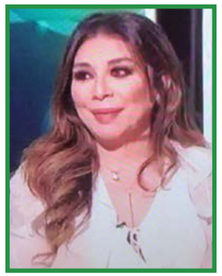
Antimicrobial Stewardship to Combat Antibiotic Resistance



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Introduction

Antimicrobial resistance (AMR) has become a threat to public health worldwide.[1] An increase in antimicrobial use is paralleled by an increase in the prevalence of resistance. This results in ineffective empiric therapy and thus increased hospital stay and resource utilization. The spreading AMR will definitely lead to limited treatment alternatives along with the paucity of newly developed antimicrobials. AMR is more prevalent in hospital setting compared with the community. To curb down AMR and improve antimicrobial use, evidence-based and multidisciplinary antimicrobial stewardship (AMS) programs have become a necessity.[2]

Definition of Antimicrobial Stewardship

Antimicrobial stewardship (AMS) is a term used to describe the integrated strategy of improving antimicrobial use in order to enhance patient outcomes, reduce antimicrobial cost, and minimize the side effects associated with antimicrobial use, including, drug toxicity, the selection of antimicrobial resistant organisms and nosocomial infections.[2-4]

Core Members of Antimicrobial Stewardship Program

Core members of a multidisciplinary antimicrobial stewardship team include an infectious diseases (ID) physician, a clinical pharmacist with infectious diseases training, a clinical microbiologist, an information system specialist, an infection control professional and a hospital epidemiologist.[2] Since AMS is considered as an important component of patient safety and a medical staff function, an ID physician usually directs the program. [2,3] The clinical pharmacist should be knowledgeable on the appropriate use of antimicrobials, and appropriate training should be made available to achieve and maintain this expertise.[2,3] The clinical pharmacist is responsible for the following: evaluating antimicrobial prescription patterns in the hospital, measuring antimicrobial consumption, continuous medical education, and consulting with the ID physician.[2,3] The clinical microbiologist is responsible for the rapid testing of AMR and quick reporting of positive cultures, especially for resistant organisms, in addition to frequent reporting of surveillance data on antimicrobial resistance.[2,3] The information system specialist should provide the computer support necessary for surveillance and implementation of recommendations.[2,3] The infection control professional and the hospital epidemiologist should coordinate efforts on improving antimicrobial use, because reduction of antimicrobial resistance is a common goal of these persons through the following: identification of MDROs detected among the population served by the hospital, the monitoring and reporting of trends over time involving MDROs as part of surveillance, identifying outbreaks of epidemiologically significant organisms, appropriate use of standard and transmission-based precautions aimed at preventing cross transmission of pathogens, compliance with hand hygiene, use of surveillance data to inform risk assessment and planning for prevention of infection.[2,5,6] The support and collaboration of the hospital administration is essential in the development and maintenance of AMS programs.[2,3]

Strategy of Antimicrobial Stewardship

There are two core strategies, both proactive, that provide the foundation for an antimicrobial stewardship program.[2] They are: ***(1) the front-end or pre-prescription authorization of specific agents and formulary restriction and (2) the back-end or post-prescription prospective audit with intervention and feedback.*** [2] Other supplemental elements to the core active AMS strategies based on local practice patterns and resources are: clinical guidelines and treatment algorithms, education, dose optimization, pharmacy-based dosing programs, and streamlining or de-escalation of empirical antimicrobial therapy.[2] For further explanation of each strategy, refer to Table 1.

Table 1- Antimicrobial stewardship Strategies

Strategy	Explanation
Formulary restriction and preauthorization requirements for specific agents	The Infectious Diseases physician reviews the order for appropriateness at the time it is written. Specific antimicrobials are restricted to use by certain prescribers or units, whereas others must obtain authorization. Antimicrobial order forms can help prompt clinicians to obtain approval.
Prospective audit with intervention and feedback.	The antimicrobial steward reviews existing antibiotic orders and provides clinicians with direct recommendations to continue, adjust, change, or discontinue the therapy based on the available microbiology results and clinical features of the case.
Clinical guidelines and treatment algorithms	Prompt the prescriber to make evidence-based antibiotic choices based on local antimicrobial resistance patterns, national guidelines, and relevant clinical factors
Education	Grand Rounds, conference presentations, house staff teaching sessions, e-mail alerts, and guidebooks * Education alone, without incorporation of active intervention, is only marginally effective in changing antimicrobial prescribing practices and has not demonstrated a sustained impact
Dose optimization	Use of pharmacokinetic and pharmacodynamic properties of antimicrobial agents to optimize drug efficacy based on organism, site of infection, and patient characteristics
Pharmacy-based dosing program	Algorithms empower pharmacists to transition bioequivalent drugs from intravenous to oral formulation; dosing and monitoring of antibiotics like vancomycin, colistin and aminoglycosides.
Streamlining or de-escalation of empirical antimicrobial therapy	Therapy on the basis of culture results and elimination of redundant combination therapy can more effectively target the causative pathogen, resulting in decreased antimicrobial exposure and cost savings

Core Elements of Antimicrobial Stewardship for Hospitals

Improving the use of antibiotics is an important patient safety and public health issue, and was identified by the Centers for Disease Control and Prevention (CDC) as a key strategy to address antibiotic resistance.2 The CDC recommends that all hospitals develop and implement their own AMS programs, in recognition of the urgent need to improve antibiotic use.7 The core elements of hospital AMS that assist hospitals in effectively implementing these programs are8:

1. Leadership commitment: Dedicating necessary human, financial, and IT resources. Leadership support is in a number of forms, including: formal statements of support for AMS accompanied by stewardship-related duties in job descriptions and annual performance reviews, supporting training and education, and ensuring that staff from relevant departments is given sufficient time to contribute to stewardship activities. Financial support greatly augments the capacity and impact of a stewardship pro- gram. These programs will often pay for themselves, through savings in both antibiotic expenditures and indirect costs.
2. Accountability: Appointing a single leader responsible for program outcomes and accountable to an executive-level or patient quality–focused hospital committee. Experience with successful programs shows that a physician leader is effective.
3. Drug expertise: Appointing a single pharmacist leader responsible for working to improve antibiotic use. Formal training in ID and/or AMS benefits stewardship program leaders.
4. Action: Improving prescribing through institution-wide policies related to antibiotic use and disease state management as well as patient-specific interventions. Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (e.g. antibiotic “time-out” after 48 hours)
5. Reporting: Regular reporting of antibiotic use and resistance rates to doctors, nurses, and relevant staff.
6. Education: Educating clinicians about infectious disease state management, resistance, and optimal prescribing. Education has been found to be most effective when paired with corresponding interventions and measurement of outcomes
7. Tracking: Monitoring process measures (e.g., adherence to facility-specific guidelines, time to initiation or de-escalation), impact on patients (e.g., Clostridium difficile infections, antibiotic-related adverse effects and toxicity), antibiotic use and resistance.

Conclusion

A comprehensive evidence-based stewardship program to combat antimicrobial resistance should be based on local antimicrobial use and resistance problems and on available resources that may differ, depending on the size of the institution or clinical setting.

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