Session 1 – June 16th, 2011
Arjun Srinivasan MD
Christopher Ohl MD
Edina Advic PharmD
Diane Jacobsen, MPH

These presenters have nothing to disclose

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**What is an Expedition?**

**ex•pe•di•tion (noun)**

1. an excursion, journey, or voyage made for some specific purpose
2. the group of persons engaged in such an activity
3. promptness or speed in accomplishing something
Where are you joining from?

Our Expedition Director

Diane Jacobsen, MPH, CPHQ, Director, Institute for Healthcare Improvement (IHI), is content director for Project JOINTS, directs the CDC/IHI Antibiotic Stewardship Initiatives, Expeditions on Antibiotic Stewardship and Sepsis, and serves as IHI content lead and improvement advisor for the California Healthcare-Associated Infection Prevention Initiative (CHAIFI). Ms. Jacobsen also directed Expeditions on Preventing CA-UTIs, Reducing *C. difficile* Infections, Improving Flow in Key Areas and Improving Stroke Care.
Overall Program Aim

The Aim of this Expedition: To provide hospitals with the most effective ideas and practices in improving Antibiotic Stewardship in their organization.

Objectives

Upon completion of this expedition, participants will be able to:

- **Describe the impact** of antibiotic overuse on complications, including *Clostridium difficile* and adverse drug reactions, length of stay, costs, and antimicrobial resistance

- **Establish or enhance** a multidisciplinary focus to heighten awareness of the challenges of antimicrobial resistance and support antibiotic stewardship

- **Identify and begin improving** at least one key process to optimize antibiotic selection, dose, and duration of antimicrobial agents in their hospital
Expedition Focus

The expedition will focus on key “high leverage” changes to ensure timely and appropriate antibiotic utilization:
• Making antibiotics patient is receiving and start & stop dates visible at point of care
• Reconciling and adjusting antibiotics – focused on care transitions within the hospital
• Stopping or de-escalating therapy appropriately
• Monitoring and providing feedback on process measure to assess progress over time

Agenda

• Welcome and introductions
• Making the Case – Arjun Srinivasan MD
• Medical Staff Leadership & Buy-in – Chris Ohl MD
• Role of the Pharmacist & Programmatic Aspects – Edina Advic PharmD
• Questions and Answers
• Model for Improvement – testing on a small scale – Diane Jacobsen MPH
• Assignment & Planning for Next Session
• Final Questions & Close
Making the Case for Antibiotic Stewardship

Arjun Srinivasan, MD, is the Associate Director for Healthcare-Associated Infection Prevention Programs in the Division of Healthcare Quality Promotion at the Centers for Disease Control and Prevention (CDC). Dr. Srinivasan’s primary responsibilities include oversight and coordination of efforts to eliminate healthcare-associated infections. His research and investigative areas of concentration include outbreak investigations, infection control, multi-drug resistant gram negative pathogens, and antimicrobial use. In 2008, he assumed the medical directorship of the CDC campaign called “Get Smart for Healthcare,” which is designed to improve the use of antimicrobials in in-patient health care facilities. Dr. Srinivasan has published several articles in peer-reviewed journals on his research in health care epidemiology, infection control, and antimicrobial use and resistance.

Antimicrobial Stewardship

CDR Arjun Srinivasan, MD
Associate Director for Healthcare Associated Infection Prevention Programs
Division of Healthcare Quality Promotion
Why We Have to Improve Antibiotic Use

• A lot of in-patient antibiotic prescriptions are unnecessary or sub-optimal.
• Antibiotics are unlike any other drug, in that the use of the agent in one patient can compromise its efficacy in another.
• We are running out of antibiotics.
• We won’t get new ones soon.

Susceptibility Profile of KPC-Producing *K. pneumoniae*

<table>
<thead>
<tr>
<th>Antimicrobial</th>
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<th>Interpretation</th>
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<tr>
<td>Amikacin</td>
<td>I</td>
<td>Chloramphenicol</td>
<td>R</td>
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<tr>
<td>Amox/clav</td>
<td>R</td>
<td>Ciprofloxacin</td>
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<td>Ampicillin</td>
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<td>Aztreonam</td>
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<td>Cefazolin</td>
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<td>Imipenem</td>
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<tr>
<td>Cefpodoxime</td>
<td>R</td>
<td>Meropenem</td>
<td>R</td>
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<tr>
<td>Cefotaxime</td>
<td>R</td>
<td>Pipercillin/Tazo</td>
<td>R</td>
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<tr>
<td>Cefotetan</td>
<td>R</td>
<td>Tobramycin</td>
<td>R</td>
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<tr>
<td>Cefoxitin</td>
<td>R</td>
<td>Trimeth/Sulfa</td>
<td>R</td>
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<tr>
<td>Ceftazidime</td>
<td>R</td>
<td>Polymyxin B</td>
<td>MIC &gt;4mg/ml</td>
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<td>Ceftriaxone</td>
<td>R</td>
<td>Colistin</td>
<td>MIC &gt;4mg/ml</td>
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<tr>
<td>Cefepime</td>
<td>R</td>
<td>Tigecycline</td>
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C. difficile Incidence and Mortality Are Increasing


Five Truths About In-patient Antibiotic Use

• Antibiotics are misused in hospitals
• Antibiotic misuse is bad
• Improving antibiotic use can improve medical care
• There are many ways to improve antibiotic use
• Every facility can improve antibiotic use
Most Common Reasons for Unnecessary Days of Therapy

576 (30%) of 1941 days of antimicrobial therapy deemed unnecessary

Antibiotic misuse adversely impacts patients- *C. difficile*

- Antibiotic exposure is the single most important risk factor for the development of *Clostridium difficile* associated disease (CDAD).
  - Up to 85% of patients with CDAD have antibiotic exposure in the 28 days before infection\(^1\)

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Estimated burden of healthcare-associated CDI

- Hospital-acquired, hospital-onset: 165,000 cases, $1.3 billion in excess costs, and 9,000 deaths annually
- Hospital-acquired, post-discharge (up to 4 weeks): 50,000 cases, $0.3 billion in excess costs, and 3,000 deaths annually
- Nursing home-onset: 263,000 cases, $2.2 billion in excess costs, and 16,500 deaths annually


Annual prevalence of imipenem resistance in *P. aeruginosa* vs. carbapenem use rate

45 LTACHs, 2002-03 (59 LTACH years) Gould et al. ICHE 2006;27:923-5
Targeted antibiotic consumption and nosocomial *C. difficile* disease

Tertiary care hospital; Quebec, 2003-2006


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*P. aeruginosa* susceptibilities before and after implementation of antibiotic restrictions (CID 1997;25:230)

P<0.01 for all increases
Clinical outcomes better with antimicrobial management program

Improving antibiotic use saves money

- “Comprehensive programs have consistently demonstrated a decrease in antimicrobial use with annual savings of $200,000 - $900,000”
- IDSA/SHEA Guidelines for Antimicrobial Stewardship Programs
- http://www.journals.uchicago.edu/doi/pdf/10.1086/510393
Total costs of parenteral antibiotics at 14 hospitals

Conclusions

• The time for stewardship is now.
• Every facility should be doing stewardship
  – Limited interventions as a place to start, more comprehensive programs as the goal
• Improving in-patient antibiotic use is a public health imperative.
• Tell us how we can help you.
Medical Staff Leadership & Buy-in

Christopher Ohl, MD, is the Medical Director for Antimicrobial Utilization Stewardship and Epidemiology at Wake Forest University Baptist Medical Center, and Infectious Diseases Associate Professor at Wake Forest University School of Medicine

www.cdc.gov/getsmart/healthcare
Effective Strategies for Designing A Stewardship Program

Christopher A. Ohl, MD, FACP
Director, Center for Antibiotic Utilization, Stewardship and Epidemiology
Associate Professor of Medicine
Wake Forest University
School of Medicine

Antimicrobial Stewardship

Definition

A system of informatics, data collection, personnel, and policy/procedures which promotes the optimal selection, dosing, and duration of therapy for antimicrobial agents throughout the course of their use.

An effective antimicrobial stewardship program will limit inappropriate and excessive antimicrobial use, but more importantly improve and optimize therapy and clinical outcomes for the individual infected patient.

Antimicrobial Stewardship

Goals

• Prevent or slow the emergence of antimicrobial resistance
• Optimize selection, dose and duration of Rx
• Reduce adverse drug events including secondary infection (e.g. C. difficile AAD)
• Reduce morbidity and mortality
• Reduce length of stay
• Reduce health care expenditures


Infectious Diseases Society of America and the
Society for Healthcare Epidemiology of America
Guidelines for Developing an Institutional Program
to Enhance Antimicrobial Stewardship

Timothy H. Dellit,1 Robert C. O’connor,2 John E. McGowan, Jr.,3 Dale N. Gerding,4 Robert A. Weinstein,5
John P. Burke,6 W. Charles Hadler,7 David L. Paterson,7 Neil O. Fishman,7 Christopher F. Carpentier,9 P. J. Brennan,9
Marionneau Billi,9 and Thomas M. Hooton10

1Northwick Medical Center and the University of Washington, Seattle; 2Maine Medical Center, Portland; 3Emory University, Atlanta, Georgia;
4Veterans Affairs Hospital and Loyola University Stritch School of Medicine, Illinois; and 5Stroger (Cook County) Hospital and Rush
University Medical Center, Chicago, Illinois; 6University of Utah, Salt Lake City; 7Mayo Clinic College of Medicine, Rochester, Minnesota;
8University of Pittsburgh Medical Center, Pittsburgh, and 9University of Pennsylvania, Philadelphia, Pennsylvania; 10William Beaumont Hospital,
Royal Oak, Michigan; 11Ochsner Health System, New Orleans, Louisiana; and 12University of Miami, Miami, Florida
Elements for constructing a comprehensive antimicrobial stewardship program

Multidisciplinary team
- Infectious diseases physician
- Clinical pharmacist (with ID training)  Both compensated for their time
- Additional
  - Clinical microbiology
  - Information systems specialist
  - Infection control professional/hospital epidemiologist

Medical Staff function

Stewardship Program Development
Role of the Physician Team Leader
- Effective ASPs often are rooted as a Medical Staff function
- MD program and team leadership important
- 3 C’s Conceptualization, Communication, Coercion best done by an MD
- Individual interventions may be better accepted form an MD
- Team leader needs to be vested in and have program ownership
- Does need time compensation
Stewardship Program Development

Role of the Physician

• IDSA/SHEA Guidelines suggest an Infectious Diseases Physician as Team Leader
• Non ID could well be suited: Hospitalist, Intensivist, others
• Qualities needed
  – Leadership skills
  – Politician and Communicator
  – Evidence Based Knowledge
  – Respect of the Medical Staff and Leadership
  – Respect of Hospital Administration
  – Familiar with Stakeholder Needs
  – Experienced Clinician Who Sees Patients

Stewardship Program Development

Inpatient Facilities without an ID MD

• Consider partnering with an Infectious Diseases MD with stewardship experience outside of the institution
• ID MD could work with a nonID “physician champion” and clinical PharmD at the hospital to help develop protocols, guidelines and provide backup and support and training
• Some facilities may want to contract with an ID at an outside institution for day to day activities.
  – “St. Paul model” for prospective audit and feedback
  – Works best with electronic medical records
  – Clinical ward PharmD’s provided suggested patients for intervention 3-5 times per week
  – Contract ID MD goes over patients with on-site PharmD and makes intervention with call to attending MD
Stewardship Program Development
Role of the Clinical Pharmacist

- IDSA/SHEA Guidelines suggest a PharmD with infectious diseases training
- Together with MD responsible for the day to day operations
  - Prospective audit and feedback
  - Antimicrobial Restriction
- Often works with IT as “data manager”
- Implements pharmacokinetic and pharmacodynamic interventions
- Trains and works with other ID PharmD’s to extend the reach of the ASP
- Also needs time compensation

Stewardship Program Development
Role of the Clinical Pharmacist

- Problems with IDSA guidelines
  - Training in “Infectious Diseases” not defined
  - Pharmacy ID residencies are small in number
  - Training in infectious diseases does not always imply training or experience with antimicrobial stewardship
  - Time is not always protected for stewardship activities
- ID residency training maybe not essential
- Personal qualities that are helpful
  - Experienced
  - Respect of the medical staff
  - Familiar with data gathering and analysis
Help is on the way!

- Training opportunities/certificate programs
  - IDSA/SHEA
  - SIDP
  - MADID
  - Public health symposia
- Materials and toolkits
  - CDC Get Smart program
  - SHEA
  - Institute for Healthcare improvement (IHI)
  - Others

Goals of Antimicrobial Stewardship

Combination of effective antimicrobial stewardship with a comprehensive infection control program has been shown to limit the emergence and transmission of antimicrobial resistance bacteria

Dellit et. al. Clin Infect Dis 2007;44:159-177
Elements for constructing a comprehensive antimicrobial stewardship program

Support/collaboration
- Hospital administration
- Medical staff leadership
- Local providers
- Part of quality/safety program

Clinical Infectious Diseases 2007;44:159-177

Getting started

- Establish a core planning committee
  - Subcommittee of P&T?
  - Subcommittee of Infection Control?
  - Other interested and like minded people
- Establish goals and mission statement
- Draft an idea
  - Program structure
  - Program elements
- Identify existing and needed resources
Getting started (2)

- Present ideas to pharmacy director
- Vet your ideas with CMO or key medical staff leadership
- Met with VP for patient safety
- Establish a working budget
- Write a strategic (business plan)

Overview of the Program
Wake Forest Univ. Baptist Medical Center

Informatics based monitoring of antimicrobial resistance (From microbiology)
Informatics based monitoring of antibiotic utilization (antibiotic density) DDD vs Mean Days of Therapy

Computerized integration of antimicrobial resistance and antibiotic density data

CAUSE Staff & Medical Director

Microbiology
Pharmacy
Information Systems

Medical Director of Hospital Epidemiology (Infection Control)
Overview of the Program
Wake Forest University Baptist Medical Center

CAUSE Staff & Medical Director

National guidelines; Proven, literature based antimicrobial stewardship practices

New antimicrobial agents

CAUSE ADVISORY BOARD

Pharmacy and Therapeutics Committee

Major Interventions

Chiefs of Professional Services (Executive Committee Level)

Informatics for Support

- Home grown possible but takes time and can be frustrating
- Vendor programs (not all inclusive)
  - Safety Surveillor ®
  - BD Protect™
  - Theradoc™
- Need to think about NHSN reporting when making these decisions
Strategies for Medical Staff Buy-In

The Role of the Pharmacist & Programmatic Aspects

Edina Avdic, Pharm.D., MBA, BCPS AQ-ID is the associate director of the antimicrobial stewardship program at The Johns Hopkins Hospital. She serves as a co-chair of the Maryland Society of Health System Pharmacists (MSHP) Antimicrobial Stewardship committee and a pharmacy director for the CDC’s campaign Get Smart for Healthcare. Dr. Avdic's practice and research interests are in the area of antimicrobial stewardship and management of patients with multidrug resistant organisms. She is committed to development of tools and methods that promote optimal antimicrobial use to decrease antimicrobial resistance and education of healthcare professionals and public on the subject of appropriate antimicrobial use and development of resistance.
Role of Pharmacists in Antimicrobial Stewardship Program (ASP)

Edina Avdic, Pharm.D, MBA, BCPS, AQ-ID
Pharmacy Director, Get Smart for Healthcare - CDC
Associate Director, Antimicrobial Stewardship Program
The Johns Hopkins Hospital

Role of Pharmacist

- Role of pharmacy department
- Role of infectious diseases pharmacy specialist
  - Additional post-graduate training in infectious diseases or equivalent experience
- Role of clinical pharmacy specialist with various specialty training
  - Additional post-graduate training in various specialties such as critical care, oncology, internal medicine or equivalent experience
- Role of all other pharmacists
  - Additional 1 year post-graduate training (pharmacy practice)
  - No additional post-graduate training, experienced practitioner, new graduate
Role of Pharmacy Department

- Pharmacy director along with physician champion should negotiate with hospital administration resources and outcomes needed for the program
- Collaborates with antimicrobial stewardship team
- Provides financial support for pharmacist(s) salary, +/- some % of physician and/or ID fellow(s) salary
- Enforces antimicrobial restrictions, guidelines and polices at the institution

Role of the Infectious Diseases Pharmacist(s)

- Core member of the antimicrobial stewardship team along with physician champion (ID physician, hospitalist, etc.)
- Collaborates with infectious diseases, microbiology, infection control and other departments to develop institution specific guidelines for antimicrobial use and antibiogram
- Member of Antibiotic Subcommittee or equivalent
- Actively participates in Hospital Infection Control and Prevention Committee or equivalent
Role of the Infectious Diseases Pharmacist(s)

- Promotes optimal use of antimicrobials
  - Appropriate antimicrobial selection and monitoring
  - Dosing and pharmacokinetic consultation
  - De-escalation of antimicrobial therapy
  - Assists with development, implementation, and assessment of critical pathways
  - Conducts research on the program outcomes
  - Ensures that the appropriate antimicrobial agents are available for the patient population served
  - IV to PO conversion

Am J Health-Syst Pharm. 2010; 67:575-7

Role of the Infectious Diseases Pharmacist(s)

- Promotes optimal use of antimicrobials
  - Works closely with microbiology laboratory to ensure that appropriate culture and susceptibility data are performed and reported in a timely manner
  - Utilizes information and electronic data systems when available to improve and monitor antimicrobial use
  - Generates reports on antimicrobial usage (DDD, DOT) and cost data

Am J Health-Syst Pharm. 2010; 67:575-7
Role of the Infectious Diseases Pharmacist(s)

- Education of health care professionals and patients
  - Provides formal and informal educational sessions on antimicrobial use, antimicrobial pharmacokinetics/pharmacodynamics, resistance related issues
  - Participates in public health efforts related to prudent use of antimicrobials
  - Provides exposure to antimicrobial stewardship through experiential and didactic training of pharmacists, pharmacy residents/students, and other health care professionals

Role of non-ID Clinical Pharmacy Specialist(s)

- Promotes optimal use of antimicrobials
  - Makes recommendations on appropriate antimicrobial selection, dosing, monitoring and de-escalation in their practice area
  - Seeks assistance from infectious disease pharmacists and/or physician with complicated cases
  - Collaborates with infectious diseases pharmacists on development, implementation, and assessment of critical pathways for their patient population
- May assume some responsibilities of infectious diseases pharmacists in hospitals without ID pharmacists
# Role of Other Pharmacist(s)

- Ensures appropriate antimicrobial dosing based on indication and patient specific factors
- Promotes IV to PO conversion when appropriate
- Provides therapeutic interchange when appropriate
- Enforces hospital formulary restrictions and other antimicrobial restrictions
- Pharmacokinetic consultation
- Assists with de-escalation of antimicrobial therapy
- Flags orders for review by ID/stewardship pharmacist

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# Stewardship Pharmacist Without Formal ID Training

- Full time or % of time dedicated to the stewardship activities
  - Clinical coordinator, clinical pharmacist (with/without PGY-1 residency training), clinical pharmacist with specialty training in another area (e.g. cardiology, medicine, etc), staff pharmacist
  - Additional stewardship education is highly recommended to initiate or improve stewardship activities: stewardship certificate, stewardship workshop attendance
  - Type of stewardship interventions will depend on individual’s knowledge of infectious diseases, ID/physician support/backup, and % time dedicated to stewardship activities
Antimicrobial Stewardship Interventions that Can be Performed by Pharmacist(s)

- Prospective audit with intervention and feedback
- Streamlining and de-escalation
- Dose optimization
- Conversion from parenteral (IV) to oral (PO) therapy

Prospective Audit with Intervention and Feedback

- Regular review of all or selected antimicrobials for their appropriateness
  - target selected antimicrobials: broad spectrum, expensive, toxic agents
  - target positive culture results or mismatched results
  - target specific diseases states: CAP, sepsis, UTIs
  - review at 48-72 hours
  - make start and stop dates visible at point of care
  - use of electronic software programs can help identify patients (e.g. TheraDoc, SafetySurveillor)
- Improves antimicrobial use, easier to implement, however, can be time-consuming and difficult to communicate
- Requires knowledge of infectious diseases and antimicrobial therapy, and stewardship physician time/support
Streamlining and De-escalation

• Usually part of the prospective audit and feedback
• Narrowing therapy from broad spectrum antibiotic or stopping antibiotic when:
  – at the transition of care (e.g. ICU to the floor, or at discharge)
  – culture and susceptibility data is available
  – appropriate cultures did not yield positive results
  – non-infectious causes identified
  – usually performed at 48-72 hours
• Requires some knowledge of infectious diseases and antimicrobial therapy

Conversion from Parenteral (IV) to Oral (PO) Therapy

• Targets antimicrobials with high bioavailability in patients who meet specific clinical criteria
• Decreases cost and hospital stay; can prevent potential complications from IV access
• Fairly easy to implement
• Can be performed by any pharmacist and requires minimal training
  – usually protocol driven
Dose Optimization

- Optimizes antimicrobial dosing based on:
  - patient characteristics
  - causative organism
  - site of infection
  - pharmacokinetic and pharmacodynamic properties of the drug
- Can be done by any pharmacist, requires good knowledge of antimicrobial agents
  - usually protocol driven

Testing on a small scale….

Diane Jacobsen MPH, CPHQ
Fundamental Questions for Improvement

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in an improvement?

Source: Improvement Guide, p 3, 4
Why Test?

- Increase the belief that the change will result in improvement
- Predict how much improvement can be expected from the change
- Learn how to adapt the change to conditions in the local environment
- Evaluate costs and side-effects of the change
- Minimize resistance upon implementation

Testing on a Small Scale

- RULE OF ONE: Conduct the test on one unit, with one staff member or physician and one patient
- Conduct the test over a short time period
- Test the change on a small group of volunteers
- Develop a plan to simulate the change in some way
To Be Considered a PDSA Cycle:

- The test or observation was *planned* (including a plan for collecting data).
- The plan was attempted (*do* the plan).
- Time was set aside to analyze the data and *study* the results.
- *Action* was rationally based on what was learned.

Measurement and Data Collection During PDSA Cycles

- Collect useful data, not perfect data - the purpose of the data is learning, not evaluation
- Use a pencil and paper until the information system is ready
- Use sampling as part of the plan to collect the data
- Use qualitative data rather than wait for quantitative
- Record what went wrong during the data collection
Measurement and Data Collection During PDSA Cycles

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- Record what went wrong during the data collection

What We Expect of You

- “All Teach, All Learn” philosophy
- Join and participate on all calls
- Participate in the listserv discussion
- Test, test, test
- Share what you’ve learned (challenges as well as successes and insights)
What You Should Do Over the Next 14 Days

**Operational and Team Issues**

• Identify a unit-based multidisciplinary team to actively test changes, identifying key roles in your organization that may not currently be involved in the process

• Assess current process & Prioritize areas for improvement/focus
  ─ visibility of start & stop dates at the point of care
  ─ process for reconciling and adjusting antibiotics at all care transitions
  ─ stopping or de-escalating antibiotics.
  ─ monitoring & providing feedback on process measures

Upcoming Sessions 1-2pm ET

• **June 30th** – Making antibiotics patient is receiving and start & stop dates visible at point of care
• **July 14th** – Reconciling and adjusting antibiotics – focusing on care transitions
• **July 28th** – Stopping or de-escalating therapy appropriately
• **Aug 11th** – Insights and challenges in community hospitals
• **Aug 25th** – Brief report outs from participating hospitals: progress and challenges