Antimicrobial Stewardship

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Objectives

- Recognize the urgent need for antimicrobial stewardship

- List the benefits of having an antimicrobial stewardship program

- Provide examples of effective Antimicrobial Stewardship in a Community Hospital

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Why Stewardship?

- Inappropr [Optimize Patient Safety and Outcomes]
  - Adverse [...]
  - *Clostridi* [Limit inappropriate and Excessive Antibiotic Use]
  - Antimicr [...]
  - Mortality [Reduce Drug Resistance]
  - Cost
- Limited a [Ensure Cost Effectiveness] pment

Optimize Patient Safety and Outcomes

Limit inappropriate and Excessive Antibiotic Use

Reduce Drug Resistance

Ensure Cost Effectiveness

Clin Infect Dis (2008) 47 (6): 735-743

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Why Stewardship? Cont'd

In recognition of the urgent need to improve antibiotic use in hospitals and the benefits of antibiotic stewardship programs, in 2014 CDC recommended that all acute care hospitals implement Antibiotic Stewardship Programs

MMWR (2014) 63

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Not Just an Inpatient Issue…

Community Antibiotic Prescriptions per 1,000 Population by State — 2014

At least 30% of antibiotics prescribed in doctors' offices, emergency departments and hospital clinics are unnecessary.*

Prescriptions per 1,000
- 501–648
- 692–744
- 768–852
- 853–925
- 927–1,000
- 1,021–1,285
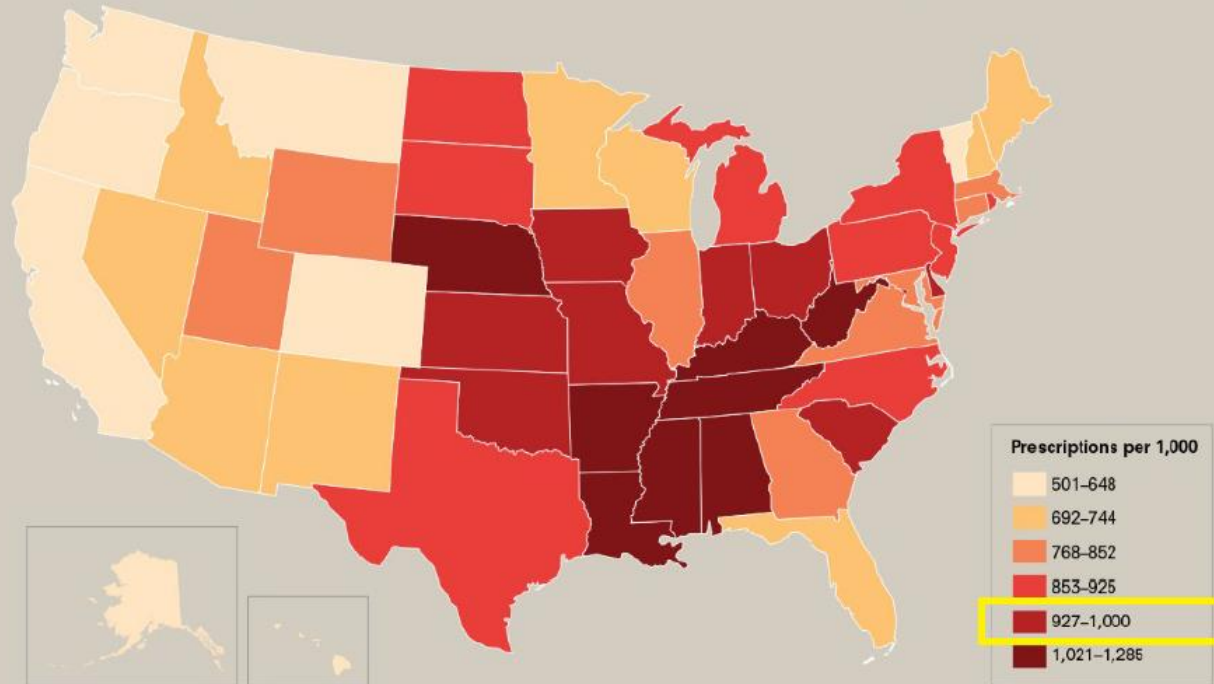
Data source: IMS Health Xponent 2014.

*Fleming-Dutra, K., et al. (2016). "Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011." JAMA: the Journal of the American Medical Association 315(17): 1864-1873.

GET SMART
Know When Antibiotics Work

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- Business plan for Antimicrobial Stewardship Pharmacist drafted July 2014
  - Implemented January 2015
- Key members
  - ID Physician (0.25 FTE)
  - ID Pharmacist (1 FTE)
  - Infection Prevention Nurse
  - Microbiology
  - Quality

Daily Stewardship

- Daily Chart Review
  - House wide review
  - Allergies
  - Antimicrobial indication
  - Appropriate drug, dose, and duration
  - Culture review for de-escalation or drug bug mismatch
  - Discontinuation

- Pharmacy Services
  - Emergency Department culture/sensitivity review
  - IV to PO
  - Renal adjustments
  - Dosing and monitoring
    - Vancomycin
    - Pip/tazo
    - Aminoglycosides
  - Penicillin allergy testing

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Stewardship Tracking

- Daily
  - De-escalation
  - Discontinuation
  - Dose Optimization
  - Formulary Substitution
  - Renal Adjustment
  - Culture/ Sensitivity Review
  - New Drug
  - Information Provided
  - IV to PO
  - Level Ordered
  - Contraindication
  - Discharge Intervention

- Monthly
  - Percentage of accepted recommendations
  - Total interventions

- Quarterly
  - Days of Therapy (DOT)
  - Acquisition cost
  - Highest cost antimicrobials

- Yearly
  - Acquisition cost
  - Drug resistance
  - Antibiogram

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Stewardship Focus

- Sepsis core measures
- Asymptomatic bacteriuria
- Allergy reporting
- Transitions of care

Sepsis

- Pharmacist carries sepsis pager 7a-11p
  - Alerted if lactate >2.0
- Sepsis bundle "cheat sheets" at all workstations
- Pharmacist worklist
- Achieving compliance
  - Emergency department education
    - Role of ED Pharmacist
  - Automatic lactate rule

Core Measure

SEVERE SEPSIS Core Measure Definition (A + B + C)[1,2]

A + B + C *within 6 hours of each other* meets Severe Sepsis definition		
A. Source of Infection	B. Any two (2) SIRS criteria	C. ANY one (1) Organ dysfunction
Documentation of infection or possible infection by provider with date/time	Temp > 38.3 or < 36	Acute Respiratory Failure: new requirement for invasive or noninvasive mechanical ventilation
	HR > 95	SBP < 90 **or** MAP < 65 **or** SBP drop by >40 points from normal
	RR > 22	Creatinine > 2 **or** UO < 0.5 kg/hr x 2 hrs
	WBC > 12 or < 4 or 10% bands	Bilirubin > 2
		Platelet count < 100,000
		INR > 1.5 **or** PTT > 60
		Lactate > 2

SEPTIC SHOCK Core Measure Definition (A or B)[1,2]

A or B meets Septic Shock definition	
A.	B.
Lactate level > 4 (automatically treat as shock)	Identification of severe sepsis (as above) **AND**
	Tissue hypoperfusion within the 1st hour after fluids infused: readings meeting BP criteria defined under C above

3 HOUR BUNDLE

1. Measure lactate level
2. Obtain blood cultures prior to administration of antibiotics
3. Administer broad spectrum antibiotics
4. Administer crystalloid fluids at 30 ml/kg

6 HOUR BUNDLE

1. Repeat initial lactate if level >2
2. Vasopressor initiated if unresponsive to fluids
3. Focused exam documented by provider after fluids started
   a. Vitals
   b. Cardiopulmonary evaluation
   c. Capillary refill examination
   d. Peripheral pulse evaluation
   e. Skin examination

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Antibiotic Therapy

SEVERE SEPSIS ANTIBIOTIC THERAPY[1,2]

Within 3 hours of diagnosis of Severe Sepsis, *MUST HAVE* 1 MONOTHERAPY OR 2 COMBINATION THERAPY (1 from Column A + 1 from Column B)

MONOTHERAPY	COMBINATION THERAPY	
	Column A	Column B
Amoxicillin/clauvulanate	Amikacin	Cefazolin
Ampicillin/sulbactam	Gentamicin	Clindamycin IV
Piperacillin/tazobactam	Tobramycin	Vancomycin IV
Ceftriaxone	Aztreonam	Linezolid[ID CONSULT]
Cefepime	Ciprofloxacin	Daptomycin[ID CONSULT]
Meropenem[ID CONSULT]		Azithromycin
Levofloxacin		Penicillins (Ampicillin, Nafcillin, Oxacillin, PCN G)

*For antibiotics specific to source of infection, refer to Sepsis Order Set*

INFECTION	GUIDED ANTIBIOTIC THERAPY	
	NKDA	PCN Allergy
Abdominal	→Zosyn 3.375 g IV Q6H	→Ceftriaxone 1 g IV Q24H + Metronidazole 500 mg IV Q8H
Pyelonephritis	→Zosyn 3.375 g IV Q6H	→Cefepime 1 g IV Q8H
Localized SSTI**	→Unasyn 3g IV Q6H +/-Vancomycin 15 mg/kg IV Q12	→Ceftriaxone 1 g IV Q24H +/- Vancomycin 15 mg/kg IV Q12
Necrotizing SSTI**	→Zosyn 3.375 g IV Q6H + Vancomycin 15 mg/kg IV Q12 +Clindamycin 900 mg IV Q8H	→Meropenem 1 g IV Q8 +Vancomycin 15 mg/kg IV Q12 +Clindamycin 900 mg IV Q8H
Neutropenic	→Cefepime 1 g IV Q8H + Vancomycin 15 mg/kg IV Q12	
Respiratory/CAP*	→Ceftriaxone 1 g IV Q24H +Azithromycin 500 mg IV Q24 +/- Vancomycin 15 mg/kg IV Q12	→ Levofloxacin 750 mg IV Q24 +/- Vancomycin 15 mg/kg IV Q12
Respiratory/HCAP/HAP*	→ Zosyn 3.375 g IV Q6H + Levofloxacin 750 mg IV Q24 +/- Vancomycin 15 mg/kg IV Q12	→Cefepime 1 g Q8H + Levofloxacin 750 mg IV Q24 +/- Vancomycin 15 mg/kg IV Q12
Unknown Source	→Vancomycin 15 mg/kg IV Q12 + Zosyn 3.375 g IV Q6H	

*=SEE SPECIFIC ORDERSETS FOR GUIDED THERAPY   **=SKIN AND SOFT TISSUE INFECTION

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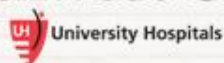
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Asymptomatic Bacteriuria

Population	Prevalence, %
Healthy, premenopausal women	1-5%
Pregnant women	1.9-9.5%
Postmenopausal women aged 50-70	2.8-8.6%
Diabetic patients (Women, Men)	9-27%, 0.7-11%
Elderly person in the community (≥70 years) (Women, Men)	10.8-16%, 3.6-19%
Elderly person in long term care facility (≥70 years) (Women, Men)	25-50%. 15-40%
Patient with spinal cord injuries	
Intermittent catheter use	23-89%
Sphincterotomy and condom catheter in place	57%
Hemodialysis	28%
Indwelling catheter use	
Short term	9-23%
Long term	100%

Clin Infect Dis (2005) 40, 643-54

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Asymptomatic Bacteriuria, cont'd

- Identify the problem
  - Data collection
- Develop a solution
  - Education
  - Algorithm to assist clinical decision making
  - Ordering urine cultures
- Pushback
  - Change in mental status
  - Family pressure

Allergy Testing

- Program developed June 2016 after PGY-1 resident identified area of need
- ID consult needed to allow for appropriate chart review
  - 59% of patients missing reaction
  - Student utilization
- Pushback
  - Time commitment
  - Pharmacists cannot administer testing

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Transitions of Care

- Program developed by PGY-2 Ambulatory Care resident

- Daily communication with ECF

- Identify potential discharges with antimicrobial therapy
  - Duration of antibiotics
  - Stop date
  - IV to PO opportunities
  - Laboratory Monitoring
  - De-escalation opportunities

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Standard MM.09.01

| Element of Performance	Plan
EP 2: Physician Education	• Quality dashboard available on intranet • Yearly presentation to all departments • Antibiogram distribution annually at Medical Staff • Computer based learning on program highlights
EP 3: Patient Education	• Admission binder with educational materials from CDC for all patients • Educational material on discharge for patients treated with antimicrobials
EP 5: CDC Core Elements	• Action: indication is specified in chart, 48 hour phone calls to assess therapy, antibiotics time out at 5 days

Program Outcomes

Antimicrobial Cost per Year
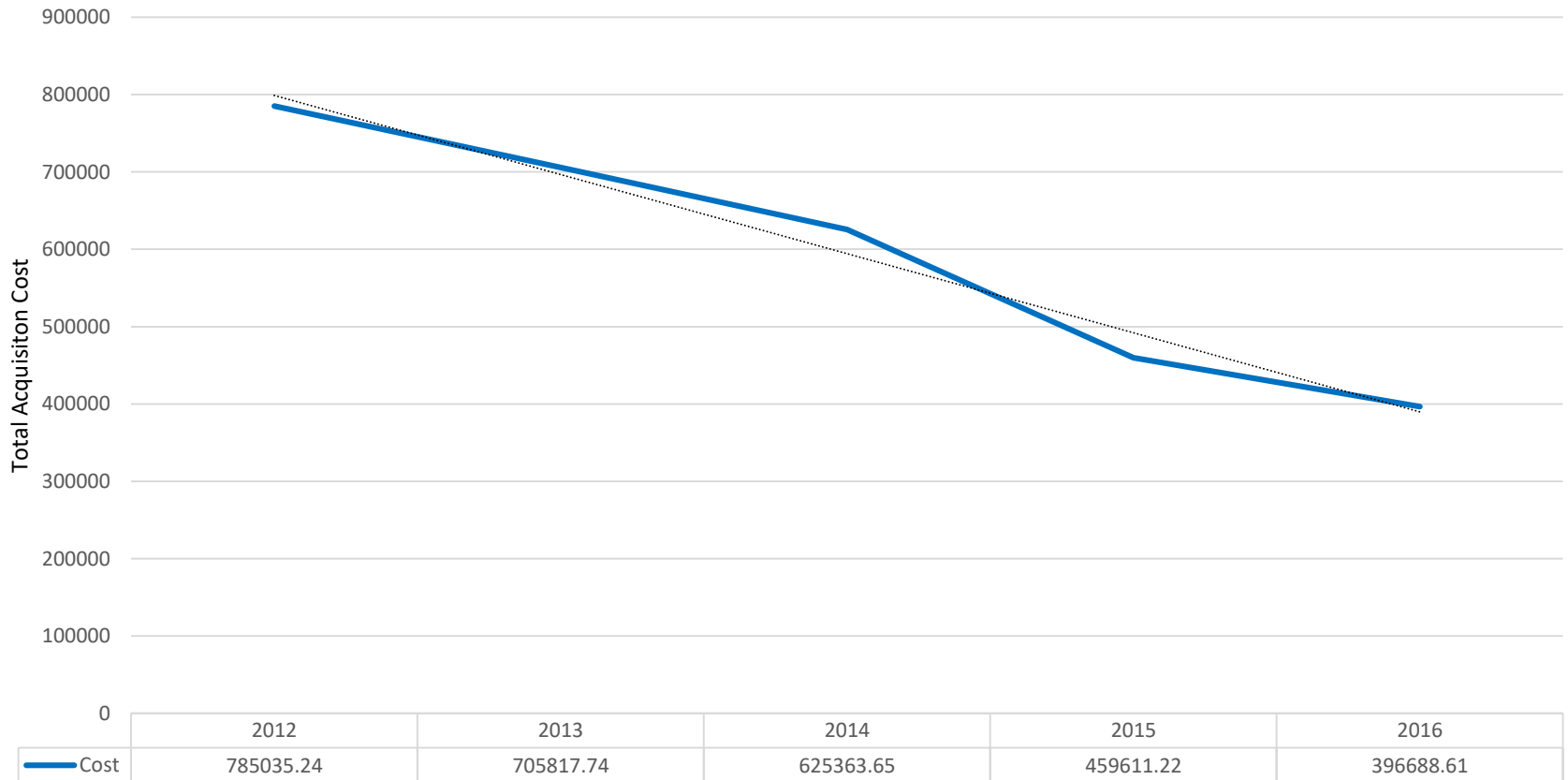
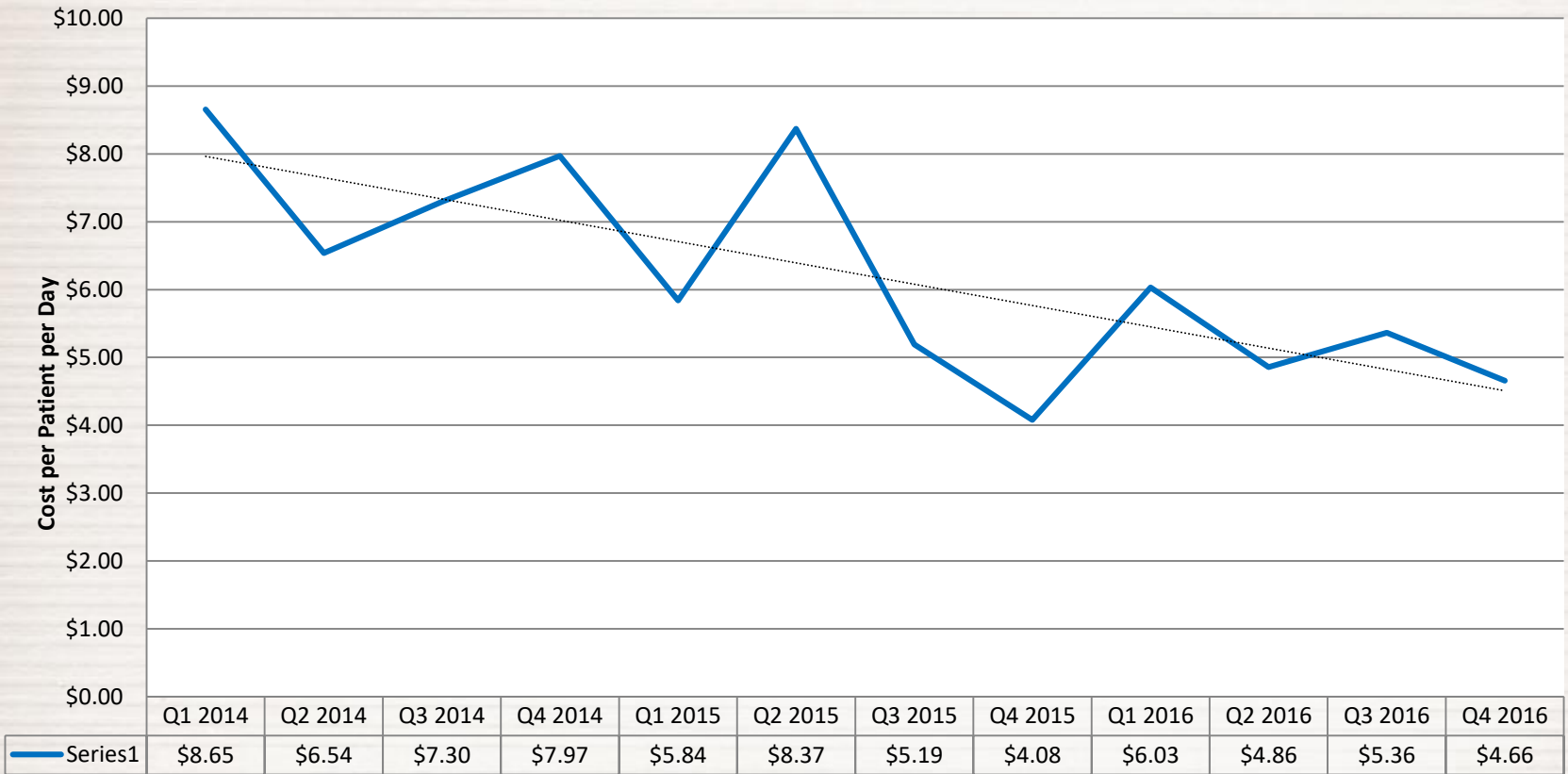|	2012	2013	2014	2015	2016
Cost	785035.24	705817.74	625363.65	459611.22	396688.61

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Program Outcomes-Costs
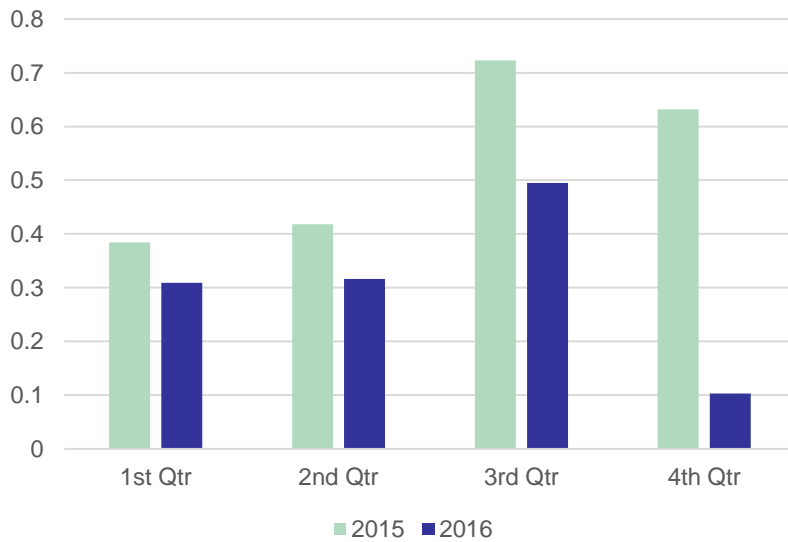
Cost per Patient per Day Adjusted for 1000 Patient Days

	Q1 2014	Q2 2014	Q3 2014	Q4 2014	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016
Series1	$8.65	$6.54	$7.30	$7.97	$5.84	$8.37	$5.19	$4.08	$6.03	$4.86	$5.36	$4.66

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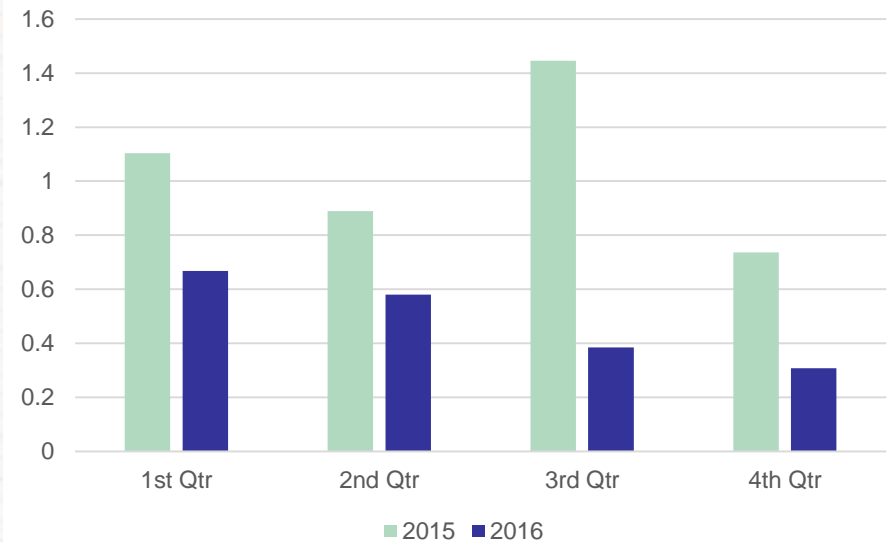Partnering with University Hospitals

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Program Outcomes, C-Diff

C-Difficile (Hospital Acquired)

2015: N=42
2016: N=23

C-Difficile (Community Acquired)

2015: N=82
2016: N=37

Program Outcomes-Antibiotics

Antibiotic	DOT per 1000 pt days before ASP (2014)	DOT per 1000 pt days after ASP (2016)
Meropenem	19.2	11.3
Ertapenem	3.8	3.3
Daptomycin	1.9	1.1
Linezolid	6.0	3.7
Tigecycline	0.6	0.3
Micafungin	1.0	1.5
Ceftaroline	5.5	0
Aztreonam	3.0	0.4
Pip/tazo	71.3	78.6
Vancomycin IV	99.4	100.4

Effective Practices

- Antimicrobial Stewardship Guide
- Daily face-to-face interaction
- Education
- Automatic stop orders
- Strict 24 hour restricted antibiotic policy
- Allergy clarification
- Utilize students
- Program growth

Lessons Learned

- ASP members have multiple roles in a community hospital
- Continuous surveillance lacking
- No formal mechanism of data collection or clinical support technology
- Contacting private practice practitioners
- Practitioners may be hesitant to adopt new practices

Key Concepts

- Pharmacist driven stewardship efforts can be effective and successful

- Education to practitioners is vital for program success

- Stay visible on floors

- Utilize stewardship team and resources

- Be persistent but don't jeopardize physician autonomy

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Next Steps

- Continued education to staff
- Identified areas for improvement
    - Antimicrobial use in respiratory infections
    - Antimicrobial use in abdominal infections
    - Discharge prescriptions
    - NHSN reporting
    - Reduction of PPIs

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- Rebecca Margevicius, PharmD, BCPS
- Karen Shrimpton, BS MT(ACSP)
- Colleen Gazzillo, RN
- Sue Markland, RN
- Sandra Chisar, MD

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