

## What is Comprehensive Antibiotic Stewardship?

The goals of Antibiotic Stewardship (AS):

1. Preserve the effectiveness of antimicrobials within a facility or region by promoting their intelligent, restrained and coordinated use.
2. Assist physicians with the complex process of selecting and dosing antimicrobials while minimizing collateral damage to the patient and other patients in the hospital.
3. Improve the outcomes for patients with infections.

Some areas often addressed by an AS program include:

- a. Minimizing suboptimal antibiotic selection, dosing, duration or de-escalation which, if not accomplished correctly, result in excessive lengths of stay in the hospital and actually promote new hospital acquired infections. See [Vignettes 1](#) and [Vignette 2](#) for graphic illustration.
- b. Detection and prevention of Adverse Drug Reactions such as fever, acute renal failure, rash, Clostridium difficile, etc.
- c. Detection and avoidance of deleterious Drug-Drug interactions.
- d. Assistance for prescribers in the interpretation of Complex Clinical Microbiology reports.
- e. Detection and prevention of the proliferation of Multidrug Resistant organisms.
- f. Improving outcomes of Sepsis and Septic Shock.
- g. Education programs. Serve as a reference source to the medical staff and other hospital personnel.
- h. Optimizing the length of time from antibiotic order to time of administration of the correct antimicrobial (delays worsen outcomes).

**Addressing all of these areas and goals effectively requires a Comprehensive AS Program. Without Antibiotic Adjuvant (AA), such a program is an enormous and highly complex task requiring expertise and personnel beyond the capacity of most hospitals.**

**Keep in mind that, at any given time, 45-60% of patients in an acute care hospital are receiving systemic anti-microbials and ~30-50% of antibiotic usage is either suboptimal or inappropriate. Effectively addressing this number of cases each day is simply not practical using current systems. Heretofore, the molding of disordered patterns of hospital antibiotic use, heterogeneous disease types and diversity of physicians into a coordinated and adaptable campaign against resistant bacteria and nosocomial infections has been beyond the reach of hospitals. The IT approach of AA makes Comprehensive AS feasible, even in skilled nursing facilities and medical offices, and can even be used for regional stewardship.**

Often hospitals have some of the activities of a more comprehensive AS program, such as:

- Vancomycin pharmacokinetic monitoring.
- Dosing adjustments for abnormal renal function.
- Calling/messaging physicians for:
  - Use of restricted antibiotics.
  - Dosing suggestions.
  - Bug-Drug mismatches. Many times, this type of ‘intervention’ may be clinically irrelevant or actually encourage inappropriate antibiotic use due to the common mistake of interpreting asymptomatic colonization as infection. Sputum, wound and urine cultures are all subject to frequent misinterpretation in this regard.
  - Duration of antibiotics at specific sign posts.
  - These calls are a serious time expense for already over-extended pharmacists and physicians. Commonly, calls are from general pharmacists who have limited training in infectious diseases, making for frequent inappropriate recommendations or physician irritation.
- Restriction of specific antibiotics, often based largely and inappropriately on drug acquisition cost.
  - May inadvertently predispose to **more** resistant bacterial clonal expansion by preventing a healthy mix of antibiotic classes in the hospital.
  - May cause the AS program to be misperceived by clinicians as solely an administration drug cost-saving measure rather than a patient care improvement and safety initiative. Cooperation between the prescribers and the AS program can be compromised.

While many of these activities are useful, they are labor intensive and cannot, in themselves, reliably address the big picture of antibiotic use or quickly adapt new usage patterns in response to the presence of a new resistant clone. For these reasons most AS programs fall short on several levels.

**Comprehensive AS Characteristics as available in a single package from AA. In summary:**

- AA decision support algorithms are embedded in the CPOE in the normal physician work flow and perform the functions listed above automatically, saving pharmacists hours of time each day and adding important capabilities.
- Affect nearly all antibiotic prescriptions via adaptable, syndrome specific algorithms.
- Assistance with culture interpretation, de-escalation, duration and dosing of treatment.
- Automated vancomycin dosing adjustment algorithms.
- Administrator's dashboard providing, often for the first time, the ability to visualize the costs and outcomes of this most common, but highly heterogeneous, subgroup of patients that have infections. Administrators can see the infection ‘product line’ and AS in the larger context, not just as a matter of antibiotic acquisition costs. The costs of nosocomial infections, delayed patient clearance of infection and multi-drug resistant infections become clear, allowing focused care initiatives.
- Ability to monitor resistance patterns within the facility concurrently and adjust treatment recommendations based on patient specific and/or hospital (or unit) specific resistance patterns.

- Augmented Infection Control dashboard that lists all physician designated nosocomial infection events, making comprehensive infection control practical.
- Assist physicians and nurses in monitoring patients for antibiotic complications or dosing changes. For example:
  - Renal function changes
  - Hepatotoxicity
  - Diarrhea
  - Eosinophilia
  - Drug blood levels
  - Significant drug-drug interactions.
- Augmented hospital pharmacists and physician efficiency.

In short, Antibiotic Adjuvant provides a virtual ID pharmacist or ID specialist with every doctor for nearly every antibiotic prescription creating, for the first time, affordable effective Comprehensive Antibiotic Stewardship.