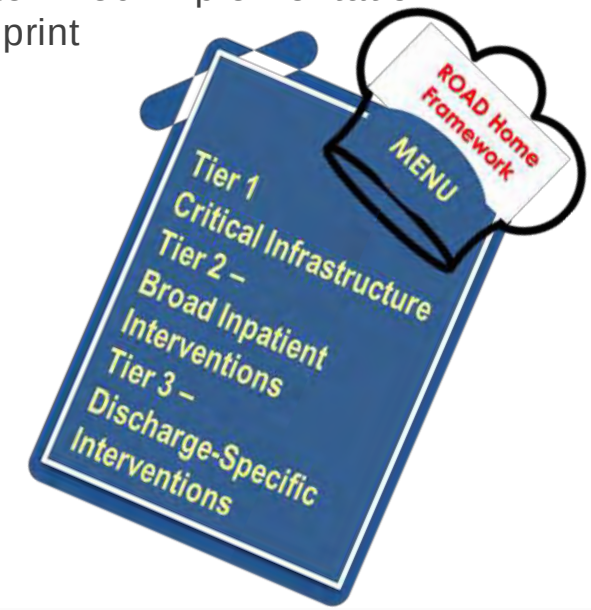
Cluster Randomization

20 Hospitals — Road Home Intervention

20 Hospitals — Control Stewardship as Usual

The ROAD Home Intervention

- Needs Assessment
- Supported Decision-Making
- Customized Implementation Blueprint



Primary Outcome: Baseline-adjusted days of antibiotic overuse at hospital discharge

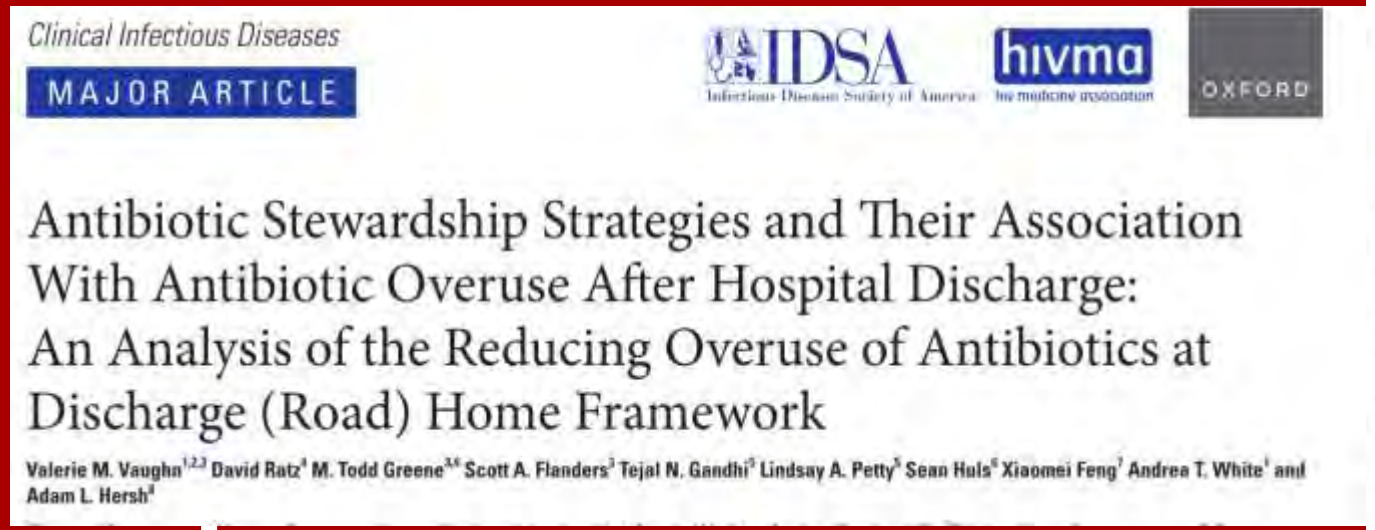
MPIs: Vaughn VM, Szymczak JE

Gandhi TN, Hersh AL, Lindenauer P, Neetz R, Petty LA, Presson AP

Agency for Healthcare Research and Quality

Summary

- Clinicians make decisions under great uncertainty and experience complex influences *rarely* related to evidence
- Antibiotic overuse at discharge is common
  - 3 types: excess duration, unnecessary use, avoidable fluoroquinolones
  - Related to cognitive biases (nudges, diagnostic momentum), fear of transitions
- The Reducing Overuse of Antibiotics at Discharge (ROAD) Home Framework can help hospitals pick strategies likely to be effective for their individual context
  - Tier 2→ proactive consideration during inpatient stewardship
  - Tier 3→ dedicated discharge activities
  - (all bolstered by strong stewardship infrastructure [Tier 1])



Clinical Infectious Diseases

MAJOR ARTICLE

IDSA Infectious Diseases Society of America · hivma hiv medicine association · OXFORD

Antibiotic Stewardship Strategies and Their Association With Antibiotic Overuse After Hospital Discharge: An Analysis of the Reducing Overuse of Antibiotics at Discharge (Road) Home Framework

Valerie M. Vaughn[1,2,3] David Ratz[4] M. Todd Greene[3,6] Scott A. Flanders[3] Tejal N. Gandhi[3] Lindsay A. Petty[5] Sean Huls[6] Xiaomei Feng[7] Andrea T. White[1] and Adam L. Hersh[8]

Szymczak et al. Implementation Science (2024) 19:23
https://doi.org/10.1186/s13012-024-01348-w

Implementation Science

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. Petty[2], Tejal N. Gandhi[2], Robert A. Neetz[3], Adam Hersh[4], Angela P. Presson[1], Peter K. Lindenauer[5], Steven J. Bernstein[6,7,8], Brandi M. Muller[1], Andrea T. White[9], Jennifer K. Horowitz[10], Scott A. Flanders[10], Justin D. Smith[11] and Valerie M. Vaughn[7,9,10,11*]

Questions?

Keep In Touch!

@ValerieVaughnMD

valerie.vaughn@hsc.utah.edu