THE MAGNIFICENT SEVEN:

Essentials for An Effective and Sustainable Antibiotic Stewardship Program

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Antimicrobial Stewardship Program (ASP)

What is Antimicrobial Stewardship?

A structured program that promotes appropriate use of antimicrobials by selecting:

• the appropriate agent,

• dose,

• frequency,

• duration, and

• route of administration.

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Goals of an Antimicrobial Stewardship Program

- Improved patient outcomes
- Reduced adverse events (e.g. *C. difficile* infection)
- Improved rates of antibiotic susceptibilities to targeted antibiotics
- Reduced length of stay
- Reduced healthcare expenditures
- Optimization of resource utilization across the continuum of care

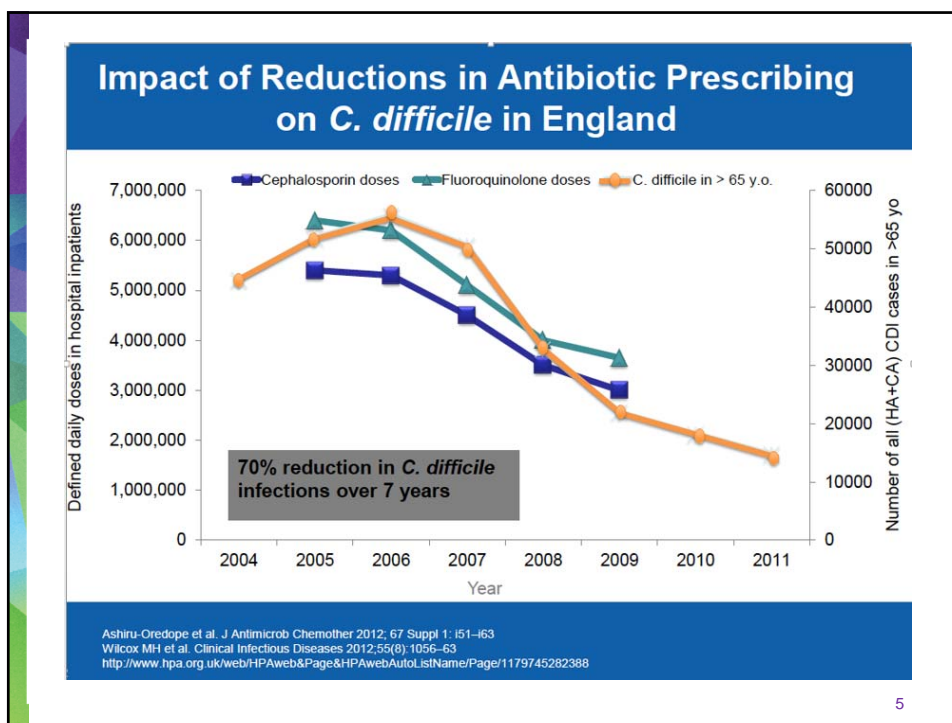Barlam TF et al. Clin Infect Disease. 2016:62;51-76.

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Antibiotic Stewardship: Does It Work?

Hospital Antibiotic Stewardship Programs have been shown to:
- Improve antibiotic use
- Reduce antibiotic resistance
- Reduce *C. difficile*
- Improve patient outcomes
- Save $$$$$

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Impact of Reductions in Antibiotic Prescribing on *C. difficile* in England

Legend: Cephalosporin doses · Fluoroquinolone doses · C. difficile in > 65 y.o.

Y-axis (left): Defined daily doses in hospital inpatients (0 to 7,000,000)

Y-axis (right): Number of all (HA+CA) CDI cases in >65 yo (0 to 60000)

X-axis: Year (2004 to 2011)

70% reduction in *C. difficile* infections over 7 years

Ashiru-Oredope et al. J Antimicrob Chemother 2012; 67 Suppl 1: i51–i63
Wilcox MH et al. Clinical Infectious Diseases 2012;55(8):1056–63
http://www.hpa.org.uk/web/HPAweb&Page&HPAwebAutoListName/Page/1179745282388

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DECREASE DAYS OF THERAPY BY 20 PERCENT BY SEPTEMBER 27, 2018

CREATE ORGANIZATIONAL WILL	SECURE VISIBLE LEADERSHIP COMMITMENT	Change Ideas
	PERFORM GAP ANALYSIS	Change Ideas
	DEVELOP COMMUNICATION PLAN	Change Ideas
ESTABLISH CAPACITY, CAPABILITY, AND ACCOUNTABILITY	ESTABLISH PROGRAM GOVERNANCE	Change Ideas
	PROVIDE CLINICIAN TRAINING, EDUCATION, AND CERTIFICATION	Change Ideas
	DEFINE ROLES, RESPONSIBILITIES, AND EXPECTATIONS	Change Ideas
MATCH THE DRUG TO THE BUG	ADOPT AND ADAPT EVIDENCE BASED GUIDELINES	Change Ideas
	STANDARDIZE TIMELY CULTURE & SENSITIVITY REVIEW	Change Ideas
	APPLY STEWARDSHIP TECHNIQUES	Change Ideas
	KNOW WHEN AND HOW TO SAY "NO"	Change Ideas
AIM, MEASURE, ANALYZE, AND REPORT	DETERMINE AIMS AND SELECT METRICS	Change Ideas
	MONITOR AND REPORT REGULARLY	Change Ideas
ENGAGE PATIENTS AND FAMILIES	USE MULTIPLE MODALITIES TO TEACH RISKS AND APPROPRIATENESS	Change Ideas
	TEACH WHAT TO DO IF ANTIBIOTICS ARE ORDERED	Change Ideas

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The Magnificent Seven

- Leadership Commitment
- Accountability
- Drug Expertise
- Action
- Tracking
- Reporting
- Education

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Add to That…

- Pharmacy and Physician Champions
- IP Champion
- Nurse Champion
- Strategies

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CDC Gap Analysis Tool

Executive Ownership	Y	N	Comments
Senior leadership is supportive of program and necessary requirements to meet resource needs			
Process exists to review medical staff participation in hospital quality initiatives			
Medical staff process exists to monitor compliance to quality programs • Process exists to evaluate outliers			
Process exists to evaluate critical staffing needs for quality programs • Central Order Entry (Supply Chain sponsored program) has been retained as a method for pharmacist redeployment, for clinical programs as opposed to staff reduction • Microbiology services are readily available • Infection Prevention staff are readily available • Education time and resources are protected and provided to support programs- i.e. AMP development			

Antimicrobial Management Program Gap Analysis Checklist, Centers for Disease Control and Prevention, 2010. Retrieved at
https://www.cdc.gov/getsmart/healthcare/improve-efforts/resources/pdf/AMP-GapAnalysisChecklist.pdf

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Key Strategies

- Pre-Prescription Authorization
- Post-Prescription Audit and Feedback
- Target the high risk antibiotics
- 48 to 72 hour Antibiotic Time Out

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Preauthorization

Advantages

- ↓ initiation of antibiotics
- ↓ costs
- Directly controls use

Disadvantages

- Limited to restricted agents
- Loss of prescriber autonomy
- May delay therapy
- Requires skill
- Real-time resource intensive
- Shift to other agents may be worse

Mother, May I?

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Post-Prescription audit and feedback

Advantages

- ↑ visibility of ASP
- ↑ clinical data available
- ↑ flexibility in timing of recommendations
- Less than daily
- Educational
- Prescriber autonomy
- Promotes teamwork
- Addresses de-escalation & duration

Disadvantages

- Compliance voluntary
- Labor-intensive
- Success driven by delivery
- Fear of change is patient doing well
- May require IT/data mining
- May take longer to achieve ↓ in targeted antibiotic use

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Pre or Post?

- Significant reduction in use of restricted agents and $$

- Decreased antibiotic use

- Decreased antibiotic resistance particularly gram-negative pathogens

- Both have advantages and disadvantages

- Unintended consequences

Seek Forgiveness not Permission?

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Antibiotic Time Out

1. Infected?
2. If yes, Bacterial?
3. If yes, source?
   Culture? Sensitivity?
4. Right drug?
5. Right dose?
6. Right frequency?
7. Right duration?
8. Right route?

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SUMMARY OF KEY ASP STRATEGIES

STRATEGY	PROS	CONS
PREPRESCRIPTION AUTHORIZATION (PPA)	> Limits access to selected antibiotics	> Can increase the use of other antibiotics and may not decrease total use. > Requires authorization pathway, including consideration of the need for after-hours authorization.
Postprescriptive Review and Feedback (PPRF)	> Encourages communication and discussion, and creates learning loops. > Can reduce targeted antibiotics as well as all antibiotic use. > More likely to be accepted by prescribers.	> Initial inappropriate use of targeted antibiotics is not prevented.
48-HOUR TIME-OUT	> Prompts multidisciplinary discussion of appropriateness of current antibiotic orders, and often leads to de-escalation (narrower spectrum, shorter duration, or discontinuation).	> Potential physician resistance, but generally easily overcome as physician experiences value of pharmacist's assistance.
FORMULARY RESTRICTION	> Reduces antibiotic choice to manageable number, reduces duplicate therapy, decreases costs.	> May be a challenge for hospitals with providers or specialists who work in many hospitals and find it difficult to use different formularies at each.
ORDER SETS AND TREATMENT ALGORITHMS	> Prompts the prescriber to make choices based on likely bacteria or source of infection, consider allergies, adjust for renal function, consider cost, and order appropriate tests and consultations. > Allows for default algorithmic orders for common conditions for drug, dose, and duration. > Can be paper or electronic.	> Must allow for opt out with explanation.

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STRATEGY	PROS	CONS
CLINICAL GUIDELINES	> Provides the opportunity to include many leaders to develop hospital-specific guidelines and algorithms. > Allows for communication to frontline caregivers who are not infectious disease specialists.	> Important and effective when coupled with PPA or PPRF. Lesser effectiveness as stand-alone strategy. > Note: Infectious disease specialists are not required for guideline development. Any physician and/or pharmacist champion may lead this effort.
EDUCATION	> Necessary for buy-in and discussion and use of order sets, algorithms, and guidelines.	> Required but not sufficient as a stand-alone strategy.
PHARMACODYNAMIC DOSE OPTIMIZATION (PK MONITORING)	> Using a pharmacodynamics parameter correlated with efficacy, PK Monitoring optimizes bacterial killing and decreases the emergence of resistance. > This strategy has been applied to beta-lactams, ciprofloxacin, vancomycin, and cefepime.	> Cost.
COMPUTER ASSISTED DECISION SUPPORT PROGRAMS	> Provides real-time guidance and feedback to prescribers, and the option to monitor prescribing practices and create prior authorization mechanisms.	> None
PHARMACIST-DRIVEN INTRAVENOUS TO ORAL SWITCH PROGRAMS	> Pharmacists have heightened awareness of the oral bioavailability of antibiotics, and can initiate timely IV to oral administration for patients who meet criteria. Drugs often suitable for early IV to oral conversion include fluoroquinolones, metronidazole, macrolides, doxycycline, clindamycin, and linezolid.	> Potential medical staff resistance to pharmacist orders.
PHARMACY DOSING PROGRAMS	> Pharmacist-managed dosing for vancomycin and aminoglycosides has been shown to reduce mortality, length of stay, adverse events, and costs.	> Clinicians, particularly residents, will lose or fail to learn dosing skills because of exclusion from the dosing and learning loop.

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Measurement

- Days of therapy (DOT)
- True Costs based on prescriptions

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The Math

- Admitted tonight at 2300, given Amp + Gent before midnight
- Receive 4 doses of amp and 3 doses of Gent tomorrow
- Switched to Cephalosporin the next day and receives 3 doses, Amp + Gent both discontinues prior to dosing
- 4th day discharged before any abx dosing.

DOT = 2 + 2 + 1 + 0/4 days = 1.25 then X 1000 = 1250

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Barriers/Solutions

- Education and skill development for front line pharmacists

- Staff development
  - Bugs and drugs
  - Guideline familiarity
- Provide resources
  - Sanford Guide
  - Johns Hopkins Antibiotic Guide
  - Pharmacist Guide to ASP
    - ashp.org
  - www.mad-id.org
  - www.sidp.org

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Barriers/Solutions

- Metric for tracking

- Internal IT involvement
- External vendors
- Soft wear/data mining
- Build into budget and seek approval
  - Sentri7
  - Theradoc
  - Vigilanz

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Do's and Don'ts

Don't:
- Talk about saving money
- Start hammering outliers

Do:
Talk about the 5 rights:
- Antibiotic
- Dose
- Frequency
- Duration
- Route

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Next Steps…

- Become Knowledgeable
- Engage physicians and pharmacists
- Guide structure
- Oversee gap analysis
- Provide necessary resources
  (does not need to be expensive!)
- Seek monthly updates and data

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Resources:
HRET HIIN Change Package
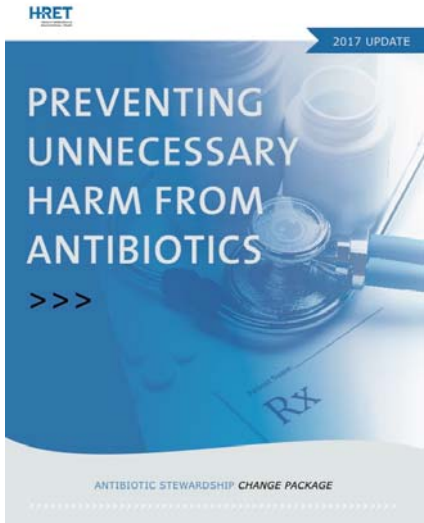
Resources:
Case Studies – Large & Small Hospitals

References

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