

Emerging Antimicrobial Resistance & Antimicrobial Stewardship Program (TBD)



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The last two decades have witnessed an emergence of multi-drug resistant pathogens, not only in the healthcare and hospital-acquired settings, but also in the community. Infections with these pathogens have been associated with increased morbidity, mortality, length of hospital stay, and a marked increase in the cost of care.

Enterococcus sp., Staphylococcus aureus, Clostridium difficile, Enterobacteriaceae, Acinetobacter sp., and Pseudomonas aeruginosa have been the most troubling bacterial pathogens. In addition, Streptococcus pneumoniae and Haemophilus influenzae, which are the most common pathogens in community-acquired respiratory infections, have shown increased resistance over the past years.

Bacteria that were previously susceptible to penicillins are now resistant to even the broadest spectrum antibiotics in the market. Unfortunately, the pipeline for the development of new antibiotics is drying out. In the 1990s, serious discussions about antibiotic stewardship programs (AMS) began as a mean to preserve these precious agents for current and future use. The new core strategies for stewardship revolve around the concept of: i) combining effective infection control programs to limit the spread of antibiotic resistant clones with ii) the use of an antibiotic care bundle that optimizes therapy to result in superior treatment outcome and less antimicrobial resistance development.

A tertiary care Lebanese hospital has developed and

implemented a program for the prudent use of antibiotics based on the principles of antibiotic stewardship. The key points of establishing an Antimicrobial Stewardship Unit and implementing an antimicrobial stewardship program (ASP) are summarized below:

I. Goals of the Antimicrobial Stewardship Program

Primary Goals: optimize clinical outcomes; minimize unintended consequences of antimicrobial use (toxicity, selection of pathogenic organisms, emergence of resistance)

Secondary Goal: reduce healthcare costs without adversely affecting the quality of care

II. Process Measures in Evaluating ASP Impact

1. Restricted antimicrobial usage rate in percentage
2. Appropriateness of antibiotic drug choice/ avoidance of unnecessary combination therapy after 48-72 hours of empiric therapy, based on spectrum of activity and susceptibility of suspected or documented pathogens, and based on drug allergies, potential toxicity, and drug interactions.
3. Appropriateness of antibiotic drug regimen (dose, dosing interval, and route of administration) based on pharmacokinetics and pharmacodynamics.
4. Appropriateness of time of initiation of antibiotic therapy (with respect to time of surgery for prophylactic use and to time of cultures for therapeutic use).
5. Appropriateness of duration of antibiotic therapy/ avoidance of unnecessarily prolonged therapy.
6. Rate of acceptance of ASP recommendations (number of recommendations accepted/number of recommendations).
7. Rate of adherence to institutional guidelines, care bundles, policies, and procedures for antibiotic use
8. Impact assessments (*Clostridium difficile* rates, *Multi-Drug Resistant Organism* rates MDROs), using antibiogram results.
9. Antimicrobial treatment cost.

10. Other indicators (including but not limited to Defined Daily Doses)

III. Establishing an ASP Unit & Responsibilities

Core Members:

- a. **ID Physician:** to coordinate the program, lead educational and academic detailing, and report to hospital administration.
- b. **ID Trained Clinical Pharmacist:** to coordinate day-to-day activities and perform daily prospective audits with interventions and feedback.
- c. **Main Pharmacy Activity** to operate orders from the main pharmacy.
 - a. **Other:** Infection Control officer, IT member, nursing staff, microbiologist, trainees

Main Focus: Initially, unit core members will be reviewing the antimicrobials of patients after 48-72 hours of starting a certain anti-infective therapy. The scope of reviews can widen based on workload and time.

IV. Proposed Strategies of the Antimicrobial Stewardship Program

Prospective audit post 48-72 hours with direct intervention and feedback to the prescriber. This activity can be practiced from Monday to Friday.

Formulary restriction and preauthorization requirement.

The implementation of the ASP program initially will enable the institution to shorten the list of restricted antimicrobials as follows:

- Remove fluoroquinolone, third generation cephalosporins and fluconazole from the restriction list for adults.
- Remove third generation cephalosporins and fluconazole from the restriction list for pediatrics.
- Maintain restriction on the following: Carbapenems, Vancomycin, 4th and 5th generation cephalosporins, tigecycline, echinocandins, posaconazole, voriconazole, lipid formulations of Amphotericin B, colistin, linezolid, IV antiviral medications.

Education (Lectures and trainings):

Prospective audit and intervention are required with education because passive education alone (e.g. provision of seminars and written guidelines) is only marginally



effective in modifying prescribing behaviors.

Tailoring guidelines and clinical pathways to address local microbiology and resistance patterns, improving the likelihood of adherence.

Other supplemental elements:

- *De-escalation of therapy on the third day of empiric antibiotic use.*
- *Antimicrobial order forms with automatic stop orders and requirements for the prescriber to justify antibiotic use.*
- *Dose optimization.*
- *Parenteral-to-oral conversion for antimicrobial agents with excellent bioavailability when the patient's condition permits.*

The major barriers to implementing a good stewardship program are: limited access to infectious diseases and microbiology advice and support, lack of enforcement, lack of willingness to change, lack of senior clinical support, poor education and training, limited available resources to fund the AMS daily work and activities and lack of leadership.