INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

# GUIDE TO INFECTION CONTROL IN THE HOSPITAL

## CHAPTER 12

# Antimicrobial Stewardship in the Hospital Setting


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**Topic Outline**

*Chapter last updated: April,2018*

## KEY ISSUE

The inappropriate use of antimicrobials in human medicine is widespread. This has a direct impact on antimicrobial resistance, one of the greatest threats to global health, food security, and development today.[1] The primary goal of antimicrobial stewardship, as defined by the Infectious Diseases Society of America (IDSA), is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms (such as *Clostridium difficile*), and the emergence of resistance.[2]

## KNOWN FACTS

- Inappropriate use of antimicrobials is a global health problem of monumental proportions. In the United States, 30-50% of antibiotics prescribed are unnecessary or inappropriate. Similarly, in countries where antibiotics can be purchased without a prescription and antimicrobial use lacks regulation, antibiotics are often over-prescribed by health workers and over-used by the public.[1,3]
- Indiscriminate use of antibiotics is a major factor in promoting antimicrobial resistance.[4]
- The antimicrobial armamentarium is rapidly diminishing and must be preserved through judicious use, strict regulation, and supplementation with new agents to combat multi-drug resistant bacteria.[5,6]
- The combination of antimicrobial stewardship programs (ASPs) and infection control programs have been shown to curtail the emergence and transmission of antibiotic resistance.[2]
- Reducing inappropriate antibiotic use has been shown to decrease healthcare costs, *Clostridium difficile infections*, and improve patient outcomes.[2,7]

**Controversial Issues**

- Antibiotic cycling, which involves the deliberate withdrawal of an antibiotic or antibiotic class from general use coupled with the substitution of antibiotics from a different class with similar activity, is not a recommended stewardship strategy to curtail antibiotic resistance. Studies have failed to provide sufficient evidence of benefit, and have proved that cycling is labor intensive, challenging, and an impractical use of resources.[4]
- Passive education (pamphlets, posters, etc…) *alone* is insufficient when used in isolation and must be coupled with other stewardship activities (see below) to be successful.[4]

## SUGGESTED PRACTICE

Hospitals are encouraged to implement a multidisciplinary antimicrobial stewardship team that includes among its core members, when available, an infectious diseases physician and clinical pharmacist with infectious diseases training. Other important members of this team would optimally include a hospital epidemiologist, a clinical microbiologist, an information system specialist, and an infection control professional.[7] The United States Centers for Disease Control and Prevention suggest the following seven core elements be incorporated into all ASPs.[7]

1. **Leadership Commitment:** Dedicating necessary human, financial and information technology resources.
2. **Accountability:** Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.
3. **Drug Expertise:** Appointing a single pharmacist leader responsible for working to improve antibiotic use.

4. **Action:** Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. “antibiotic time out” after 48 hours).
5. **Tracking:** Monitoring antibiotic prescribing and resistance patterns.
6. **Reporting:** Regular reporting of information on antibiotic use and resistance to doctors, nurses and relevant staff.
7. **Education:** Educating clinicians about resistance and optimal prescribing.

The following strategies have been proven to be effective ASP initiatives and should be considered as local resources allow:

- **Pre-prescription Authorization (PPA)**[2,4,7]
    - Restrict the use of certain antibiotics based on known overuse/misuse, spectrum of activity, toxicities, and cost.
- **Post-prescription review with feedback (PPRF)**[2,4,7]
    - Conduct external reviews of antibiotic therapy currently being administered in the hospital.
    - Reviews and feedback should be performed by an expert in the field of antibiotic use
- **Develop policies to optimize antimicrobial use.**[2,4,7]
    - Document dose, duration, and indication for all courses of antibiotics
    - Develop hospital specific treatment guidelines for common scenarios (ie; surgical prophylaxis, diarrhea, pneumonia, urinary tract infection) that correspond to national standards, local drug formulary, and local resistance patterns.
- **Antibiotic “Time outs”** [2,4,7]
    - When microbiological results are available, typically within 24-48 hours, antibiotics should be reassessed for opportunities to de-escalate, discontinue, or tailor therapy in light of new information.

- A re-assessment for the continuing need for ongoing antimicrobial therapy (and/or opportunities to de-escalate therapy to more narrow-spectrum antimicrobials) should occur at least every 48 hours while antimicrobials are continued.

- **Pharmacy-driven Interventions**[2,4,7]
  - Intravenous to oral conversion of antibiotics known to have high oral bioavailability such as trimethoprim-sulfamethoxazole, fluconazole, and fluoroquinolones.
  - Antimicrobial dose adjustments for renal and hepatic dysfunction.
  - Antimicrobial dose optimization to maximize penetration to organs and body tissues, activity against MDROs, and other pharmacokinetic interventions such as extended-infusion administration of beta-lactams where available.
  - Alerts for common situations where antimicrobial therapy may be inappropriate or unnecessary.
    - Examples: double anaerobic coverage, “bug-drug” mismatch, drug-drug interactions, prolonged empiric coverage without positive cultures, etc...

## SUGGESTED PRACTICE IN UNDER-RESOURCED SETTINGS

Barriers to the effectiveness of stewardship in under-resourced areas are many and include a paucity of human and technological resources, inadequate microbiology laboratory infrastructure and support, and insufficient funding, to name a few.[8] Compounding the problem, the burden of infectious diseases and multidrug-resistant organisms (MDROs) is higher and often times antibiotics can be obtained without prescription, which makes the practice of antimicrobial stewardship more challenging.

- Efforts should be made to ensure that prescription from a trained professional is required whenever antimicrobials are administered.
- In areas where antimicrobial resistance testing is not (or is not widely) available, investing in lab capacity should be a priority at the national level.
- PPA is a strategy that can be deployed successfully in the under-resourced setting.[8]
- Access to new antibiotics should be restricted and their use ideally would be directed by susceptibility testing.
- Antibiotic therapy should always have an end date identified by condition.
- ASPs and infection prevention programs should be integrated (wherever feasible).
- Antibiotic resistance does not respect borders and is often difficult to detect. A collaborative, international approach to curbing resistance and expanding access to ASPs is of critical importance.

## SUMMARY

Antimicrobial resistance is an escalating global threat projected to cause more deaths than cancer by 2050. Antimicrobial stewardship is a key strategy to combat antimicrobial resistance, optimize clinical outcomes, and

minimize the collateral damage of antimicrobial use. Pre-prescription authorization (restriction) of antibiotics and post-prescription review with feedback (PPRF) are the most effective strategies. Hospitals should deploy multidisciplinary antimicrobial stewardship teams with an infectious diseases physician and clinical pharmacist with infectious diseases training wherever resources allow.

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