Antibiotic Stewardship Programs

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Disclosures

• Gilead: Advisory Panel member

Goals:

- Define ASPs, discuss the need for antibiotic stewardship, and review CMS requirements.
- Review the goals of ASPs, and strategies / tactics for tackling problems / opportunities for improvement
- Discuss steps to implementing an ASP, and addressing pitfalls and barriers

Definition

- Antimicrobial stewardship refers to coordinated 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.

http://www.idsociety.org/Stewardship_Policy/#sthash.VU7f2TVa.dpuf

Why do we need Antibiotic Stewardship?

A PERFECT STORM

As bacterial infections grow more resistant to antibiotics, companies are pulling out of antibiotics research and fewer new antibiotics are being approved.



Staphylococcus aureus. VRE, vancomycin-resistant Enterococcus. FQRP, fluoroquinolone-resistant Pseudomonas aeruginosa.

Antibiotic Prescriptions* by State

The frequency with which antibiotics are prescribed varies greatly from state to state.



per 1,000 people of all ages.

Source: Adapted from: CDC. Antibiotic Resistance Threats in the United States, 2013. Available at www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=14.

Consequences of Hospital Antibiotic Use

- At one tertiary care center 70% of Medicare patients received an antibiotic in 2010
- Approximately 50% of this use was unnecessary or inappropriate
- Untoward consequences of antibiotic therapy identified in this and other studies:
 - Inadequate treatment of infection
 - Increased hospital readmissions
 - ADEs



Polk et al. In: PPID, 7th ed. 2010 Luther, Ohl. IDSA Abstract 2011

Frequency of ADEs due to Antibiotics in Outpatient Setting

- 142,505 estimated emergency department visits/year due to untoward effects of antibiotics (~ 1:1000 abx prescriptions)
 - Antibiotics account for 19.3% of drug related adverse events
 - 78.7% for allergic events
 - 19.2% for adverse events (e.g. diarrhea, vomiting)
 - Approximately 50% due to penicillin & cephalosporin classes
 - 6.1% required hospital admission

2004-2005 NEISS-CADES project Bourgeois, et al. Pediatrics. 2009;124;e744-50 Linder. Clin Infect Dis. 2008 Sep 15;47(6):744-6 Vangay, et al. Cell host & Microbe 2015;17;553-64 Shehab N et al. Clin Infect Dis. 2008;47:735

Diversity of Bacteroides Species in Gut After a 7 day Course of Clindamycin



Microbiology (2010), 156, 3216-3223

"Dysbiosis"

Obesity

- Auto-immune dz
- Metabolic syndrome
- Diabetes
- > IBD
- ➤ Asthma





Percent of Hospitals with Antibiotic Stewardship Programs by State, 2014*

Antibiotic stewardship programs ensure patients get the right antibiotics at the right time for the right duration



AE, AP, AS, GU, VI data are not shown due to 7 or fewer hospital respondents but are included in the overall percentage.



Nationally, 39.2% of all hospitals have stewardship programs (1642 of 4184); the national goal is 100% of hospitals by 2020.

7 - 28%

29 - 35%

36 - 48%

49 - 58%

Source: CDC's NHSN Survey

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What Is Antimicrobial Stewardship?

- A system of informatics, data collection, personnel, and policy/procedures which promotes the optimal selection, dosing, and duration of therapy for antimicrobial agents throughout the course of their use
- Pertinent in all healthcare settings and practiced at system and individual levels
- Collaborative expertise from clinicians, pharmacists, microbiologists, infection control, and informatics technologists

Ohl CA. *Seminar Infect Control* 2001;1:210-21. Ohl CA, Luther VP. J. Hosp. Med. 2011;6:S4 Dellit TH, et. al. Clin Infect Dis. 2007;44:159-177

Goals of ASPs

- Improve clinical outcomes
- Reduce unintended consequences of antimicrobials
- Combat the emergence of antimicrobial resistance
- Control costs

Regulatory and Cost Imperatives for Antimicrobial Stewardship





- 1. Leaders establish antimicrobial stewardship program as an organizational priority
- 2. Educates staff involved in abx ordering/dispensing/administration on resistance and stewardship practices. Upon hire and periodically thereafter.
- Educates patients and families as needed re: appropriate use of abx (e.g. GetSmart)
- 4. Multi-disciplinary team including MD / PhD / ICP / PharmD / RPh / APP
- 5. Program has 7 core CDC elements (next slide)
- 6. ASP uses organization-approved multidisciplinary protocols (e.g. formulary restrictions, appropriateness assessments, C diff care, abx use guidelines, IV to PO conversion, pre-auth requirements
- 7. ASP collects/analyzes/reports data on a regular basis
- 8. Hospital takes action on improvement opportunities identified by its ASP

CDC Guidelines 7 Core Elements

- Leadership commitment dedicating necessary human, financial, and IT resources to the program
- Accountability leader who is responsible for program outcomes
- Drug expertise pharmacist in charge of working to improve antibiotic use
- Action implementing one or more CDC-recommended actions
- Education teaching clinicians and relevant staff about antibiotic resistance and optimal prescribing habits
- Tracking monitoring patterns of prescribing and resistance
- Reporting relaying information on antibiotic use and resistance within institution on a regular basis

http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html.

CMS Carrots and Sticks

Value Based Purchasing metrics

- Dollars at risk based on performance
- "Losers" give up money to "winners"

Hospital Acquired Conditions (HACS)

- Financial penalties for adverse events occurring during hospitalization 0
- 6/14 HACS are related to infections
- Proposed rule for all hospitals to develop an ASP as a condition of participation

- HAC 6: CAUTI
- HAC 7: Vascular catheter associated infection 0
- HAC 8: SSI Mediastinitis after CABG 0
- HAC 11: SSI Bariatric surgery 0
- HAC 12: SSI Certain orthopedic procedures of spine, 0 shoulder, and elbow
- HAC 13: SSI Post cardiac implantable electronic 0 device procedures

Proposed NHSN "SAAR" measure (standardized antimicrobial administration ratio) as part of future VBP





ASP Strategies / Approach I

- The front-end or pre-prescription approach to stewardship uses restrictive prescriptive authority. Certain antimicrobials are considered restricted and require prior authorization for use by all except a select group of clinicians.
- The front-end approach has the advantage of targeting specific antimicrobials for specific indications based on local resistance patterns and the hospital formulary. Antimicrobials can be approved for a specific duration, thereby prompting review after culture data have been obtained.
- Data suggest that programs that use this approach have been able to demonstrate significant reductions in expenditures of the targeted drug but also result in increased use of antimicrobials that are not restricted, which may or may not be the desired effect.

ASP Strategies / Approach II

- The back-end or post-prescription approach to stewardship uses prospective review and feedback. The antimicrobial steward reviews current antibiotic orders and provides clinicians with recommendations to continue, adjust, change, or discontinue the therapy based on the available microbiology results and clinical features of the case. Studies of programs that use this approach have shown decreased antimicrobial use, decreased number of new prescriptions of antimicrobials, and improved clinician satisfaction.
- The back-end approach has the advantage of being able to focus on de-escalation, a critical aspect of appropriate antimicrobial use.
- **De-escalation** includes changing a broad-spectrum antibiotic to one with narrower coverage, changing from combination therapy to monotherapy, or stopping antibiotic therapy altogether as it becomes more apparent that these drugs are not needed.

IDSA ASP Elements/Regions Hospital 2013

•	Multidisciplinary antimicrobial stewardship team with	A-III	Yes	
•	Infectious Disease Physician		Yes	
•	Clinical Pharmacist with ID training		Yes	
•	Clinical Microbiologist			Yes
•	Information system specialist		Yes	
•	Infection Control Professional			Yes
•	Hospital Epidemiologist			No
•	Collaboration between stewardship committee and	A-III		
•	Infection Control		Yes	
•	Pharmacy and Therapeutics Committee		Yes	
•	Support and collaboration of hospital administration,			
	medical staff leadership		A-III	Yes
•	Function under quality control and patient safety	A-III	No	
•	Negotiation with administration for adequate authority,			
	compensation, expected outcomes	A-III	Yes	

IDSA ASP Elements/Regions Hospital 2013

•	Prospective audit and feedback	A-I	Yes	
•	Formulary restriction and guidelines		A-II	Yes
•	Education of staff		A-III	Yes
•	Guidelines and clinical pathways	A-I	Yes	
•	Antimicrobial cycling		C-II	No
•	Antimicrobial order forms		B-II	Yes
•	Combination therapy		C-II	No
•	Streamlining/de-escalation of therapy		A-II	Yes
•	Dose optimization		A-II	Yes
•	IV-to-PO conversion		A-III	Yes
•	Health care information technology			
	Electronic medical records	A-III	Yes	
	Computer physician order entry		B-II	Yes
	Clinical decision support	B-II	Yes	
•	Computer-based surveillance		B-II	No
•	Micro lab providing surveillance data	A-III	Yes	
•	Process measures		B-III	No
•	Outcome measures		B-III	Yes

Data Needs for ASPs

- Pharmacy information: DOT vs DDD; Annual spending; Indication (appropriateness)
- Laboratory information: Pt-specific data; antibiograms; C diff rates; Nosocomial and MDRO incidence; Non-micro lab testing with costs
- Outcomes information: PharmD-driven interventions; Provider compliance rates; Costs

IDSA recommendations for Micro Lab support for ASPs ["Speed is good"]

- Any test or process that allows clinicians to more quickly diagnose disease, optimize therapy, and/or rule-out non-infectious conditions, helps antibiotic stewardship
 - Use current CLSI susceptibility testing and reporting
 - Implement molecular diagnostics / automation
 - Update and categorize antibiograms
 - Rapidly screen for resistant pathogens [MRSA, VRE, ESBL, CRE]
 - Provide strain-typing service for outbreak investigations

Infection Control / Clinical Decision Support Software

- MedMined [Care Fusion]
- ICNet
- SafetySurveillor [Premier]
- rL Solutions

- Sentri 7
- TheraDoc [Premier]
- Truven
- VigiLanz

http://cid.oxfordjournals.org/content/59/suppl_3/S122.full



2016 IDSA/SHEA ASP Guidelines

28 recommendations

• 5 "strong"

Preauthorization and/or prospective audit and feedback

Interventions designed to reduce the use of antibiotics associated with a high risk of CDI compared with no such intervention

PK monitoring and adjustment programs for aminoglycosides

Programs to increase both appropriate use of oral antibiotics for initial therapy and the timely transition of patients from IV to oral antibiotics

Guidelines and strategies to reduce antibiotic therapy to the shortest effective duration "IDSA and SHEA strongly believe that antibiotic stewardship programs (ASPs) are best led by infectious disease physicians with additional stewardship training"

"For instance, PAF conducted by a clinical pharmacist and infectious diseases physician at a community hospital led to a 22% reduction in the use of parenteral broad-spectrum antibiotics as well as a reduction in rates of CDI and nosocomial infections due to antibiotic-resistant Enterobacteriaceae over a 7-year period of time [22]."

Barlam et al. IDSA/SHEA ASP Guidelines. CID 2016.

Targeted antibiotic consumption and Nosocomial C. *difficile* disease

Tertiary care hospital; Quebec, 2003-



Valiquette, et al. Clin Infect Dis 2007;45:S112.

Antibiotic Stewardship Improves Clinical Outcomes



Fishman N. *Am J Med* 2006;119:S53.

AMP = Antibiotic Management Program UP = Usual Practice

BARRIERS AND PITFALLS

- One of the greatest challenges of antimicrobial stewardship research is demonstrating a clear causal association between implementation of ASPs and decreased rates of antimicrobial resistance. Early studies that achieved decreased cephalosporin use were successful in controlling the incidence of resistant gramnegative infections to cephalosporins but resulted in an increase in carbapenem use and resistance to carbapenems
- Time-series analysis is useful in study designs in which infection rates have been ascertained before and after an intervention, but controlling with a nonintervention group may not be practical or ethical. Several time-series analyses of methicillin-resistant *S aureus* and *C difficile* have shown that variations in rates of multidrug-resistant infection may be attributed not only to changes in drug use but also to implementation of infection control practices and rates of colonization with multidrug-resistant bacteria
- In a nationwide survey of hospitals, of 406 respondents, 51% had what they would consider formal ASPs. Of those who did not, the most commonly cited barriers to implementation were staffing constraints, funding, and lack of time.

ASP Checklist for Hospital Prescribers

- Prescribe antibiotics correctly get cultures, start the right drug promptly at the right dose for the right duration. Reassess the prescription within 48 hours based on tests and patient exam.
- Document the dose, duration and indication for every antibiotic prescription.
- Stay aware of antibiotic resistance patterns in your facility.
- Participate in and lead efforts within your hospital to improve prescribing practices.
- Follow hand hygiene and other infection control measures with every patient.

ASP Checklist for Hospital CMOs

- Leadership commitment: Dedicate necessary human, financial, and IT resources.
- Accountability: Appoint a single leader responsible for program outcomes. Physicians have proven successful in this role.
- Drug expertise: Appoint a single pharmacist leader to support improved prescribing.
- Act: Take at least one prescribing improvement action, such as requiring reassessment within 48 hours, to check drug choice, dose, and duration.
- Track: Monitor prescribing and antibiotic resistance patterns.
- **Report**: Regularly report to staff prescribing and resistance patterns, and steps to improve.
- Educate: Offer education about antibiotic resistance and improving prescribing practices.
- Work with other health care facilities to prevent infections, transmission, and resistance.

How do we measure success of an ASP?

- Reduction in rates of *Clostridium difficile* infection
- Reduction in rates of antimicrobial-resistant nosocomial infections
- Reduction in microorganism resistance
- Reduction in antimicrobial usage (eg. total use, broadspectrum, parenteral, duration, cost)

Barlam et al. IDSA/SHEA ASP Guidelines. CID 2016.

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