

Technology in the Fight Against Antibiotic Resistance

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Antibiotic resistance is one of the greatest threats to global health today. In the U.S. alone, more than [2.8 million antibiotic-resistant infections](#) occur each year, and more than 35,000 people die as a result. This translates to a death every 15 minutes as a result of an antibiotic-resistant infection. Future projections suggest that by 2050, [10 million mortalities a year](#) will result from antibiotic-resistant bacteria, leading to a 2 to 3.5% reduction in Gross Domestic Product and costing the world up to \$100 trillion.

Antibiotic resistance occurs naturally, but overuse of antibiotics is drastically accelerating the process. Reducing the profligate use of antibiotics is a crucial element in preventing further bacterial resistance from emerging.

Reducing Antibiotic Use in the Hospital

Hospital antibiotic stewardship programs (ASPs) can reduce inappropriate antibiotic use and are now a mandatory entity in all U.S. hospitals. The [new rule](#) from the Centers for Medicare & Medicaid Services (CMS) dictates that all hospitals will be required to have infection prevention and control and stewardship programs in place by March 30, 2020 in order to receive payments from the agency. Hospital accrediting bodies such as The Joint Commission have required antibiotic stewardship programs in hospitals since 2017.

An ASP is designed to provide guidance for the safe and cost-effective use of antibiotic agents. This evidence-based approach addresses the correct selection of antibiotic agents, dosages, routes of administration and duration of therapy. Such programs not only decrease antibiotic resistance, adverse drug events and hospital length of stay, but they can also save money for healthcare institutions. A [University of Maryland study](#), for example, showed \$3 million in cost savings in the first three years of an ASP.

According to the CDC, [20 to 50% of antibiotic use](#) is unnecessary and inappropriate. While preventing infections is the first defense against antibiotic resistance, perhaps the single most important action needed to greatly slow down the development and spread of antibiotic-resistant infections is to change the way antibiotics are prescribed.

Examples of interventions to prevent overuse or overprescribing of antibiotics in hospitals include:

- Use of rapid diagnostic testing
- Restricting broad-spectrum antibiotics
- Shortening the duration of therapy through automatic stop orders
- Basing treatment on patient pharmacokinetic and pharmacodynamic characteristics
- Developing institution-specific treatment guidelines
- Therapeutic review with comprehensive feedback and provider education.

Leveraging Technology to Optimize Antibiotic Therapy

With so many components to a successful ASP, technology, such as clinical decision support systems (CDSSs) is critical to maximize program efficiency and effectiveness. Based on a sophisticated set of customizable rule engines, CDSSs can provide prompts and reminders to assist healthcare providers in implementing evidence-based clinical guidelines at the point of care.

CDSSs operate by continuously monitoring patient data to alert clinicians in real time of potential infections, drug-bug mismatches, multidrug-resistant organisms, isolation candidates, test results and reportable infections. These alerts help to identify patients for potential interventions. Several studies have demonstrated that CDSS implementation increases the number of antibiotic interventions that can be made by as much as [87%](#). A significant time reduction in both de-escalation and escalation to appropriate antibiotic therapy has also been demonstrated.

Customization of the electronic health record (EHR) is another electronic tool that can bolster an ASP program. EHR capabilities may include tracking interventions, dose checking alerts, best practice guided order sets, antibiotic time-outs, antibiotic restriction processes, intravenous to oral conversion monitoring and tracking antibiotic prescribing practices.

Reporting on Facility and State Improvements

Technology can also be a [major asset](#) for the electronic reporting of antibiotic use and antibiotic resistance data to the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN). Although currently voluntary, NHSN antibiotic use and/or antibiotic resistance reporting has been identified as one option for eligible hospitals to meet Public Health Registry reporting criteria under Stage 3 of the CMS Meaningful Use (MU3) Program. The information must be submitted electronically in Health Level Clinical Document Architecture format. Manual data entry is not available for the Antibiotic Use and Resistance Module.

Collecting, analyzing and reporting data on antibiotic use and then using that information to improve prescribing practices is the foundation of a successful ASP leading to decreased antibiotic resistance. Technology such as CDSSs and EHR customization not only enables program metric tracking and reporting, it allows an ASP to reach a larger patient population and optimize resource utilization.