Ask the Experts: Key Considerations for Improving Patient Outcomes with Antimicrobial Stewardship Programs

Presented as a Live Webinar
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On-demand Activity
Live webinar recorded and archived to be watched at your convenience
Available after May 16, 2016

http://cemidday.com/stewardship/ate

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Activity Overview

This activity will focus on current issues related to improving patient outcomes with effective antimicrobial stewardship programs. The faculty will address the key issues and provide practice pearls for physicians and pharmacists.

The content for this activity is based on questions and comments from participants at a recent educational symposium on this topic. Time for additional questions from the webinar audience will be provided at the end of the presentation.

Learning Objectives

At the conclusion of this application-based educational activity, participants should be able to

- Develop a plan to improve or expand antimicrobial stewardship program (ASP) initiatives based on approaching national mandates surrounding ASP.
- Recommend clinical interventions for initiating or expanding ASP programs.
- Provide specific examples of areas where pharmacists and ASPs have proven efficacy.

Continuing Education Accreditation

The American Society of Health-System Pharmacists is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education. This activity provides 1.0 hours (0.10 CEUs – no partial credit for pharmacists) of continuing pharmacy education credit.

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On-Demand Activity ACPE #: 0204-0000-16-444-H01-P

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Webinar Information

Visit [http://cemidday.com/stewardship/ate](http://cemidday.com/stewardship/ate) to find:

- Webinar registration link
- Group viewing information and technical requirements
- CE webinar processing information

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Activity Faculty

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Professor and Chair
Department of Pharmacy Practice and Translational Research
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Houston, Texas

Kevin W. Garey, Pharm.D., M.S., FASHP, is Professor at the University of Houston College of Pharmacy and Chair of the Department of Pharmacy Practice and Translational Research at the University of Houston College of Pharmacy in Houston, Texas. Dr. Garey is Adjunct Professor at the University of Texas School of Public Health and Clinical Specialist and Researcher at Baylor St. Luke’s Medical Center in Houston, Texas.

Dr. Garey received a Bachelor of Science in pharmacy from Dalhousie University in Halifax, Nova Scotia, Canada, a Doctor of Pharmacy degree from the State University of New York in Buffalo, New York, and Master of Science in biometry from the University of Texas School of Public Health in Austin, Texas. He completed a pharmacy practice residency at Bassett Healthcare, Cooperstown, New York and infectious disease specialty residency and fellowship training at the University of Illinois at Chicago College of Pharmacy in Chicago, Illinois.

Dr. Garey has authored numerous publications in infectious diseases topics and presented extensively at national and international professional conferences. He has received numerous professional awards including the ASHP Drug Therapy Research Award, ASHP Best Practices Award in Health-System Pharmacy, the Society of Infectious Diseases Pharmacists Impact Paper in Infectious Diseases Pharmacotherapy Award, and the University of Houston Faculty Leadership award. He is also a fellow of ASHP.

Dr. Garey's research interests involve clinical and translational research involving healthcare-associated infections including post-surgical infections, candidemia, and Clostridium difficile infection.
Ask the Experts: Key Considerations for Improving Patient Outcomes with Antimicrobial Stewardship Programs

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Edward J. Septimus, M.D., FACP, FIDSA, FSHEA, is Medical Director, Infection Prevention and Epidemiology at Hospital Corporation of America (HCA) and Professor of Internal Medicine at Texas A&M Health Science Center College of Medicine in Houston, Texas. He is also Professor, Distinguished Senior Fellow, at the George Mason University School of Public Health.

Dr. Septimus received his Bachelor of Science from The Ohio State University and his Doctor of Medicine degree from Baylor College of Medicine in Houston. He completed his postgraduate training in internal medicine and infectious diseases at Baylor College of Medicine in Houston and is board certified in both internal medicine and infectious diseases. He is fellow of the American College of Physicians, Infectious Diseases Society of America (IDSA), and Society for Healthcare Epidemiology of America (SHEA).

His practice interests include patient safety, infection prevention, antimicrobial stewardship and resistance, public health including vaccine preventable diseases, sepsis, medical informatics, clinical integration, and human factors engineering. Dr. Septimus has lectured nationally and internationally on surviving sepsis, reduction of healthcare-associated infections, antimicrobial stewardship, influenza, methicillin-resistant Staphylococcus aureus (MRSA), the economic case for quality, and employee health. He is Past President of the Texas Infectious Diseases Society and has served on the Board of Directors of the IDSA. He is on the IDSA Antimicrobial Resistance Committee, the SHEA Antimicrobial Stewardship Committee, and the IDSA Quality Measurement Committee. In 2011 he was appointed to the Healthcare-Associated Infections/Preventable Adverse Events Advisory Panel for the Texas Department of State Health Services. Dr. Septimus is also a member of the FDA Anti-Infective Drug Advisory Group and is co-chair of the National Quality Forum (NQF) Patient Safety Steering Committee.

Dr. Septimus has published over 100 peer-reviewed articles and book chapters. He was the first recipient of the IDSA Annual Clinician Award, received the John S. Dunn Sr. Outstanding Teacher Award in 2010, 2011, 2013 and 2014, and received the Clinical Excellence Award from HealthTrust in 2013.
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- The faculty and planners report no financial relationships relevant to this activity.
Disclosures

• All faculty and planners report no financial relationships relevant to this activity.

Learning Objectives

• Develop a plan to improve or expand antimicrobial stewardship program (ASP) initiatives based on approaching national mandates surrounding ASP.
• Recommend clinical interventions for initiating or expanding ASP programs.
• Provide specific examples of areas where pharmacists and ASPs have proven efficacy.

Background

• President’s Executive Order and National Strategy (Sep 2014)
• PCAST Report to the President (Sep 2014)
• National Action Plan for Combating Antibiotic-Resistant Bacteria (CARB) (Mar 2015)
Proposed Policy Changes

- Strengthen antibiotic stewardship in inpatient, outpatient, and long-term care settings
  - Alignment with CDC Core Elements
  - Compliance with Conditions of Participation and The Joint Commission (TJC) Accreditation requirements
- Implement annual reporting of antibiotic use in inpatient and outpatient settings and identify variation at geographic, provider, and patient levels
- Establish and improve antibiotic stewardship programs across all healthcare settings
- Reduce inappropriate antibiotic use by 50% in outpatient settings and 20% in inpatient settings
- Establish State Antibiotic Resistance (AR) Prevention (Protect) Programs in all 50 states

Core Elements for Antibiotic Stewardship Programs

- Leadership commitment from administration
- Single leader responsible for outcomes
- Single pharmacy leader
- Antibiotic use tracking
- Regular reporting on antibiotic use and resistance
- Educating providers on use and resistance
- Specific improvement interventions

Leadership Commitment

- There should be a formal expression of support for the stewardship program from the facility administration.
- Leadership must ensure that staff have necessary time, education/competencies and resources to implement the stewardship program.

Program Leadership

- There should be a designated leader of the antibiotic stewardship program.
- Physicians have proven very effective in this role.
  - Prescribing is a medical staff function
  - Often an ID physician, but others have filled this role, especially in hospitals with no ID physicians.
- Leadership by committee is not as effective.

Pharmacy Leadership

- Pharmacy leadership is consistently identified as a must for stewardship in hospitals.
- Pharmacists often play a lead role in implementing improvement interventions and monitoring antibiotic use. Should have some training in infectious diseases. (e.g. MAD-ID)
- Many programs are co-lead by a physician and pharmacist.
Question
What core element do you think has made the most difference?

a. Leadership commitment from administration.
b. Educating providers on use and resistance.
c. Single leader responsible for outcomes.
d. Regular reporting on antibiotic use and resistance.
e. All of the above.

Policy Changes continued

• Creation of a regional public health network for resistance testing
• Routine reporting of antibiotic use and resistance data to NHSN by 95% of Medicare-eligible hospitals, DOD, and VA healthcare facilities
• Enhance reporting infrastructure and provide incentives
  — Require reporting to NHSN as part of CMS IQR (inpatient quality report)
  — CDC has new measure SAAR (Standard Antimicrobial Administration Ratio)-NQF endorsed
• Add electronic reporting of antibiotic use and resistance data to Stage 3 Meaningful Use for EHR systems
• CDC and partners will submit an antibiotic utilization (AU) electronic clinical quality NHSN-reporting measure to NQF and CMS

NHSN AU Measure
Basic Metric is the Standardized Antimicrobial Administration Ratio (SAAR)

SAAR is an Observed-to-Expected (O-to-E) ratio

Observed antibacterial use – Days of therapy reported by a healthcare facility for a specified category of antimicrobial agents in a specified patient care location or group of locations

Expected antibacterial use – Days of therapy predicted on the basis of nationally aggregated AU data for a healthcare facility’s use of a specified category of antimicrobial agents in a specified patient care location or group of locations

NHSN AU Measure Proposal – Patient Care Locations

Measure proposal covers antimicrobial use in 6 specified groupings of adult and pediatric patient care locations:

1. Adult medical, surgical, and medical/surgical intensive care units
2. Adult medical, surgical, and medical/surgical wards
3. Pediatric medical, surgical, and medical/surgical intensive care units
4. Pediatric medical, surgical, and medical/surgical wards
5. All adult medical, medical/surgical, and surgical intensive care units and wards
6. All pediatric medical, medical/surgical, and surgical intensive care units and wards

Policy changes and ASP

• A LOT of attention is going to be paid to ASP in the coming years
• How should we implement these ASPs and affect change?
**ASP interventions and bundled approaches**

**Getting Started**
- Establish a core planning committee
  - Subcommittee of Pharmacy and Therapeutics (P&T) Committee?
  - Subcommittee of Infection Control Committee?
  - Other interested stakeholders
- 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 Chief Medical Officer (CMO) and/or key medical staff leadership
- Meet with VP for patient safety/quality
- Establish a working budget
- Write a strategic (business plan)-work with Chief Financial Officer (CFO)
- Meet with Chief Executive Officer (CEO)/Chief Operating Officer (COO) when above complete
- Present to key medical staff committees and get approval from the Executive Committee*

*Antimicrobial stewardship team should be physician directed or supervised

**Team success**
- “The ultimate difference between a company and its competition is, in fact, the ability to execute.”
  - Larry Bossidy

**Antimicrobial Management Team**

**ASP Foundation**
- Selecting Physician Champion
- Complete gap assessment and action plan as a team
- Determine staffing needs to adequately resource ASP activities
- Create competency/training plan for all disciplines based on current knowledge and involvement
- Invite CEO to ASP team meeting to discuss plan, resources, and support

The establishment of a well-supported, multidisciplinary ASP infrastructure ensures an ASP that is sustainably integrated into facility practices rather than dependent on a single person

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*Based on local resources


See page 20 for enlarged view
Antimicrobial Stewardship

Goals
- Improve patient outcomes
- Optimize selection, dose and duration of Rx
- Reduce adverse drug events including secondary infection (e.g., *C. difficile* infection)
- Reduce morbidity and mortality
- Limit emergence of antimicrobial resistance
- Reduce length of stay
- Reduce health care expenditures

How best can we achieve these goals?


Common Misconceptions

- If ID consultant approves or uses an antibiotic, it must be appropriate
- Retrospective data collection and analysis can result in change in behavior
- The adoption of information technology (IT) will automatically make data collection, analysis and change in behavior easy
- Restricting use of certain antibiotics will reduce antibiotic misuse and overuse

Antimicrobial Stewardship Framework


Measurement

Clinical
- Length of stay
- Clinical cure/failure rates
- Readmission rates (30 days)
- Resistance rates
- Infection-related mortality
- C. * difficile* infections

Process
- Dose optimization
- Adherence to hospital specific guidelines
- Appropriate de-escalation/remediation
- Appropriation of therapy
- Culture before antibiotics

Outcomes

Humanistic
- Adverse drug events avoided
- Time to receipt of appropriate antimicrobial
- Duration of antimicrobial therapy
- IV/P O conversion rates
- Inpatient intravenous therapy rates

Economic
- Antimicrobial utilization (DDD or DDI)
- Hospital wide antimicrobial expenditures
- Relative consumption
- Rate of institution antimicrobial use
- Nontherapeutic agents avoided

Challenges

- Literature often not clear in Infectious Disease
- Everyone thinks they know how to use antibiotics
- Providers perceive autonomy is lost
- Medicolegal implications of responsibility for patients
- Difficulty proving impact of program (without national measures)
- Financial pressures dictating decisions
  - Pharmaceutical manufacturers
  - Hospitals
  - Payers (insurance companies/Centers for Medicare & Medicaid Services [CMS])
  - Patients
The Challenge

- How to initiate and improve antibiotic stewardship efforts
- Proving that it works
  - Clinical outcomes
  - Decrease resistance
- Changing the antibiotic prescribing culture
- Hardwiring the process
- Continuing to show financial benefit to maintain funding and support of efforts

Physician Barriers

- Physician accountability and acceptance of need for improvement
- Misperceptions
- Misalignment of incentives
- Lack of definition of appropriate use of antimicrobial agents
- Lack of standardized, risk‐adjusted measures
- Adaptive/behavioral changes needed to change prescribing practices

Changing Prescriber Behavior

- Engagement of senior physician leadership (clinical and administrative) is critical
- Address stewardship message to the clinical leadership within existing clinical groups (rather than just the trainees or the ID doctors) physician to physician
- ID should not be excluded from stewardship process
- Understand local culture and patient population

The Approach to the Problem Prescriber

- Carefully plan your approach:
  - Pick your battles
  - Timing is important
  - Want home field advantage
  - Avoid heat of the moment confrontations (generate light not heat)
- Do your homework
  - Gather as much data as possible
    - DUE: Service and physician specific for several drugs
    - Interview Clinical PharmDs and discreetly other MDs
    - Discuss with CMO/Chief of staff
  - Understand the MD’s Practice and Patient Population
  - Look into the MD’s own professional literature

IDSA/SHEA Antimicrobial Stewardship Guidelines

- A multidisciplinary ASP team should include an ID physician and pharmacist and other key stakeholders as determined by the institution
- Two core strategies were recommended
  - Prospective audit with intervention and feedback
  - Formulary restriction and preauthorization
- Other recommended strategies
  - Education
  - Guidelines and clinical pathways
  - Order forms
  - De-escalation
  - Dose optimization
  - IV to PO conversion

Antibiotic Time Out

- Trigger tool to stop and reassess antibiotic therapy
- Targeted at all providers for Med/Surg patients
- Guided assessment at 72 hr
- Treatment duration recommendations included for key infections
De-escalation of Therapy

- **Advantages**
  - Allows initial use of broad-spectrum therapy
  - Narrows therapy when appropriate
  - May influence future prescribing behavior
  - Decreases inappropriate use of antimicrobials
  - Reduces adverse events
  - May save money overall

- **Disadvantages**
  - Prescribers may be reluctant to change therapy if the patient is doing well
  - If not done correctly, may narrow therapy “inappropriately”

De-escalation: Lessons learned

The most common reasons for not de-escalating:
- Lack of conclusive microbiology results
  - Continued use of broad-spectrum antimicrobial therapy
- Diagnostic uncertainty
  - Treatment of fever, colonization and/or contamination
- Insecurity
  - Treatment of noninfectious syndrome associated with fever
- Duration longer than necessary

Microbiology Stewardship

**Obtain Cultures Prior to Starting Antibiotics!**

- Develop a process to ensure cultures are properly and consistently ordered
- Develop a process to ensure cultures are properly and consistently obtained
- Develop processes to ensure cultures are properly and promptly transported and processed
- Develop standards for and assess reliability of processes for ordering and obtaining a culture

Case

- 64 y/o female admitted for weakness, fever, incontinence, and syncope. 10 days PTA patient was seen by local MD for flank pain and dysuria. She was diagnosed with probable pyelonephritis and started on PO ciprofloxacin. Over the week she became weaker, had decreased appetite, and developed fever. She was triaged on 8-17 at 1900
- PMH of recurrent UTIs—last hospitalized 6 months earlier with pyelonephritis. She has DM, HTN, and hyperlipidemia (HLD)

Case continued

- On admission she was hypotensive with BP 60/40 mm Hg, T-101°F, Pulse 140, RR 24, weight 60 kg
  - HEENT normal
  - Lungs CTA, no murmur
  - Left sided CVA tenderness, BS+
  - Neuro intact
- Laboratory
  - WBC 21,000/µL, GCS 12, platelets 274,000/µL, HB 8.5 g/dL
  - PT/PTT 24.6/51.7
  - Creatinine 6.2 mg/dL (was 1.2 mg/dL 6 months ago), HCO3 16 mmol/L, HCT 37%
  - u/a pyuria and bacteriuria, nitrite negative, negative ketones
  - ALT 28 U/L, alb 2 g/dL, lactate 4 mg/dL, glucose 48 mg/dL
- Imaging
  - COR clear
**Question**

What antimicrobial would you prescribe?

a. Aminoglycoside.
b. Broad-spectrum cephalosporin.
c. Carbapenem.
d. Fluoroquinolone.
e. None of the above.

**Case: And now the rest of the story**

- First 8 hours:
  - Given 2 liters in first hour still hypotensive and norepinephrine was started
  - Blood cultures drawn 2120 on 8-17
  - Urine culture sent 2150 on 8-17
  - Ciprofloxacin given at 2130 on 8-17
  - Repeat glucose 127 mg/dL, plat ↓ 83,000, WBC ↓ 9900
  - Lactate 4 → 7.6 → 15.9 mg/dL
  - Platelet 83,000 → 45,000 → 13,000/µL
  - ALT 57 → 2518 U/L
- Blood and urine *E. coli* R-amp, amp/sulb, fluoroquinolones (FQ) at 48 hours

**Risk Factors for FQ Resistance**

- Hospitalization in previous 12 months OR
- FQ use in previous 12 months OR
- Prior documented FQ-resistant organism

**Key Takeaways**

- CMS and TJC are developing guidance for accreditation related to demonstrating an effective ASP, including developing publicly reportable measures
- Antimicrobial resistance is an urgent public health and patent safety concern
- Know your local epidemiology
- All stakeholders need to be engaged across the continuum of care, including consumers

**CE IN THE MIDDAY**

What is the best use of pharmacists for ASP activities?

**Kevin W. Garey, Pharm.D., M.S., FASHP**

Professor and Chair
Department of Pharmacy Practice and Translational Research
University of Houston College of Pharmacy
Houston, Texas

A pessimist sees the difficulty in every opportunity, an optimist sees the opportunity in every difficulty

Winston Churchill
There is without a doubt going to be a lot of attention paid to antimicrobial stewardship!

Pros and Cons of both approaches

1. Lots of personnel (interventions)
2. Usually not specially trained High-level interventions may not be possible
3. Continuous education of new personnel

1. Limited number of personnel (limited interventions)
2. Usually specially trained (PGY2/3)
3. High-level interventions possible

So, I just hired my superhero, new ID pharmacist. What should they do?

• You should take inspiration from James Bond, of course

The United Kingdom was very serious about controlling MRSA and CDI during the last decade

• Mandatory reporting of MRSA and CDI rates with financial penalties
• 12 million pound investment in pharmacy to monitor and control anti-infectives
• 77% reduction in CDI cases (41% reduction in MRSA infections)
• How did they spend this money?
  – Pharmacy personnel!!

UK Antimicrobial resistance strategy

<table>
<thead>
<tr>
<th>Number</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Better access to and use of surveillance data</td>
</tr>
<tr>
<td>2</td>
<td>Optimizing prescribing practice</td>
</tr>
<tr>
<td>3</td>
<td>Improving infection prevention and control</td>
</tr>
<tr>
<td>4</td>
<td>Improving professional education, training, and public engagement</td>
</tr>
<tr>
<td>5</td>
<td>Improving the evidence base through research</td>
</tr>
<tr>
<td>6</td>
<td>Developing new drugs, vaccines, and diagnostics</td>
</tr>
<tr>
<td>7</td>
<td>Strengthening UK and international collaborations</td>
</tr>
</tbody>
</table>

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Ok, I can model my ID Pharm.D. off of the UK model. What evidence exists in the U.S. that the superstar ID Pharm.D. is worth the money?

Multicenter study recommending discontinuation of inappropriate antibiotics

Why did intervention work at some hospitals but not others?

However, let’s not totally drink this Kool-aid! Still lots of work to be done:

Qualitative study of 19 Australian pharmacists with ASP activities

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme</th>
</tr>
</thead>
</table>
| Attitudes toward significance of antibiotic use in hospitals and the threat of resistance | Divergent views on significance of antibiotic use and resistance  
Optimising antibiotics relatively low priority in day to day work flow |
| Capacity for pharmacy to influence is limited | Divergent perspectives on pharmacy’s responsibilities  
Lack of capacity to enforce given prescribing power of others |
| Inter-professional and organizational barriers to enact change | Junior prescribers present, senior prescriber advisors not |

<table>
<thead>
<tr>
<th>N</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evidence-based prescribing guidelines and prescribing policies (use technology, smartphone ‘apps’, others)</td>
</tr>
<tr>
<td>2</td>
<td>Education (prescribers, pharmacy and nursing staff). Mandatory induction training for all staff</td>
</tr>
<tr>
<td>3</td>
<td>Providing a clinical advice service (pager or app) and input on multidisciplinary infection ward rounds</td>
</tr>
<tr>
<td>4</td>
<td>Advising on therapeutic drug monitoring for antimicrobials</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and feedback of trends in antimicrobial prescribing to clinical teams and governance structures</td>
</tr>
<tr>
<td>6</td>
<td>Managing entry of new antimicrobials onto hospital formularies</td>
</tr>
<tr>
<td>7</td>
<td>Clinical research both in drug registration studies and consolidating the evidence base around antimicrobial stewardship</td>
</tr>
</tbody>
</table>

Approximately one Full-Time-ASP pharmacist per 774 inpatient beds (approximately 3% of all pharmacists)
My hospital has not invested in an ASP pharmacist. What should I do?

My advice: Bundle!

ASP Bundles

- Every good intervention needs a champion.
- Without the ID champion in pharmacy, you will need to find your champion outside the pharmacy department most likely!
- A bundle that includes infection control / infectious diseases / environmental services could provide you with that champion.


Clinical studies examining CDI bundles

<table>
<thead>
<tr>
<th>Study</th>
<th>CDI setting</th>
<th>Population</th>
<th>Control bundle</th>
<th>Effect size (before/after)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bishop 2013</td>
<td>Endemic</td>
<td>Surgical inpatients (17,145)</td>
<td>Resident rounding, hand hygiene, stop PPI, ASP</td>
<td>2.8/1,000 pd</td>
</tr>
<tr>
<td>Kall, 2013</td>
<td>Endemic</td>
<td>Adult inpatients (14,591)</td>
<td>Contact precautions, hand hygiene, isolation, environmental cleaning</td>
<td>3/10,000 hosp</td>
</tr>
<tr>
<td>Abbott, 2014</td>
<td>Endemic</td>
<td>Adult inpatients (811)</td>
<td>Contact precautions, hand hygiene, EVS, vancomycin for Rx</td>
<td>1.1/1,000 pd</td>
</tr>
<tr>
<td>Salgado, 2014</td>
<td>Epidemic</td>
<td>Adult inpatients</td>
<td>Contact precautions, EVS, hand hygiene</td>
<td>1.8/1,000 pd</td>
</tr>
<tr>
<td>Weiss, 2015</td>
<td>Epidemic</td>
<td>Adult inpatients</td>
<td>EVS, contact isolation, ASP</td>
<td>37.3/1,000 pd</td>
</tr>
<tr>
<td>Muto 2016</td>
<td>Epidemic</td>
<td>Adult inpatients</td>
<td>EVS hand hygiene, contact isolation, ASP</td>
<td>7.2/1,000 pd</td>
</tr>
</tbody>
</table>

*PPI=proton pump inhibitor, EVS=Environmental services


A lot of studies have investigated CDI rates after an intervention to control anti-infectives

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Stewardship method</th>
<th>*Post-intervention</th>
<th>*Post-intervention</th>
<th>Reduction in CDI rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>US</td>
<td>Restrictive use</td>
<td>15.8</td>
<td>1.9</td>
<td>88%</td>
</tr>
<tr>
<td>1997</td>
<td>UK</td>
<td>Restrictive use</td>
<td>5.3</td>
<td>2.3</td>
<td>57%</td>
</tr>
<tr>
<td>1998</td>
<td>US</td>
<td>Restrictive use</td>
<td>11.5</td>
<td>3.3</td>
<td>71%</td>
</tr>
<tr>
<td>2003</td>
<td>UK</td>
<td>Restrictive use</td>
<td>14.6</td>
<td>3.4</td>
<td>77%</td>
</tr>
<tr>
<td>2003</td>
<td>US</td>
<td>Prospective audit and feedback</td>
<td>2.2</td>
<td>0.3</td>
<td>86%</td>
</tr>
<tr>
<td>2004</td>
<td>UK</td>
<td>Restrictive use</td>
<td>46</td>
<td>22</td>
<td>52%</td>
</tr>
<tr>
<td>2004</td>
<td>US</td>
<td>Restrictive use</td>
<td>1.32</td>
<td>0.54</td>
<td>61%</td>
</tr>
<tr>
<td>2007</td>
<td>UK</td>
<td>Prospective audit and feedback</td>
<td>NR</td>
<td>NR</td>
<td>65%</td>
</tr>
<tr>
<td>2007</td>
<td>Canada</td>
<td>Restrictive use</td>
<td>2.03</td>
<td>0.82</td>
<td>60%</td>
</tr>
<tr>
<td>2011</td>
<td>UK</td>
<td>Restrictive use</td>
<td>2.22</td>
<td>0.45</td>
<td>80%</td>
</tr>
<tr>
<td>2012</td>
<td>Canada</td>
<td>Prospective audit and feedback</td>
<td>1.12</td>
<td>0.71</td>
<td>37%</td>
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<tr>
<td>2013</td>
<td>UK</td>
<td>Restrictive use</td>
<td>2.4</td>
<td>1.2</td>
<td>50%</td>
</tr>
</tbody>
</table>

*Rate per 10,000 patients day


Which method should I choose to control antimicrobial use in my institution?

Methods to control antimicrobial use

- Restrictive use (formulary control)
- Prospective audit and feedback

- Somewhat draconian but takes less person-power
- Any evidence to suggest it is better?

**Meta-analysis of ASP and CDI**

16 quasi-experimental or observational studies to assess relative reduction in CDI rates after implementation of an ASP

<table>
<thead>
<tr>
<th>Relative reduction in CDI rates</th>
<th>ASP</th>
<th>Geriatric specific</th>
<th>Restrictive ASP</th>
<th>Audit and feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk ratio</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Upper 95% CI</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lower 95% CI</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>


**When in doubt, go with a bundle!**

- Task force on the management of *Acinetobacter baumannii* infection in the ICU
  - Healthcare worker (HCW) task force (microbiology, ID, and ICU) to diagnose and treat Acinetobacter baumannii
- Infectious disease specialist guided ASP
  - HCW task force (guided by ID specialist) reviewed all patients given antibiotics twice weekly
- ASP-led intervention for *Staphylococcus aureus* bacteremia
  - ASP-driven comprehensive care bundle reduced re-admission rates

Nguyen CT et al. Antimicrob Chemother. 2015 Sep 3; pii: dkv256. [Epub ahead of print]

**However, more and more I think hospitals are going to have both!**

![Image of warning sign]

**Contents extremely awesome**

**Pharmacists don’t have to do all the same thing!**

Evaluation of 290 cases of parenteral antibiotic use from two hospitals that used different ID models

- Infectious disease pharmacist
- Geographic model pharmacist

<table>
<thead>
<tr>
<th>Patient % of Cases</th>
<th>Empiric therapy adhered to local guidelines</th>
<th>Therapy modified within 24 hr if possible</th>
<th>Antibiotics DC’d if not needed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remember though: Geographic model RPh will generally outnumber ID RPh by 97:3. I would have geographic RPh evaluate empiric therapy and ID RPh DC antibiotics that were not needed!


**Including pharmacy generalists in ASP care bundles leads to good outcomes**

Six-month, prospective study of 286 patients before and after a prospective audit and feedback by pharmacy generalists trained in ASP by an ID specialist.

<table>
<thead>
<tr>
<th>Percent patients</th>
<th>Control months</th>
<th>ASP bundle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of bundle</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Documentation of indications</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Guideline-preferred empiric therapy</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>


**I’m new to the ASP initiatives**

- Is there a checklist I can use to help guide my set-up?
Everyone needs to be involved in ASP

<table>
<thead>
<tr>
<th>Rule description</th>
<th>Application</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find sound innovations</td>
<td>If your stewardship team is the ‘early innovators’, give them the resources to make good decisions.</td>
<td></td>
</tr>
<tr>
<td>Find and support innovators</td>
<td>Provide time and resources for innovators to seek out new ideas (travel, professional meetings). Remember, innovators may not be the easiest individuals to deal with.</td>
<td></td>
</tr>
<tr>
<td>Invest in early adopters</td>
<td>This will usually be your ID physician and pharmacist champions.</td>
<td></td>
</tr>
<tr>
<td>Make early adopter activity observable</td>
<td>This is better done through a social network than formal processes (curbside consult).</td>
<td></td>
</tr>
<tr>
<td>Trust and enable reinvention</td>
<td>All innovations will require new local processes requiring reinvention of the innovation.</td>
<td></td>
</tr>
<tr>
<td>Create slack for change</td>
<td>Adoption requires energy. Make sure you give your innovation enough time to disseminate.</td>
<td></td>
</tr>
<tr>
<td>Lead by example</td>
<td>Leaders must be prepared to begin change with themselves.</td>
<td></td>
</tr>
</tbody>
</table>

Print this out for your next ASP intervention and fill in the blanks

<table>
<thead>
<tr>
<th>Rule #</th>
<th>Rule description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Find sound innovations</td>
<td>If your stewardship team is the ‘early innovators’, give them the resources to make good decisions.</td>
</tr>
<tr>
<td>2</td>
<td>Find and support innovators</td>
<td>Provide time and resources for innovators to seek out new ideas (travel, professional meetings). Remember, innovators may not be the easiest individuals to deal with.</td>
</tr>
<tr>
<td>3</td>
<td>Invest in early adopters</td>
<td>This will usually be your ID physician and pharmacist champions.</td>
</tr>
<tr>
<td>4</td>
<td>Make early adopter activity observable</td>
<td>This is better done through a social network than formal processes (curbside consult).</td>
</tr>
<tr>
<td>5</td>
<td>Trust and enable reinvention</td>
<td>All innovations will require new local processes requiring reinvention of the innovation.</td>
</tr>
<tr>
<td>6</td>
<td>Create slack for change</td>
<td>Adoption requires energy. Make sure you give your innovation enough time to disseminate.</td>
</tr>
<tr>
<td>7</td>
<td>Lead by example</td>
<td>Leaders must be prepared to begin change with themselves.</td>
</tr>
</tbody>
</table>

Let’s start wrapping this up!

- Antimicrobial stewardship programs are going to get more and more attention
  - Maybe not as much money as the UK but likely just as much attention
- Regardless of generalist vs. specialist pharmacy practice model, multiple interventions will work
  - Ideally, best results use specialists and generalists
- Use a ASP checklist and multidisciplinary approach to assure success
Key Takeaways

• The highest levels of government have shined the spotlight on ASP
  – This will affect boots on the ground pharmacists
• Use the practice model that works best for you to get best results!
• Get the best use of your ASP by engaging in a multidisciplinary approach
Antimicrobial Management Team

Multidisciplinary Team Approach to Optimizing Clinical Outcomes*

Hospital Epidemiologist
Hospital and Nursing Administrator
Infectious Diseases
Infection Prevention
Medical Information Systems
Microbiology Laboratory
Clinical Pharmacy Specialists
ASD Directors
- Clinical Pharmacist
- Physician Champion
Decentralized Pharmacy Specialist
Director Quality Case Management
Chair, P&T Committee
Partners in Optimizing Antimicrobial use such as hospitalists, intensivists, ED, and surgeons

*based on local resources


Clinical studies examining CDI bundles

<table>
<thead>
<tr>
<th>Study</th>
<th>CDI setting</th>
<th>Population</th>
<th>Control bundle</th>
<th>Effect size (Before/after)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bishop</td>
<td>Endemic</td>
<td>Surgical inpatients (17,145)</td>
<td>Resident rounding, hand hygiene, stop PPI, ASP</td>
<td>2.8/1000 pd 1.8/1,000 pd</td>
</tr>
<tr>
<td>Koll, 2013</td>
<td>Endemic</td>
<td>Adult inpatients (14,591)</td>
<td>Contact precautions, hand hygiene, isolation, environmental cleaning</td>
<td>12/10,000 hosp 8/10,000 hosp</td>
</tr>
<tr>
<td>Abbott, 2009</td>
<td>Endemic</td>
<td>Adult inpatients (881)</td>
<td>Contact precautions, hand hygiene, EVS, vancomycin for Rx</td>
<td>1.1/1000 pd 0.66/1000 pd</td>
</tr>
<tr>
<td>Salgado, 2009</td>
<td>Epidemic</td>
<td>Adult inpatients</td>
<td>Contact precautions, EVS, hand hygiene</td>
<td>1.8/1000 pd 1.2/1000 pd</td>
</tr>
<tr>
<td>Weiss, 2009</td>
<td>Epidemic</td>
<td>Adult inpatients</td>
<td>EVS, contact isolation, ASP</td>
<td>37.3/1000 pd 14.5/1000 pd</td>
</tr>
<tr>
<td>Muto 2007</td>
<td>Epidemic</td>
<td>Adult inpatients</td>
<td>EVS hand hygiene, contact isolation, ASP</td>
<td>7.2/1000 pd 3.0/1000 pd</td>
</tr>
</tbody>
</table>

PPI=proton pump inhibitor; EVS=Environmental services

A lot of studies have investigated CDI rates after an intervention to control anti-infectives

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Stewardship method</th>
<th>*Pre-intervention</th>
<th>*Post-intervention</th>
<th>Reduction in CDI rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>US</td>
<td>Restrictive use</td>
<td>15.8</td>
<td>1.9</td>
<td>88%</td>
</tr>
<tr>
<td>1997</td>
<td>UK</td>
<td>Restrictive use</td>
<td>5.3</td>
<td>2.3</td>
<td>57%</td>
</tr>
<tr>
<td>1998</td>
<td>US</td>
<td>Restrictive use</td>
<td>11.5</td>
<td>3.3</td>
<td>71%</td>
</tr>
<tr>
<td>2003</td>
<td>UK</td>
<td>Restrictive use</td>
<td>14.6</td>
<td>3.4</td>
<td>77%</td>
</tr>
<tr>
<td>2003</td>
<td>US</td>
<td>Prospective audit and feedback</td>
<td>2.2</td>
<td>0.3</td>
<td>86%</td>
</tr>
<tr>
<td>2004</td>
<td>UK</td>
<td>Restrictive use</td>
<td>46</td>
<td>22</td>
<td>52%</td>
</tr>
<tr>
<td>2004</td>
<td>US</td>
<td>Restrictive use</td>
<td>1.32</td>
<td>0.51</td>
<td>61%</td>
</tr>
<tr>
<td>2007</td>
<td>UK</td>
<td>Prospective audit and feedback</td>
<td>NR</td>
<td>NR</td>
<td>65%</td>
</tr>
<tr>
<td>2007</td>
<td>Canada</td>
<td>Restrictive use</td>
<td>2.03</td>
<td>0.82</td>
<td>60%</td>
</tr>
<tr>
<td>2011</td>
<td>UK</td>
<td>Restrictive use</td>
<td>2.22</td>
<td>0.45</td>
<td>80%</td>
</tr>
<tr>
<td>2012</td>
<td>Canada</td>
<td>Prospective audit and feedback</td>
<td>1.12</td>
<td>0.71</td>
<td>37%</td>
</tr>
<tr>
<td>2013</td>
<td>UK</td>
<td>Restrictive use</td>
<td>2.4</td>
<td>1.2</td>
<td>50%</td>
</tr>
</tbody>
</table>

*Rate per 10,000 patients day

Self-assessment Questions

1. The most important goal for antimicrobial stewardship is to:
   a. Save money.
   b. Reduce length of stay.
   c. Reduce antimicrobial resistance.
   d. Improve patient outcomes.

2. Which of the following is the least effective intervention for improving antimicrobial use?
   a. Dose optimization.
   b. Prospective audit and feedback.
   c. Education.
   d. Clinical pathways and guidelines.

3. The advantage of de-escalation includes all EXCEPT
   a. Influence prescriber behavior.
   b. Decreases inappropriate use of broad spectrum antibiotics.
   c. May narrow therapy inappropriately.
   d. Reduces adverse events.

Answers
1. d
2. c
3. c