Challenges and Opportunities in Inpatient Antimicrobial Stewardship

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Outline

1. Effective strategies for inpatient antimicrobial stewardship
2. Gaps and challenges
3. Future opportunities for inpatient stewardship

Antimicrobial Use in US Hospitals

Half of hospitalized patients receive antimicrobials

Half of these prescriptions are inappropriate

- Viral infxn
- Conta-minant
- Wrong drug
- Wrong dose
- Wrong duration

Antimicrobial Stewardship Programs (ASPs)

- Promote selection of appropriate
  - antimicrobial
  - dose
  - route and duration

- Optimize clinical outcomes and patient safety while minimizing toxicities and unintended consequences of antimicrobial use

- Reduce healthcare costs without reducing quality of care

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IDSA/SHEA: Stewardship Guidelines

Core Components

- **Multidisciplinary team, dedicated time**
- Collaboration with IP/P&T
- Administrative authority
- Infrastructure, including IT metrics

Strategies

- **Prospective audit and feedback – (persuasive)**
- **Formulary restriction – (restrictive)**
- Guidelines
- Education
- IV to PO conversion
- Shortest effective duration of antimicrobial therapy
- PK monitoring and dose adjustment

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Dellit et al, CID 2007:44, Barlam et al, CID 2016: 62, e51-e77

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Core Elements of Hospital ASPs

- Leadership support
- Accountability
- Pharmacy Expertise
- Action
- Tracking
- Reporting
- Education

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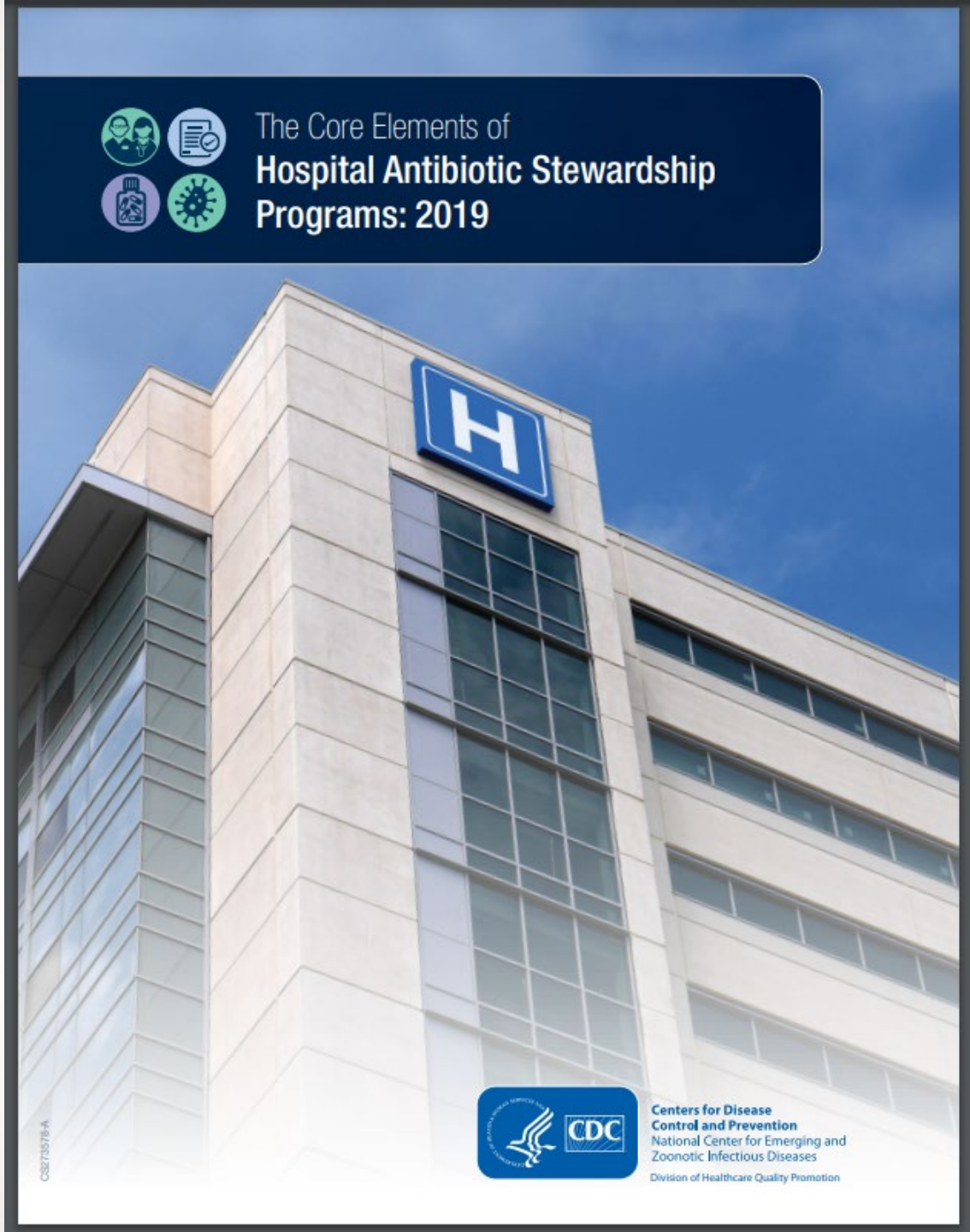

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Policy

NATIONAL ACTION PLAN FOR COMBATING ANTIBIOTIC-RESISTANT BACTERIA

MARCH 2015

THE WHITE HOUSE WASHINGTON

CDC Core Elements

Antibiotic Stewardship

PYA

[13] Centers for Disease Control and Prevention, CDC, "*Core Elements of Hospital Antibiotic Stewardship Programs.*"

Page 13

The Joint Commission

CMS

CENTERS FOR MEDICARE & MEDICAID SERVICES

Clinical Infectious Diseases

IDSA GUIDELINE

IDSA Infectious Diseases Society of America

hivma hiv medicine association

OXFORD

Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America

Tamar F. Barlam,[1,a] Sara E. Cosgrove,[2,a] Lilian M. Abbo,[3] Conan MacDougall,[4] Audrey N. Schuetz,[5] Edward J. Septimus,[6] Arjun Srinivasan,[7] Timothy H. Dellit,[8] Yngve T. Falck-Ytter,[9] Neil O. Fishman,[10] Cindy W. Hamilton,[11] Timothy C. Jenkins,[12] Pamela A. Lipsett,[13] Preeti N. Malani,[14] Larissa S. May,[15] Gregory J. Moran,[16] Melinda M. Neuhauser,[17] Jason G. Newland,[18] Christopher A. Ohl,[19] Matthew H. Samore,[20] Susan K. Seo,[21] and Kavita K. Trivedi[22]

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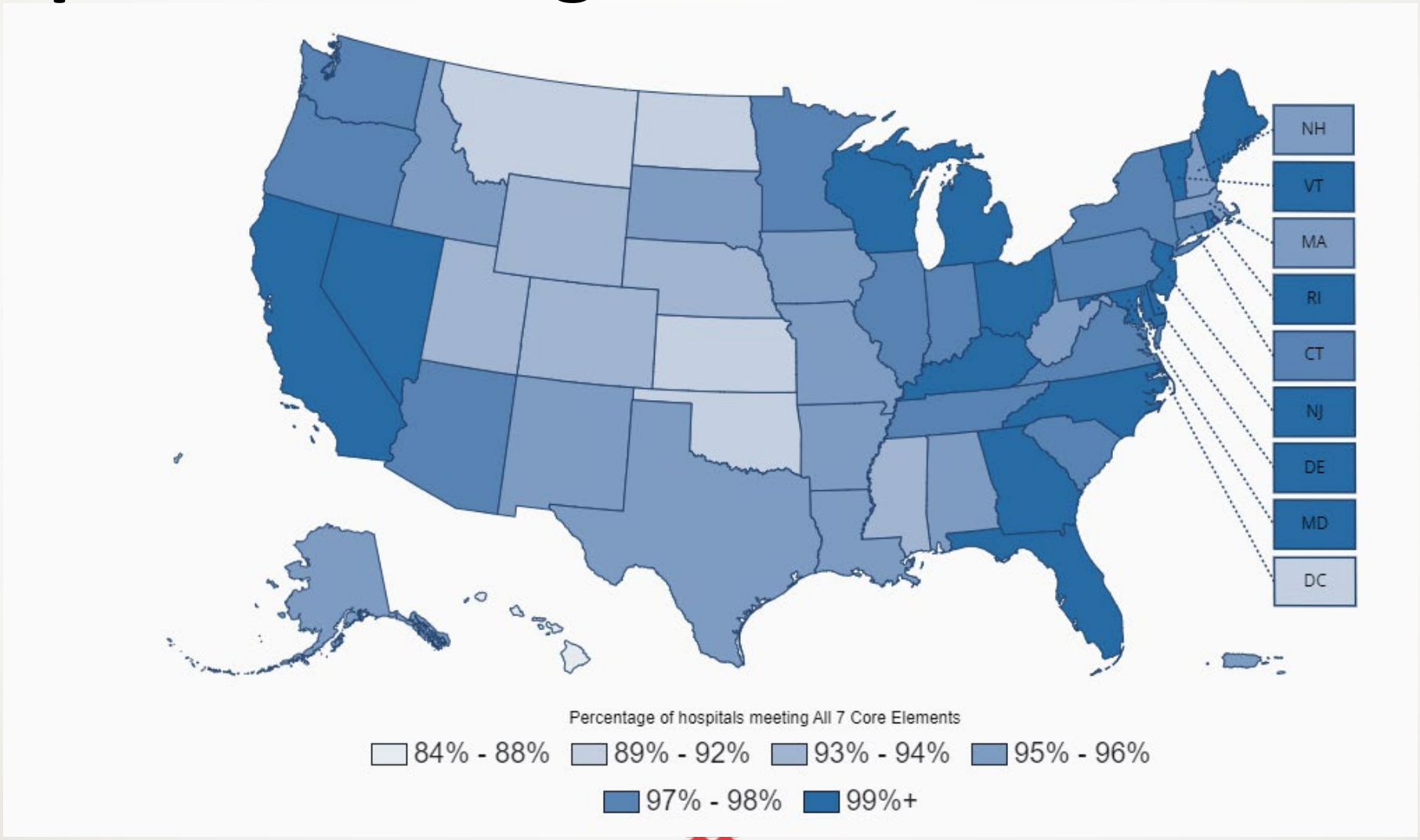
Hospitals Meeting All Core Elements, 2022



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https://arpsp.cdc.gov/profile/stewardship

Are These Strategies Effective?

- Implementing all core requirements is associated with:
  - Less overall antibiotic use[1,2]
  - Less broad-spectrum antibiotic use[3]
  - Less anti-MRSA abx use[2]
  - Less *C. difficile* infection[1,3]
  - Higher compliance with local antibiotic policies[5]
  - Shorter durations of antibiotic therapy[5]

[1]Tamma et al, JAMA Network Open 2021;
[2]Kelly et al, ICHE 2017,
[3]Bernard et al, ICHE 2019;
[4]Garcia Reeves et al, ICHE 2020;
[5]Davey et al, Cochrane Database, 2017

Gaps in Hospital-Based ASPs

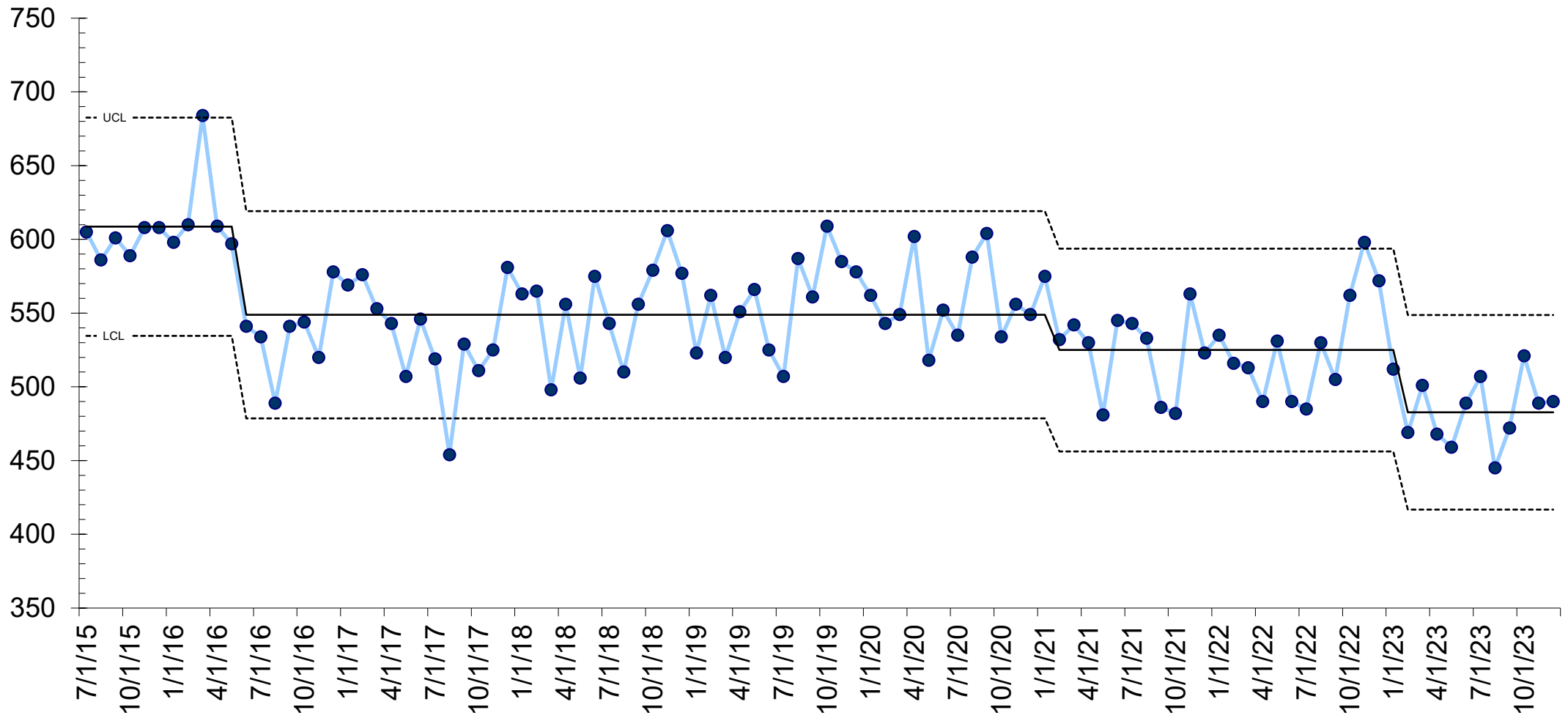
- Metrics
  - Traditional
    - Antibiotic use
    - Process measures
    - Antimicrobial costs

  - Harder to evaluate
    - Clinical outcomes
    - Appropriateness of antibiotic use
    - Cost effectiveness

- Resources, personnel

- More stewardship needed
  - Discharge stewardship
  - Special populations
  - Perioperative antibiotic use
  - Antibiotic allergy delabeling
  - Diagnostics
  - Critical access/community hospitals

Total Days of Therapy (DOT)/1000 Days Present



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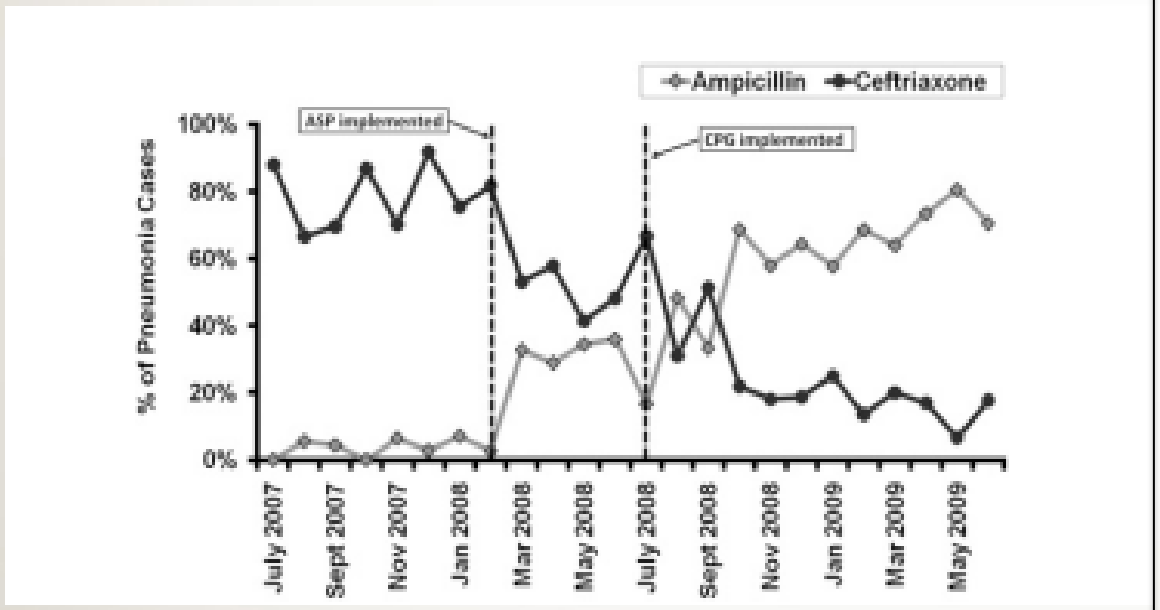
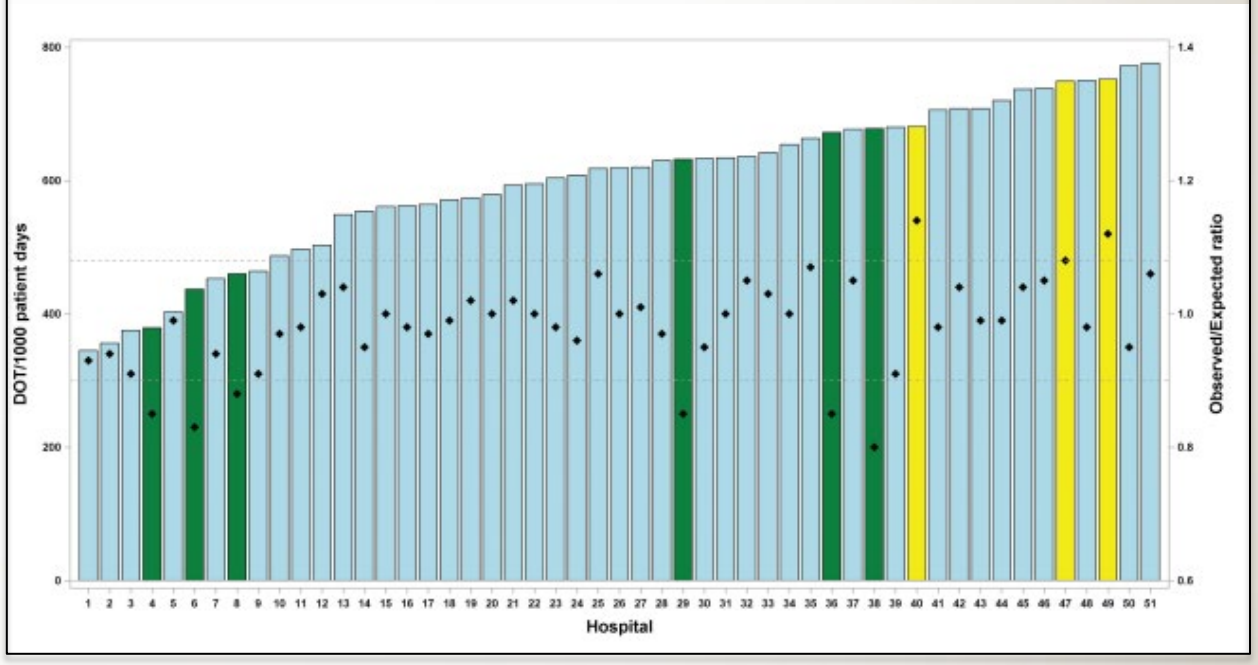
Moving Beyond Days of Therapy (DOT)

DOT does not measure appropriateness



Neumann et al, Pediatrics 129:e597

DOT does not adjust for case mix



Wattier et al, CID 2021 73: 925

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Clinical Outcomes

- LOS, mortality, resistance
  - *confounders*
- Averted harms
  - Adverse Events
  - Cost
  - Microbiome disruption
- DOOR/RADAR

DOOR (Desirability Of Outcome Ranking) ordinal scale

- Combine multiple outcomes and competing risks into single ordinal scale, e.g.:

1	Improvement in symptoms without adverse effects (AEs)
2	Improvement in symptoms with AEs
3	Survival without improvement in symptoms or AEs
4	Survival without improvement in symptoms but with AEs
5	Death

RADAR (Response Adjusted for Duration of Antibiotic Risk)

- If tied within same DOOR ranking, shorter antibiotic duration is superior to longer (tiebreaker)

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Williams et al, JAMA Pediatrics 2022, 176:253
Ong, Clin Microbiol Infect. 2023, 29:1024

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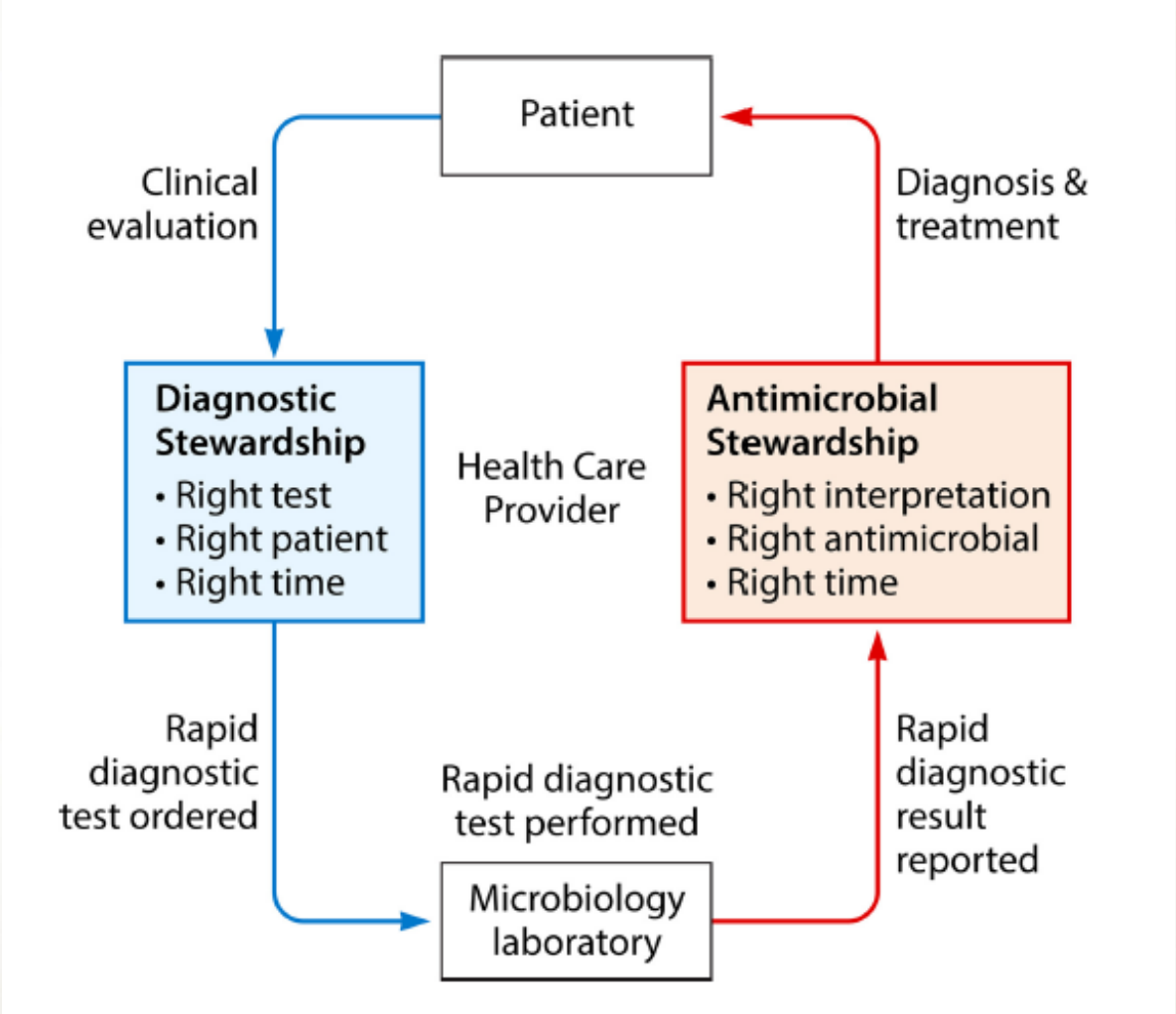
Diagnostic Stewardship

Right Test
Right Patient
Right Time



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Messacar et al, J. Clin Micro. 2017, 55:715

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Tele-stewardship

JAMA Network | Open

Original Investigation | Infectious Diseases

Feasibility of Core Antimicrobial Stewardship Interventions in Community Hospitals

Deverick J. Anderson, MD, MPH; Shera Watson, MPH; Rebekah W. Moehring, MD, MPH; Lauren Komarow, MS; Matthew Finnemeyer, MPH; Rebekka M. Arias, BS; Jacqueline Huvane, PhD; Carol Bova Hill, PhD; Nancie Deckard, BSN, MS; Daniel J. Sexton, MD; for the Antibacterial Resistance Leadership Group (ARLG)

Impact of Implementing Antibiotic Stewardship Programs in 15 Small Hospitals: A Cluster-Randomized Intervention

Edward Stenehjem,[1,2] Adam L. Hersh,[3] Whitney R. Buckel,[4] Peter Jones,[1] Xiaoming Sheng,[5] R. Scott Evans,[6,7] John P. Burke,[1,8] Bert K. Lopansri,[1,8] Rajendu Srivastava,[9,10] Tom Greene,[5] and Andrew T. Pavia[3]

Development of a Centralized Antimicrobial Stewardship Program Across a Diverse Health System and Early Antimicrobial Usage Trends

Tina M. Khadem,[1,2] M. Hong Nguyen,[1] John W. Mellors,[1] and J. Ryan Bariola[1,2]

Future

- Outcome measures that integrate efficacy and safety
- Tele-stewardship
- Personalized predictions
  - Antibiotic-associated complications
  - Response to antimicrobial therapy
- Microbiome-sparing antimicrobial therapies
- Research and implementation of ASPs in different countries, economies, cultural contexts