

Antimicrobial Stewardship

The UW Health Antimicrobial Stewardship program was rated as a top 13 program by the Infectious Diseases Society of America and is listed as a resource by the CDC Antimicrobial Stewardship Program.”

CY16 Annual Report

January 2017 Issue

The antimicrobial stewardship enters its 15th year of existence!

Fiscal year 2016 was another successful year for the Antimicrobial Stewardship Program. We continued to reduce unnecessary antimicrobial utilization, improve clinical decision support tools, mitigate the emergence of antimicrobial resistance, and provide fiscally responsible and effective care to our patients.

The stewardship team continued to monitor and improve antimicrobial use throughout the UW Health enterprise. With the opening of The American Center and UW Rehab Center, the stewardship team responsibilities expanded. 60% of patients at UW Health receive antimicrobials on a daily basis which results in between 260 and 340 patients per day that require prospective audit and review. Stewardship interventions continue to focus on encouraging antimicrobial de-escalation and early pathogen identification (which facilitates de-escalation 24 to 72 hours after). Acceptance of ASP interventions remains high at over 80%. The educational work, including fellow lectures, medical resident and intern training sessions, and educational guidelines linked to antimicrobial orders ensures that prescribers choose correctly early and often.

Given the increased patient load, this year required the antimicrobial stewardship team to focus on building workflow efficiencies. Antimicrobial stewardship interventions can generally be classified into one of several categories: drug/bug, drug/disease, drug/drug, and drug/lab interventions. We completed the first step in building a comprehensive patient scoring tool in HealthLink when we completed a drug/lab and drug/dug intervention scoring tool. We worked collaboratively with the microbiology lab to create a clean pathogen database to start building drug/bug patient scoring tools. Next year, we will focus on optimizing our drug/disease patient scoring tool.

In 2013 the Centers for Disease Control released a antimicrobial resistance threats report. At the top of the list of threats was Clostridium difficile and carbapenem-resistant Enterobacteriaceae (CRE) extended-spectrum β -lactamase producing Enterobacteriaceae (ESBL) and other multi-drug resistant pathogens. The ASP team manages twenty-five restricted antimicrobial agents. These agents are either used in the treatment of highly drug resistant pathogens or their use is associated with antimicrobial resistance. The management of this program is instrumental in optimally treating highly resistant pathogens and in mitigating the emergence of resistant pathogens.

Finally, the stewardship team has been faced with many challenges this year due to antimicrobial shortages. The ASP managed seven drug shortages, including shortages of critically important broad-spectrum antimicrobial agents. Shortages often results in the need to use sub-optimal, expensive alternatives; however, the ASP mitigation strategies successfully preserved supply and provided safe, effective, and fiscally responsible alternative therapies.

Fiscal year 2016 was a very successful year and we look forward to our 16th successful year. It promises to bring new opportunities to impact and improve patient care at the University of Wisconsin and throughout the state of Wisconsin.

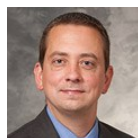
Sincerely,



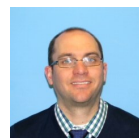
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What is Antimicrobial Stewardship?

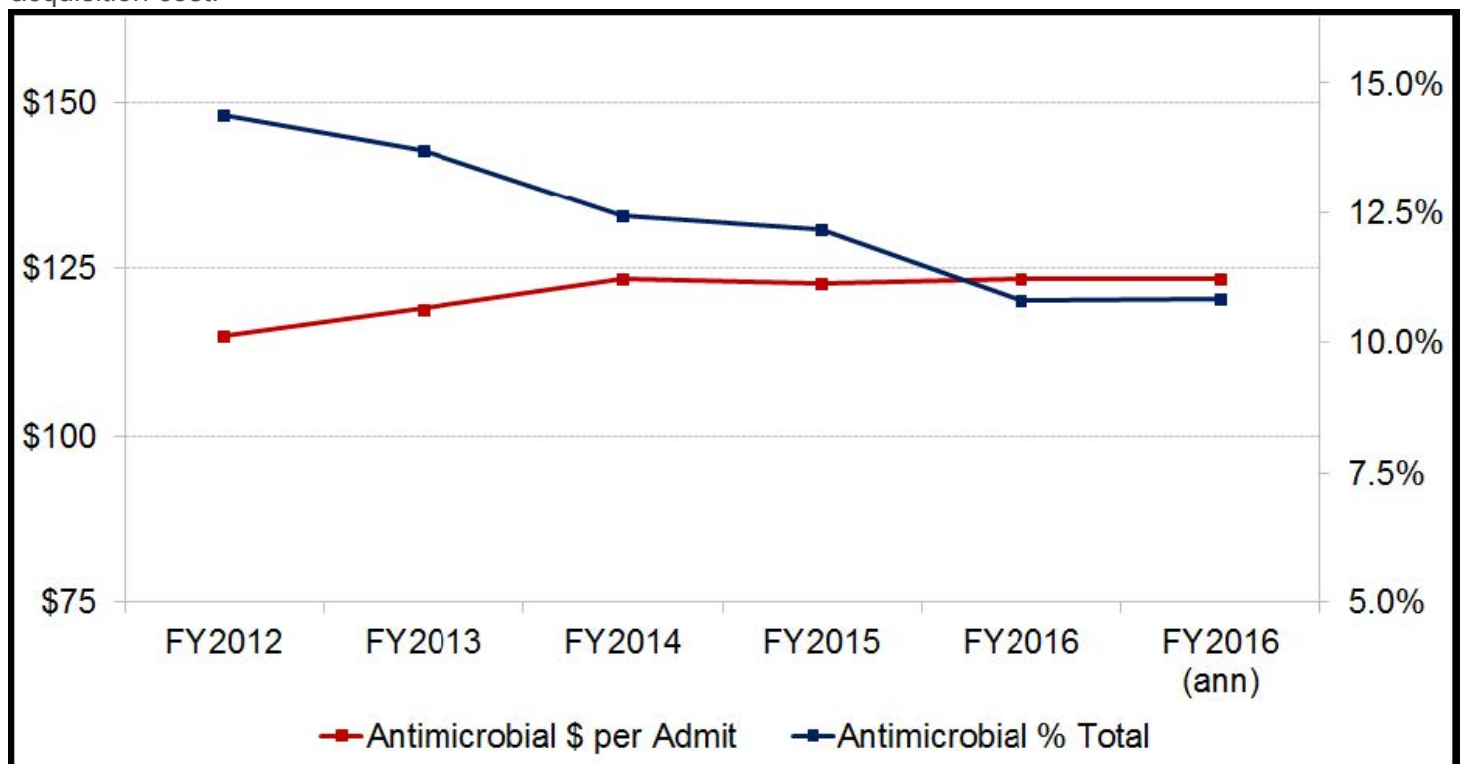
Coordinated efforts and interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration. Antimicrobial stewards seek to achieve optimal clinical outcomes related to antimicrobial use, minimize toxicity and other adverse events, reduce the costs of health care for infections, and limit the selection for antimicrobial resistant strains. Given the societal value of antimicrobials and their diminishing effectiveness due to antimicrobial resistance, antimicrobial stewardship at UW Health strives to ensure that all patients receive optimal antibiotics (when indicated) in every scenario



Antimicrobial Usage and Budget Impact

Each year, the cost of acquiring antimicrobial therapies represents 10-15% of the total inpatient drug budget of UW Health. Since the program's chartering, reduction in inappropriate antimicrobial use has reduced the annual pharmacy antibiotic acquisition budget by almost 50% per patient admission compared to a decade ago and more than \$1.13 million per year compared to drug acquisition costs just 3 years ago. The program continues to be an asset to decreasing the cost of antimicrobial usage. In 2014, actual cost of antimicrobial use was approximately \$2 million less than the projected cost for that year (projected cost based on cost of usage in 2002 and 2.5% inflation yearly since then). Since 2002, the average antimicrobial cost per admission is decreased \$85 per admission. In general, overall antimicrobial utilization remains consistent in the last few years at an average of approximately 720 days of therapy per 1000 patient days (see Figure 1). Most recently, the stewardship team was able to coordinate contract pricing for Oritavancin that resulted in a 50% reduction in acquisition cost.

Figure 1. Overall antimicrobial utilization





Budget Busters!!! Opportunities to improve antimicrobial use???

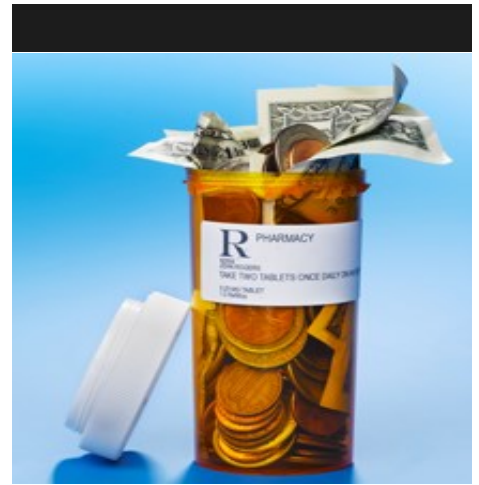
Recently, the Antimicrobial Stewardship Program (ASP) conducted a retrospective study aiming to describe the characteristics of the top 1% of patients that contribute the most to antimicrobial costs. The study found that out of a total expenditure of \$3,504,524 in FY14, the top 1% of patients (n=106) contributed to almost 50% of that cost. The highest utilized antimicrobial agents used by these patients included daptomycin, micafungin, posaconazole, valganciclovir, liposomal amphotericin B, and meropenem. In these patients, the average daily cost of antimicrobial therapy was $\$219 \pm \192 and average total cost per admission for therapy was $\$4,733 \pm \$7,614$.

Areas of opportunity to improve antibiotic utilization and therefore decrease cost, were also discussed. Weight based dose adjustments could be considered for amphotericin and foscarnet in order to optimize pharmacokinetic/pharmacodynamic parameters. Researchers found that in cystic fibrosis patients, often providers continue prophylactic medications while treating an exacerbation which results in unnecessary use of antibiotics. Beta lactam allergies often result in the use of other less effective and more expensive alternatives. Proper assessment and documentation of allergies would help in the decision making process. Lastly, prior to admission antibiotics are often resumed unnecessarily and lead to increased costs.

In conclusion, antimicrobial stewardship programs are responsible for oversight of antimicrobial utilization and responsible for providing cost-effective care. Our study demonstrated that 1% of patients account for 47% of antimicrobial spending. These patients are often complex and care is interdisciplinary, usually including the ID consult service. However, even with a robust ASP, there remain opportunities for improving the cost-effectiveness of antimicrobial therapy.

UTIs: Top Ten Myths

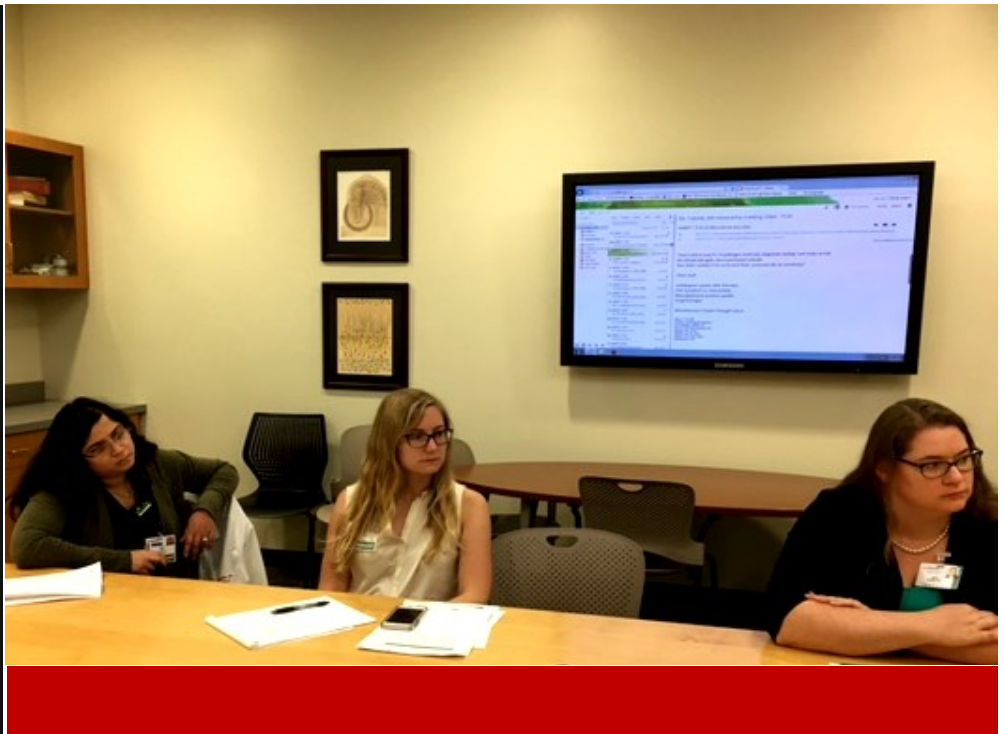
In February 2016, the stewardship team in conjunction with the Emergency department physicians published an article in the Journal of Emergency Medicine titled the Top Ten Myths of Urinary tract infections. The article focuses on de-bunking common myths that lead to unnecessary tests and antimicrobial therapy in the diagnosis and treatment of UTIs. Since its publication, it has become the second-most read paper in journals this year. A citation for the publication can be found on page 4 for those interested in reading the article.



Introducing Qlikview

An important aspect of antimicrobial stewardship is measuring and reporting of antimicrobial use. Historically, this is a very difficult metric to report. The antimicrobial stewardship program developed a new reporting tool called Qlikview that can be used to monitor antimicrobial use in realtime with on-the-fly reporting capabilities. This tool can simplify data collection for on-going research projects or provide data needed to support the implementation of new projects.

The antimicrobial days of therapy Qlikview program allows the stewardship team to report antimicrobial utilization to prescribers, services, units, and hospitals.



Clostridium difficile prevention efforts

Clostridium difficile infection (CDI) is a growing global concern. In fact, it is the most common bacterial healthcare-associated infection in the United States, affecting approximately half a million Americans in 2011. *Clostridium difficile* is an important health-care associated infection at UW Health which effects both patient outcomes and hospital financial outcomes.

Antibiotic exposure is an important risk factor for CDI. In conjunction with the infection control committee, the stewardship program as asked to implement several projects aimed at reducing the hospital-acquired *Clostridium difficile* infection rate. In 2016, the Antimicrobial Stewardship Program implemented two programs to help combat this growing infection rate.

First, the stewardship team worked to restrict fluoroquinolone antibiotics on transplant and critical care units. The program reduced fluoroquinolone use by 80% and reduced the hospital-acquired *Clostridium difficile* infection rates to 7.7 cases/10000 patient days from 16.8 cases/10000 patient days ($p=0.12$).

Second, the stewardship program increased the use of probiotics on General Medicine, Hospitalist, and Family Practice units. Probiotics have been shown to have potential for primary prevention of *Clostridium difficile* infection. A pre/post retrospective review was conducted to assess a new probiotic prescribing protocol. Pharmacists prescribed probiotics to 63% of appropriate patients via a delegation protocol within 24 hours. Greater than 80% of eligible patients received probiotics during their hospitalization per protocol. The hospital-acquired *Clostridium difficile* infection rate for the entire hospital decreased to 5.65 cases per 10000 patient days from 8.36 cases per 10000 patient days ($p=0.05$).



Guidelines and Protocols to Improve Antimicrobial Prescribing

The Antimicrobial Stewardship Program improves prescribing through multiple methods, including daily prospective audit (chart review) and feedback, antimicrobial restriction/pre-authorization policies, and guidelines and protocols. Guidelines create a standard from which to compare prescribing and standardize practice. Protocols empower nurses, respiratory therapists, and pharmacists to improve antimicrobial prescribing when specific conditions are met. Guidelines and protocols improve the efficiency of clinical care. The stewardship program oversees and manages 21 clinical practice guidelines and 21 protocols.

Clinical Practice Guideline

Anti-infective Lock Therapy – Adult/Pediatric – Inpatient/Ambulatory
Antifungal prophylaxis in Liver transplant Recipients – Adult – Inpatient
Clinical Monitoring of Outpatient Parenteral Antimicrobial Therapy (OPAT) and selected oral antimicrobial agents – Adult – Inpatient/Ambulatory
Continuous Renal Replacement Therapy Dose Adjustment – Adult – Inpatient
Diagnosis and management of sepsis – Adult – Emergency Department/Inpatient
Diagnosis and management of infections of the urinary tract – Adult – Inpatient/Ambulatory
Dosing of medications in patients receiving continuous enteral feedings – Adult – Inpatient
Hepatitis B Prophylaxis for non-thoracic solid organ transplant – Adult – Inpatient
Infective Endocarditis – Adult – Inpatient
Influenza and Pneumococcal Vaccination – Adult/Pediatric – Inpatient/Ambulatory
Intravenous Vancomycin Use – Adult – Inpatient
Management of Neutropenic Fever – Adult – Inpatient/Ambulatory
Medication Route Interchange – Adult – Inpatient
Pharmacokinetic/Pharmacodynamic Dose Optimization of Antibiotics for the treatment of Gram-negative Infections – Adult – Inpatient
Prevention, Diagnosis, and Treatment of Clostridium difficile infection – Adult/Pediatric – Inpatient/Ambulatory
Renal Function-based Dose Adjustments – Adult – Inpatient/Ambulatory
Skin, Skin Structure, and Soft Tissue Infection Diagnosis and Treatment – Adult – Inpatient/Ambulatory
Surgical and Interventional Radiology Antimicrobial Prophylaxis – Adult/Pediatric – Inpatient/Ambulatory
Treatment and Prevention of Influenza with Antiviral Medications – Adult/Pediatric – Inpatient
Treatment of Patients with Reported Allergies to Beta-lactam Antibiotics – Adult – Inpatient
Use of Procalcitonin Monitoring Related to the Diagnosis and Treatment of Respiratory Tract and Emerging Sepsis – Adult – Inpatient/Ambulatory

Delegation/Practice Protocols

Antibiotic Therapy for Urodynamics Testing – Adult – Ambulatory
Antimicrobial Dosing Based on PK/PD Principles – Adult – Inpatient
Asymptomatic Bacteriuria Preoperative Screening and Treatment – Adult – Ambulatory
Candida Intertrigo and/or Cutaneous Candidiasis and Peristomal Yeast Infection Medicated Topical Treatment - Adult – Inpatient
Clostridium Difficile - Adult - Inpatient/Emergency Department
Clostridium Difficile Testing – Adult – Infectious Disease Clinic
Continuous Renal Replacement Therapy (CRRT)-Based Dose Adjustment - Adult – Inpatient
Hepatitis B Prophylaxis for Non-Thoracic Solid Organ Transplant – Adult – Inpatient
Immunization - Adult/Pediatric - Inpatient
Immunization Ordering – Adult/Pediatric – Ambulatory
Influenza Screening and Treatment – Adult/Pediatric – Ambulatory
Liver Transplant Invasive Fungal Infection Prophylaxis – Adult – Inpatient
Lyme Disease Prophylaxis – Adult/Pediatric – Ambulatory
Management of Streptococcal Cultures of the Throat, Rectum or Vagina - Pediatric – Ambulatory
Non-Thoracic Solid Organ Transplant Antiviral Prophylaxis – Adult – Inpatient
Non-Thoracic Solid Organ Transplant Rejection Antimicrobial Prophylaxis – Adult – Ambulatory
Perioperative Antimicrobial Prophylaxis Adjustment – Adult/Pediatric – Inpatient/Ambulatory/Emergency Department
Pharmacist Medication Route Interchange – Adult – Inpatient
Probiotic Ordering to Reduce Primary Clostridium difficile Incidence - Adult- Inpatient
Treatment of Sexually Transmitted Infections (STIs) or Genital Infections – Adult/Pediatric – Ambulatory
Vancomycin Dosing and Monitoring – Adult – Inpatient

Publications

National Comprehensive Cancer Network Clinical Practice Guidelines Workgroup. Prevention and Treatment of Cancer-Related Infections. Version 1.2017. Published December 21, 2016.

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Heid C; Knobloch MJ; Schulz LT; Safdar N. Use of the Health Belief Model to Study Patient Perceptions of Antimicrobial Stewardship in the Acute Care Setting. ICHE. May 2016: 34(5):576-582

Buss B, Schulz LT, Reed KD, Fox B. Clinical utility of MALDI-TOF in a region with low bacterial resistance rates? Clin Infect Dis. 2016 Mar 1;62(5):666-7. Epub 2015 Nov 17

Fox B, McAllister E, Holm C, Handley J, Schulz LT. Use of Ertapenem at an Academic Medical Center: Defining Ertapenem's role in Outpatient Infusion Antimicrobial Therapy (OPAT): An Observational Study. Infect Dis Clin NA. Jan 2016: 24(1) 43-48

Leaders in Antimicrobial Stewardship

Fiscal Year 2016 By the Numbers

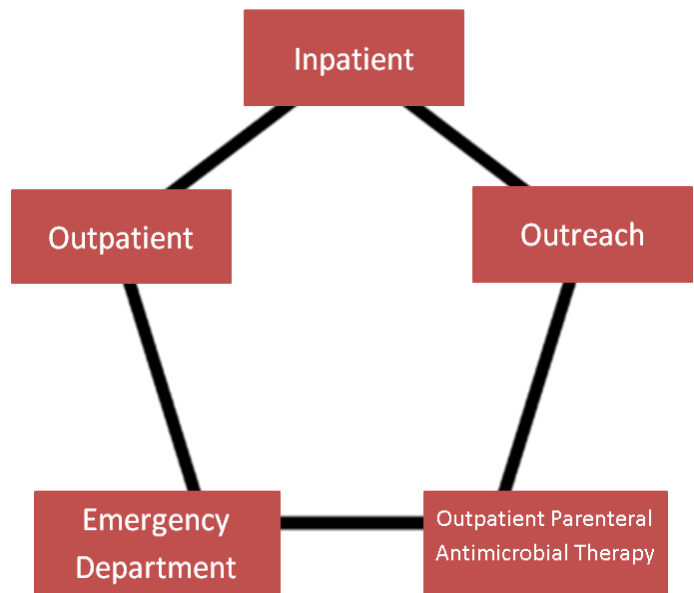
38,000 patients assessed annually by ASP
 10% provided an intervention to optimize care

24 restricted antibiotics, managed by ASP

18 drug shortages managed by ASP

17 total guidelines
 9 new in FY16

3 new FDA approved antimicrobials added to formulary



Challenges in 2017 and beyond for the antimicrobial stewardship program

1. In 2017, The Joint Commission requires Antimicrobial Stewardship as a Condition for Participation
2. Implementation of Epic Antimicrobial Stewardship and Infection Control Module will improve the efficiency of the stewardship program and provide clinical decision support to providers
3. Outpatient antimicrobial prescribing monitoring and improvement program begins
4. Outpatient parenteral antimicrobial therapy (OPAT) clinical service development to improve safety and use of infusion center resources
5. Development of outreach stewardship program to assist regional hospitals provide optimal antimicrobial therapy.

The Antimicrobial Stewardship Team

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Need help with antimicrobial therapy decisions?

Page 3333—Antimicrobial stewardship MD
 -or-
 Page 4321—Antimicrobial stewardship PharmD