

Implementing Change in Antimicrobial Stewardship Programs: Focus on Time to Effective Therapy, Asymptomatic Bacteriuria in the Emergency Department, and Pneumonia Risk Assessment

On-demand Activity

Based on virtual posters by participants in the MENTORED QUALITY IMPROVEMENT IMPACT PROGRAMSM: Accelerating Antimicrobial Stewardship Activities

www.teamasp.org



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Sponsored by the American Society of Health-System Pharmacists (ASHP).

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Content (90 minutes)*

Interview with Team Members from Shelby Baptist Medical Center (Alabaster, Alabama): Time to Effective Therapy for *C. Difficile* Infection

Interview with Team Members from St. Mary Medical Center (Langhorne, Pennsylvania): Overtreatment of Asymptomatic Bacteriuria in the Emergency Department

Interview with Team Members from Froedtert Hospital (Milwaukee, Wisconsin): Algorithm for Pneumonia Risk Assessment

Reflections about Your Stewardship Program

*Allow additional time to complete the assessment test, evaluation, and optional discussion board.

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- Dr. Karam declares that he has received honoraria from Cubist Pharmaceuticals and Merck & Co., Inc. and has served as a consultant for Merck & Co., Inc.
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Activity Overview

This educational activity provides insight into the interprofessional quality improvement efforts in antimicrobial stewardship undertaken as part of the MENTORED QUALITY IMPROVEMENT IMPACT PROGRAMSM: Accelerating Antimicrobial Stewardship Activities at three institutions across the United States.

Learning Objectives

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

- Outline process improvements seen in antimicrobial stewardship programs.
- Identify common barriers to implementing change in antimicrobial stewardship programs.
- Evaluate outcomes resulting from changes in antimicrobial stewardship programs.

To Learn More...

Part One of this Series Features Virtual Poster Interviews with Three Additional Teams that Completed the MENTORED QUALITY IMPROVEMENT IMPACT PROGRAMSM

- Featured topics
 - Adoption of New Laboratory Procedures
 - Reducing the Time to Effective Therapy
 - Reducing the Incidence of *C. difficile* Infection
- 1.5 hours CE

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Continuing Education Accreditation

Release Date: February 19, 2016

Expiration Date: August 18, 2017

Activity Type: Application-based

CE Credits: 1.5 hours, no partial credit for pharmacists, nurses, and nurse practitioners

Activity Fee: Free of charge

For Pharmacists



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ACPE activity # 0204-0000-16-422-H01-P

For Physicians



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For Nurse Practitioners

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Educational Review Systems is also approved for nursing continuing education by the state of California, the state of Florida and the District of Columbia.

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For Physician Assistants

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Accelerating Antimicrobial
STEWARDSHIP PROGRAMS



**ASHP Antimicrobial Stewardship
Mentored Impact Program: Time to
effective antimicrobial therapy**

Greg Bradford, PharmD
Clinical Pharmacy Specialist
Shelby Baptist Medical Center
Alabaster, Alabama

Shelby Baptist Medical Center

- One of a 4-hospital System
- 252-bed acute care
 - Cardiology
 - Obstetrics/gynecology
 - Orthopedics
 - Neurology
 - Psychiatry (adult, geriatric)
 - Urology
 - Gastroenterology
 - Specialized medical/ surgical care
- Emergency Services
- Long Term Acute Care Hospital

Antimicrobial Stewardship Team

- Team Leaders: Amy Clark, PharmD, BCPS (until June 2015)
Greg Bradford, PharmD
- Team Members
 - Leland Allen, MD: Infectious Diseases Physician (Epidemiology)
 - Susan Blumstein, MT, CIC, CPHQ, MHA: Infection Prevention Manager (Epidemiology)
 - Michelle Waller, MT, SM: Microbiology Specialist
 - Mukesh Patel, MD: Health System Infectious Diseases Physician
 - Carin Rutland, PharmD: Director of Pharmacy
 - Lori Quinn, RHIA, MSHA: Director of Quality
 - Susan Bria, BSN: Director of Nursing
 - Chris Davis, MD, MSML: Chief Medical Information Officer

**Time to Effective Antimicrobial Therapy:
Description of Problem**

- Known increase in mortality with every passing hour in which antibiotic therapy is delayed in septic patients
- Known time delay from diagnosis of an infection to administration of first antibiotic dose. "Timely" is defined as:
 - Within 1 hour for septic patients
 - Within 2 hours for other patients
- Staff unawareness of the urgency of getting the first dose to the patient

**Time to Effective Antimicrobial Therapy:
Process Change**

- Nursing education on timeliness of antibiotics performed on select units with results measured at 6-months and 1-year after baseline
- Code Sepsis team implemented within past six months
 - Automated alert triggered for patients triaged in the emergency department (ED)
 - Page sent to team members, including pharmacists, upon official diagnosis of sepsis

**Time to Effective Antimicrobial Therapy:
Results**

Baseline data

- Median time to antibiotic administration
 - Sepsis: 76 minutes
 - Non-sepsis: 63 minutes
- Number of patients receiving timely antibiotics
 - Sepsis: 19 of 43 (44%)
 - Non-sepsis: 23 of 32 (72%)

Time to Effective Antimicrobial Therapy: All Patients (Sepsis and Non-Sepsis)

	Combined Data Across All Areas			Medical Intensive Care Unit			Intermediate Care			3 East (Med/Surg area)		
	Patients	Timely	Effective Delivery	Patients	Timely	Effective Delivery	Patients	Timely	Effective Delivery	Patients	Timely	Effective Delivery
Baseline	75	56%	49%	25	40%	32%	25	44%	40%	25	84%	76%
Period 1	75	69%	57%	25	56%	44%	25	76%	56%	25	76%	72%
Period 2	75	84%	76%	25	80%	72%	25	84%	72%	25	88%	84%

Timely = within 1 hour for septic patients and 2 hours for other patients.

Effective delivery = timely and gram negative coverage hung first (or only one antimicrobial or no antimicrobial with gram negative coverage).

Median Time to Antimicrobial Administration

	Patients with Sepsis		Patients without Sepsis	
	No. Patients	Median Time (min)	No. Patients	Median Time (min)
Baseline	43	76	32	63
Period 1	30	54	45	60
Period 2	20	49	55	42

Time to Effective Antimicrobial Therapy: Patients with Sepsis

	Combined Data Across All Areas			Medical Intensive Care Unit			Intermediate Care			3 East (Med/Surg area)		
	Patients	Timely	Effective Delivery	Patients	Timely	Effective Delivery	Patients	Timely	Effective Delivery	Patients	Timely	Effective Delivery
Baseline	43	44%	33%	23	39%	30%	15	33%	27%	5	100%	60%
Period 1	30	53%	33%	16	38%	31%	10	70%	30%	4	75%	50%
Period 2	20	60%	45%	12	58%	50%	8	62%	38%	0	--	--

• Overall, the timeliness and effective delivery of antimicrobials in septic patients improved during the 12-month study period

• A "code sepsis" program has been recently implemented with goal of improving the percentage of septic patients receiving timely and effective antimicrobial therapy

Time to Effective Antimicrobial Therapy: Barriers and Lessons Learned

• Barriers

- Limited i.v. access combined with extended-infusion protocol for select antibiotics challenged "timely" administration
- Nurse to patient ratio

• Lessons Learned

- There is a need to reinforce the importance of "effective delivery" in the treatment of infection
- Identifying source and type of infection is key in determining which antibiotic should take priority in a patient with limited i.v. access

Time to Effective Antimicrobial Therapy: Next Steps

- Expand education to **all** nursing units on the timeliness of first dose of antibiotic
- Re-evaluate extended-infusion antibiotic administration in cases where there is limited access
- Plan to assess the impact of Code Sepsis on timeliness of antibiotic administration

Mentored Impact Program: Participation Results

- Heightened awareness of the positive impact created by an antimicrobial stewardship program
- Increased visibility of stewardship efforts across our 4-hospital system
- Created ongoing monitoring of CDI rates as a measure of appropriate antimicrobial use
- Identified need to expand education on the timeliness of first dose of antibiotic to all patient care areas
- Discovered inappropriate usage of fluoroquinolones in emergency department
- Recognized need to perpetually review order sets containing acid-suppressive therapies

Overall: Barriers and Lessons Learned

- Barriers

- Momentum lost after mentoring program completion due to:
 - Antimicrobial Stewardship Pharmacist leaving
 - Infectious Disease Physician left and new group starting
- Continuing education among the many disciplines
- Antibiotic shortages disrupting compliance with formulary

- Lessons Learned


- Additional time will need to be carved out for the pharmacist responsible for ASP
- Opportunities exist to impact antimicrobial prescribing in the ambulatory setting

Shelby Baptist Medical Center found differences in time to antibiotic administration between patients with and without sepsis. Following the implementation of process changes, the median time to antimicrobial administration appeared to improve for both patient groups. Similarly, Hospital ABC would like to raise staff awareness of the importance of timely and effective delivery of antimicrobial therapy.

Based on the results at Shelby Baptist Medical Center, which of the following might Hospital ABC consider implementing?

- a. Develop a Code Sepsis process to respond to patients with suspected sepsis admitted from the emergency department.
- b. Institute a formal education series on appropriate antibiotic therapy for all rounding hospitalists.
- c. Initiate an information technology (IT) project to automate alerts from the microbiology lab to the pharmacy.
- d. Expand the first-dose antibiotic options available to nurses on each unit.

Accelerating Antimicrobial



STEWARDSHIP PROGRAMS


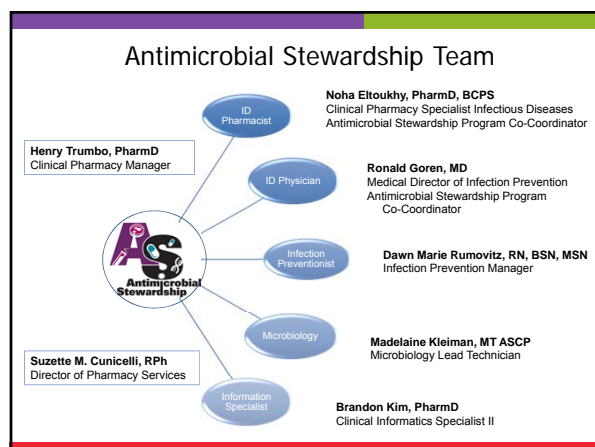
ASHP Antimicrobial Stewardship
Mentored Impact Program:
Adoption and routine use of processes known to
reduce antimicrobial resistance

St. Mary Medical Center
Langhorne, Pennsylvania

Team Leader
Noha Eltoukhy, PharmD, BCPS
Clinical Pharmacy Specialist Infectious Diseases

St. Mary Medical Center

- Level II Trauma Center
- Community, non-teaching hospital
- 373 licensed beds
- Centers of excellence
 - Heart and Vascular
 - Regional Cancer Center
 - ED/Trauma
 - Orthopedic

Antimicrobial Stewardship at SMMC

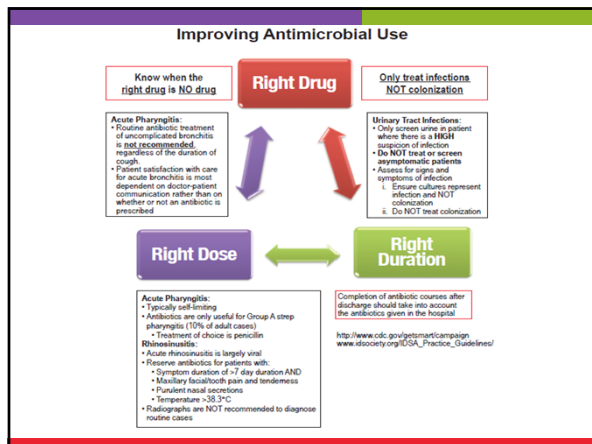
- Prospective audit and feedback
 - No formal antimicrobial restrictions
 - Utilize clinical decision support
 - Minimum of three times weekly
- Subcommittee to the P&T committee
- Provide education, protocols, policies, guidelines, and yearly antibiograms

Adoption and Routine Use of Processes
Known to Reduce Antimicrobial
Resistance: Statement of Problem

- Overtreatment of asymptomatic bacteriuria secondary to
 - Ease of obtaining urinary studies
 - Diagnostic nature of the Emergency Department
 - Fear of missing diagnosis
 - Lack of differentiation between active infection and colonization/contamination

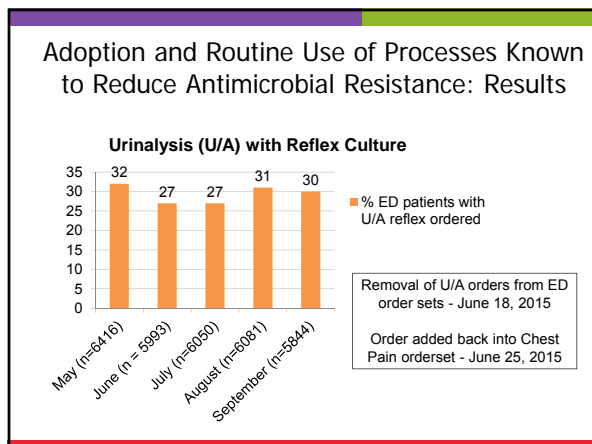
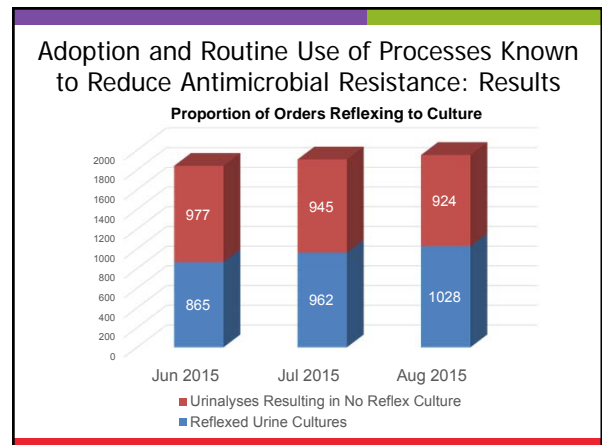
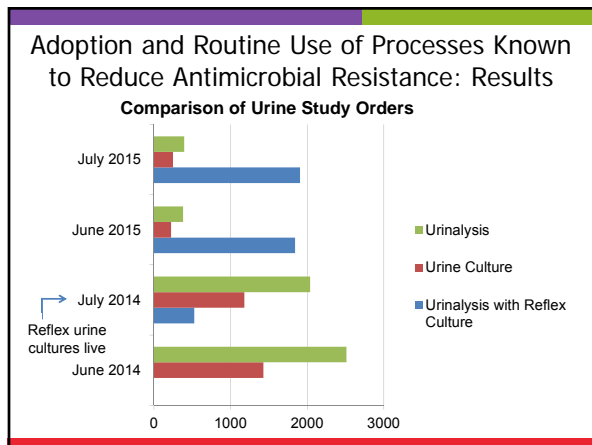
Adoption and Routine Use of Processes
Known to Reduce Antimicrobial Resistance:
Process Change

- Reflex urine cultures (July 2014)
- Distribution and electronic posting of antibiogram pocket guides (May 2015)
 - Pearls on improving antimicrobial use
- Alteration of Emergency Department order sets and protocols (June 2015)



Adoption and Routine Use of Processes Known to Reduce Antimicrobial Resistance: Process Change

- Education
 - Committee meetings
 - Emergency medicine
 - Internal medicine
 - Nurse practitioners/House physician
 - Trauma
 - Urology
 - Lunch and Learns
 - Grand Rounds
 - Immediate feedback



Adoption and Routine Use of Processes Known to Reduce Antimicrobial Resistance: Useful Reference

- Useful reference
 - Pallin DJ, Ronan C, Montazeri K et al. Urinalysis in acute care of adults: pitfalls in testing and interpreting results. *Open Forum Infect Dis.* 2014; 1(1):ofu019.
- Developing laminated card on asymptomatic bacteriuria

Adoption and Routine Use of Processes
Known to Reduce Antimicrobial Resistance:
Barriers

- Change in leadership of the ED
- Treatment pocket guide printing delayed
- Inability to obtain accurate antibiotic usage data
- Physician resistance
 - Chest pain order set used as admission order set

Adoption and Routine Use of Processes
Known to Reduce Antimicrobial Resistance:
Lessons Learned

- Engage process owners immediately
- Understand the prescribing habits of the ED
 - Integral to successful interventions involving the ED
- Set realistic goals

Adoption and Routine Use of Processes
Known to Reduce Antimicrobial Resistance:
Next Steps

- Collaborate with IT to extract antimicrobial usage data
- Re-engagement of ED leadership
 - Encourage use of order sets specific to patient condition (with U/A removed)
 - Set reasonable goals together
- Interim analysis dashboard
 - Share data in real-time
 - Meet regularly with ED to discuss results

Obtaining Administration and
Interprofessional Support

- Interdisciplinary committee meetings
 - Medication Safety, Pharmacy and Therapeutics, Antimicrobial Stewardship, Nursing Leadership, Best Practice Council, Infection Prevention
- Key leader support
 - Director of Pharmacy, Pharmacy Clinical Manager, Medical Director of Infection Prevention, Chief Medical Information Officer

Mentored Impact Program:
Participation Results

- Support for rapid diagnostic tests
- Hospital interest in marketing stewardship activities
- Increased visibility and recognition of stewardship efforts across the institution
- Increased use of students for stewardship activities
- Dedicated IT resources

Overall: Barriers and Lessons Learned

- **System standardization and competing priorities**
- Engage leadership early
- Align project outcomes to complement one another
- Increase visibility of projects
- Identify champions from each discipline
- Perform interim analyses often and timely
- Anticipate delays

Overall: Next Steps

- Rapid blood culture Pharmacy notification process
 - Anticipated go-live November 2015
- Appropriateness of surgical prophylaxis before and after the retirement of the Surgical Care Improvement Project measures
- Refocus on decreasing treatment of asymptomatic bacteriuria

Like St. Mary Medical Center, the stewardship team at Hospital ABC sought to reduce the number of urine cultures ordered in the emergency department (ED). Reviewing their ED protocols, Hospital ABC found that many of the order sets included urinalysis with reflex to culture as a default option which they suspected increases the antibiotic use for asymptomatic bacteriuria.

Based on the experience at St. Mary Medical Center, what step might Hospital ABC take first to overcome some of the barriers they are likely to encounter when implementing changes in this area?


- a. Work to integrate the ED electronic medical record (EMR) system with the hospital EMR to improve the rate at which patients move through the ED.
- b. Study the order sets and prescribing habits of the ED to better understand why certain actions are taken in the ED.
- c. Overhaul the training of staff to strongly discourage the use of antibiotics in the ED.
- d. Automate the analysis of urine cultures to allow for quicker results and faster delivery of treatment to patients.

After implementing a process change and evaluating their data, the stewardship team at Hospital ABC found that they had not reached their target reduction in urine cultures ordered.

Recognizing that changing behavior is difficult and that multiple barriers likely were responsible for the disappointing results, what approach might Hospital ABC borrow from St. Mary Hospital to continue their process improvement efforts?

- a. Revisit the original goals of the stewardship program to determine if reduction in urine cultures remains an important priority.
- b. Incorporate routine reporting to the ED leadership and staff presenting specific and recent examples of unnecessary testing.
- c. Revise the goal to focus on understanding the order sets and prescribing practices in the inpatient setting.
- d. Provide additional staff resources to overcome any expected, or unexpected, barriers to implementing process changes.

Accelerating Antimicrobial
STEWARDSHIP PROGRAMS




ASHP Antimicrobial Stewardship
Mentored Impact Program:
Final Report

Froedtert Hospital
Milwaukee, Wisconsin
Sara Revolinski, PharmD, BCPS
Antimicrobial Stewardship Coordinator

Froedtert Hospital

- 500-bed academic medical center
 - 79 ICU beds
 - Planned expansion 2015-2017
- Affiliated with the Medical College of Wisconsin
- Level 1 trauma center
- Major referral center for 40 specialties and subspecialties



Antimicrobial Stewardship Team

- Program leaders
 - Sara Revolinski, PharmD, BCPS – Antimicrobial Stewardship Coordinator (1 FTE)
 - Njeri Wainaina, MD, FACP – Medical Director for Antimicrobial Stewardship (0.2 FTE)
- Team members
 - Angie Huang, PharmD, BCPS – inpatient ID pharmacist
 - Anne Daniels, PharmD, BCPS, AAHIVP – ambulatory ID pharmacist
 - Allison Gobble, PharmD – PGY2 ID resident
 - Nathan Ledeboer, PhD, D(ABMM) – Medical Director of Microbiology
 - Mary Beth Graham, MD, FIDSA, FACP – Medical Director for Infection Control

Antimicrobial Stewardship Program

- Description of program
 - Established in 2010, re-designed in 2013
 - Core functions
 - Drug policy related to antimicrobial stewardship (restrictions, formulary assessment, guideline development)
 - Approval of restricted antimicrobial use
 - Prospective audit and feedback utilizing clinical decision support built within our electronic medical record (EMR)

Reduction in Number of Patients Receiving More than 3 Antimicrobial Agents Per Day:
Description of Problem

- Patients with healthcare associated pneumonia (HCAP) may be over-treated
 - Most patients receive at least 3 antimicrobials: 2 anti-pseudomonals, 1 anti-MRSA agent
 - Froedtert Hospital's antibiogram shows beta-lactams maintain over 90% susceptibility against *Pseudomonas* spp.
 - Need for double anti-pseudomonal coverage?
 - Second agent of choice at our institution is ciprofloxacin (77% susceptibility to *Pseudomonas aeruginosa*) – minimal benefit over beta-lactam alone
- Do all patients require dual anti-pseudomonal and anti-MRSA therapy?

Reduction in Number of Patients Receiving More than 3 Antimicrobial Agents Per Day:
Process Change

- Developed new treatment algorithm for patients with HCAP
 - Algorithm based on published literature
 - Stratified patients by pneumonia severity and risk factors for infection with resistant pathogens
 - Separate risk stratification for MRSA
 - Based on stratification patients would receive either typical community acquired pneumonia therapy or HCAP therapy
 - HCAP therapy changed to be anti-pseudomonal beta-lactam + azithromycin +/- anti-MRSA (based on risk) +/- tobramycin (for patients with a history of resistance)
 - Approved by PNT Committee on October 9, 2014

Reduction in Number of Patients Receiving More than 3 Antimicrobial Agents Per Day: Process Change

- **Treatment algorithm implemented November 13, 2014**
 - Posted on-line for providers to access
 - Order set developed for use during provider order entry
 - Inserted link directly from order set to on-line algorithm
- **Education**
 - Pharmacists: Clinical conference presentations and online competency
 - Prescribers: presentations at service line meetings, emails, clinical pharmacist intervention upon order verification

Reduction in Number of Patients Receiving More than 3 Antimicrobial Agents Per Day: Results

- **Data collection**
 - Received report of all patients discharged with a diagnosis of pneumonia obtained from our EMR
 - Manual chart review to determine outcomes via the EMR
 - Pre-guideline implementation: January – February 2014
 - Post-guideline implementation: January – February 2015

Measure	Pre-Implementation (n=155)	Post-Implementation (n=166)	P value
Patients receiving > 3 antibiotics, no. (%)	34 (21.9%)	20 (12.0%)	0.0245
Patients receiving double anti-pseudomonal coverage, no. (%)	55 (35.5%)	12 (7.2%)	<0.0001

Reduction in Number of Patients Receiving More than 3 Antimicrobial Agents Per Day: Barriers and Lessons Learned

- **Barriers and Lessons Learned**
 - Order set usage at our institution is minimal: pneumonia order set is used in under 10% of patients with pneumonia each month
 - Clinical pharmacist education and intervention is key to success
- **Next Steps**
 - Presentation of results to clinical pharmacists and prescribers
 - Publication of results
 - Implementation of functionality within the EMR to promote order set usage

Obtaining Administration and Interprofessional Support

- **Administrative support**
 - Chief medical officer (CMO) and associate CMO have supported stewardship program since its re-design in 2013
 - Supported funding 0.2 physician FTE to the program
 - Support stewardship team policies and procedures, including restricted medications and documentation of recommendations within the medical record
 - Support the stewardship team if push-back is received from providers
- **Interprofessional support**
 - Developed the Antimicrobial Stewardship Workgroup
 - Functions as a sub-committee of our System PNT Committee
 - Composed of ID providers and pharmacists, microbiology, epidemiology, and administration (associate CMO)
 - Collaborate with providers or other involved departments on new projects or implementations

Mentored Impact Program: Participation Results

- Increased visibility of the Antimicrobial Stewardship Program at our institution
- Increased recognition of the stewardship program by senior leadership
- Supported projects for improvement of antimicrobial use
- Identified areas for further optimization of stewardship and areas of opportunity to expand pharmacy practice
- Allowed for integration of pharmacy students and residents into the practice of antimicrobial stewardship
 - Learners could recognize the importance of stewardship
 - Assisted with project completion and data collection
- Assisted with the initiation of a PGY2 Infectious Diseases Pharmacy Residency Program (began July 2015)

Overall: Barriers and Lessons Learned

- **Data collection**
 - Initial reports are fairly easy to obtain
 - Still requires quite a bit of manual chart review
- **Utilizing a team of individuals to accomplish stewardship tasks achieves more**
 - Allowed for PGY2 ID Pharmacy Resident
- **Clinical pharmacists are integral to process changes at our institution as they ensure orders follow institutional guidelines and policies**

Next Steps

- Determine further stewardship opportunities for clinical pharmacists
 - Allows for increased focus on higher acuity projects by the stewardship team
- Expand stewardship efforts into other arenas
 - Emergency department
 - Ambulatory clinics
- Share results of this program with pharmacists, providers, and senior leadership

To reduce the number of patients receiving more than three antimicrobial agents per day, the stewardship team at Hospital ABC would like to develop and implement a treatment algorithm for patients with pneumonia.

Based on the experiences at Froedtert Hospital, where might Hospital ABC direct their efforts in implementing this process improvement?

- a. Distribute existing, published pneumonia treatment guidelines to hospital staff via print and online resources and via provider order entry.
- b. Seek administrative support for increased EMR functionality allowing for improved reports on daily antimicrobial use in patients with pneumonia.
- c. Support the adoption of a pneumonia treatment guideline through multiple education efforts and pharmacy interventions, if necessary, when orders are verified.
- d. Focus physician, pharmacist, and nursing attention and education on increasing the use of pneumonia-specific order sets.

Reflections about Your Stewardship Program

Which of the process improvements described in this educational activity might you consider implementing in your stewardship program?

- a. Implement a Code Sepsis team to respond to patients diagnosed with sepsis.
- b. Review and revise order sets and protocols in the ED to limit the number of urinalyses with reflex to culture as default option.
- c. Develop a treatment algorithm based on published literature.
- d. N/A or other.

What is the greatest barrier to change you are facing in your stewardship program today?

- a. Limited i.v. access and/or extended-infusion protocols for antibiotics can create a challenge to timely administration of antibiotics.
- b. Ingrained prescribing habits combined with a lack of urgency regarding the importance of implementing change.
- c. Difficulty in educating prescribers, especially medical residents who rotate in and out of the institution.
- d. N/A or other.

In evaluating outcomes following implementation of a process change, which do you feel is the most important?

- a. Documenting barriers encountered during implementation.
- b. Reviewing the original goals of the effort.
- c. Presenting the results to staff.
- d. N/A or other.

Thank you!

- To hear interviews with 3 additional teams
 - Participate in part 1 of the virtual poster activities (1.5 hr CE)
- To share ideas about Antimicrobial Stewardship
 - Participate in the optional Discussion Board as you process your CE
 - Revisit the Discussion Board to view responses

Implementing Change in Antimicrobial Stewardship Programs: Focus on Time to Effective Therapy, Asymptomatic Bacteriuria in the Emergency Department, and Pneumonia Risk Assessment

Assessment Test



This assessment test has been provided as a study aid only. Follow the prompts at the end of the presentation to claim credit. Credit must be claimed within 60 days of completing the activity.

1. Shelby Baptist Medical Center found differences in time to antibiotic administration between patients with and without sepsis. Following the implementation of process changes, the median time to antimicrobial administration appeared to improve for both patient groups. Similarly, Hospital ABC would like to raise staff awareness of the importance of timely and effective delivery of antimicrobial therapy.

Based on the results at Shelby Baptist Medical Center, which of the following might Hospital ABC consider implementing?

- a. Develop a code sepsis process to respond to patients with suspected sepsis admitted from the emergency department.
 - b. Institute a formal education series on appropriate antibiotic therapy for all rounding hospitalists.
 - c. Initiate an information technology (IT) project to automate alerts from the microbiology lab to the pharmacy.
 - d. Expand the first-dose antibiotic options available to nurses on each unit.
2. Like St. Mary Medical Center, the stewardship team at Hospital ABC sought to reduce the number of urine cultures ordered in the emergency department (ED). Reviewing their ED protocols, Hospital ABC found that many of the order sets included urinalysis with reflex to culture as a default option which they suspected increases the antibiotic use for asymptomatic bacteriuria.

Based on the experience at St. Mary Medical Center, what step might Hospital ABC take first to overcome some of the barriers they are likely to encounter when implementing changes in this area?

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 - b. Study the order sets and prescribing habits of the ED to better understand why certain actions are taken in the ED.
 - c. Overhaul the training of staff to strongly discourage the use of antibiotics in the ED.
 - d. Automate the analysis of urine cultures to allow for quicker results and faster delivery of treatment to patients.
3. After implementing a process change and evaluating their data, the stewardship team at Hospital ABC found that they had not reached their target reduction in urine cultures ordered.

Implementing Change in Antimicrobial Stewardship Programs: Focus on Time to Effective Therapy, Asymptomatic Bacteriuria in the Emergency Department, and Pneumonia Risk Assessment

Recognizing that changing behavior is difficult and that multiple barriers likely were responsible for the disappointing results, what approach might Hospital ABC borrow from St. Mary Hospital to continue their process improvement efforts?

- a. Revisit the original goals of the stewardship program to determine if reduction in urine cultures remains an important priority.
 - b. Incorporate routine reporting to the ED leadership and staff presenting specific and recent examples of unnecessary testing.
 - c. Revise the goal to focus on understanding the order sets and prescribing practices in the inpatient setting.
 - d. Provide additional staff resources to overcome any expected, or unexpected, barriers to implementing process changes.
4. To reduce the number of patients receiving more than three antimicrobial agents per day, the stewardship team at Hospital ABC would like to develop and implement a treatment algorithm for patients with pneumonia.

Based on the experiences at Froedtert Hospital, where might Hospital ABC direct their efforts in implementing this process improvement?

- a. Distribute existing, published pneumonia treatment guidelines to hospital staff via print and online resources and via provider order entry.
- b. Seek administrative support for increased EMR functionality allowing for improved reports on daily antimicrobial use in patients with pneumonia.
- c. Support the adoption of a pneumonia treatment guideline through multiple education efforts and pharmacy interventions, if necessary, when orders are verified.
- d. Focus physician, pharmacist, and nursing attention and education on increasing the use of pneumonia-specific order sets.