



The Compelling Case for Redefining the Use of Antibiotics



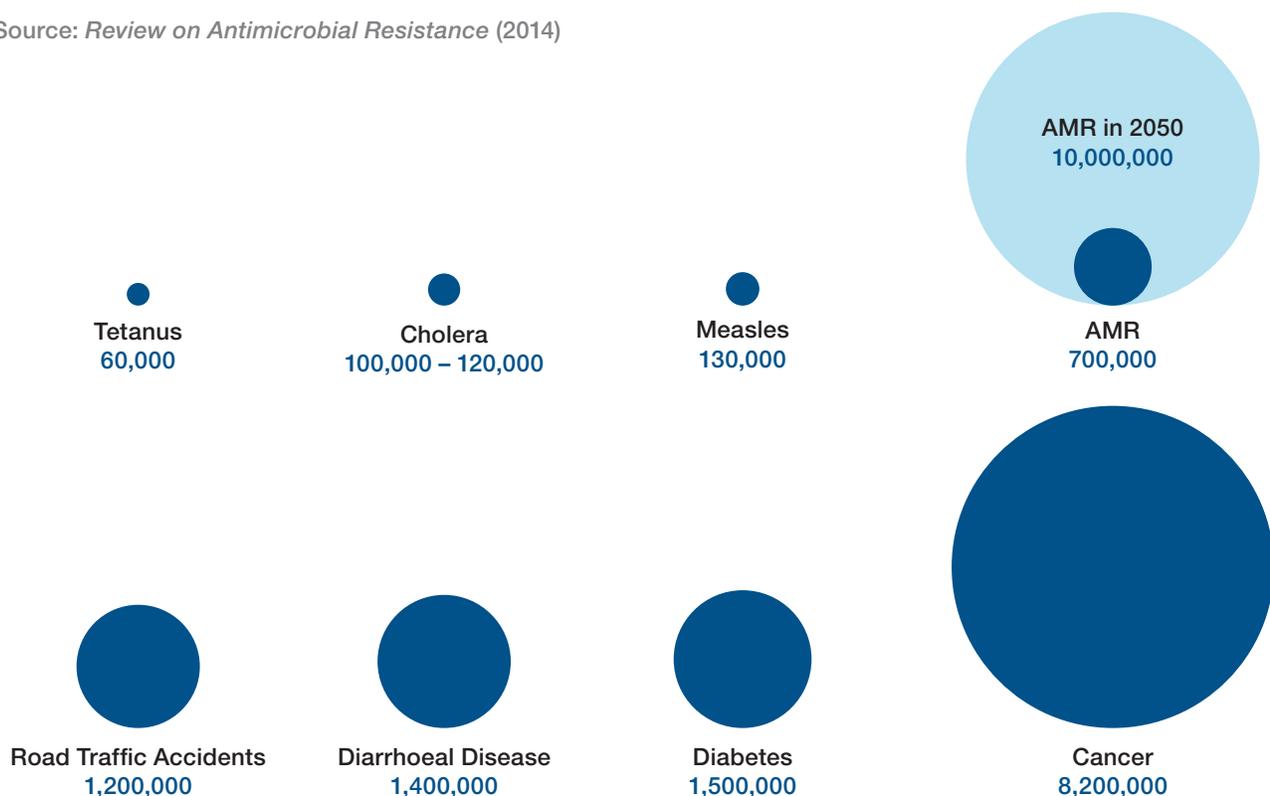
Antibiotic Stewardship: Preserving Antibiotics for the Next Generation and Building a Foundation for Population Health

Contrary to the widely held belief, antibiotics – drugs that kill or inhibit bacterial growth – often cause more harm than benefit. Each prescription contributes to the rise of antibiotic-resistant bacteria and diminishes the arsenal of effective treatments. The overuse of antibiotics has compromised our health and safety, and cost billions of healthcare dollars. Antibiotics are the only medications that may negatively impact someone other than the patient recipient.

To put the antibiotic resistance problem into context, findings by noted economist and former Goldman Sachs chairman, Jim O'Neill, are telling. Commissioned by Britain's Prime Minister, David Cameron, and chaired by O'Neill, the *Review on Antimicrobial Resistance* concluded that by 2050, more people will die from antibiotic resistance than cancer. Taken further, the Review analysis reveals that antimicrobial resistance (AMR) will be the cause for more than six times as many annual deaths as diabetes.¹

Deaths Attributed to Antimicrobial Resistance (AMR) Every Year Compared to Other Major Causes of Death

Source: *Review on Antimicrobial Resistance* (2014)



¹ "Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations." *The Review on Antimicrobial Resistance*. (2014)

The chilling conclusion foreshadows a world in which contracting common infections and undergoing routine surgeries can be deadly. Of course, one need not imagine the future to see evidence of the problem; it is here and now. “Each year in the United States, at least 2 million people become infected with bacteria that are resistant to antibiotics and at least 23,000 people die each year as a direct result of these infections.”²

A troubling aspect of antibiotic resistance is how rapidly the crisis-level problem has advanced. On March 14, 1942, U.S.-made penicillin was used to successfully treat the first patient for septicemia, or blood poisoning. Surprisingly, this one treatment exhausted half of the available supply of penicillin in the entire U.S. Up until this point, infectious diseases were a leading cause of death. In coordination with the Allied forces’ invasion of Normandy, scientists worked around the clock to manufacture 2.3 million doses of penicillin in preparation for the D-Day landings on June 6, 1944. This point marked the beginning of the antibiotic era.³

Since then, the antibiotic “wonder drugs” have saved millions of lives, but as quick as the rise, we now witness the precipitous decline of the effectiveness of antibiotics and the unmistakable advance of the post-antibiotic era. It’s not that this is surprising. Alexander Fleming, the Scottish scientist known for discovering penicillin, warned of the dangerous potential for resistance over 70 years ago.

“...the thoughtless person playing with penicillin treatment is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organism.”

According to the CDC, 20-50% of all antibiotics prescribed in U.S. acute care hospitals are either unnecessary or inappropriate. Patients who are unnecessarily exposed to antibiotics are placed at risk for serious adverse events with no clinical benefit. The misuse of antibiotics has also contributed to the growing problem of antibiotic resistance, which has become one of the most serious and growing threats to public health.⁴

The overuse of antibiotics has many causes, including the following:

- Lack of emphasis on diagnostic tests
- Patient perception of antibiotics as a cure-all
- Empiric use of broad-spectrum antibiotics “just in case”
- Failure to adjust treatment upon receipt of test results
- Lack of familiarity regarding the community antibiogram – a measure of the degree of antimicrobial resistance (essentially the microbiologic epidemiology of a region)
- The aggressive use of antibiotics historically has been the prevailing best practice strategy

To address these precipitating factors, and with an urgent need to improve antibiotic use, the CDC advised acute care hospitals to implement **antibiotic stewardship programs** (ASPs). That recommendation is reinforced by the Centers for Medicare & Medicaid Services’ (CMS) current intention to require all acute care hospitals and long-term care facilities to incorporate an ASP as a *mandatory* **Condition of Participation**.

ASP Core Elements

In response to the rapidly growing resistance threat, the CDC released the Core Elements of Hospital Antibiotic Stewardship Programs. By means of the National Healthcare Safety Network Annual Hospital Survey, the CDC revealed that only 39% of hospitals met all seven of the core elements. The level of core elements engagement dropped to 25% for hospitals with less than 50 beds.⁵

CDC’s Core Elements of Hospital Antibiotic Stewardship Programs:

- 1 **Leadership Commitment:** Dedicating necessary human, financial, and IT resources
- 2 **Accountability:** Appointing a single physician leader responsible for program outcomes
- 3 **Drug Expertise:** Assigning a single pharmacist leader responsible for technical support

² “Antibiotic/Antimicrobial Resistance.” Centers for Disease Control and Prevention. (2016)

³ “The Challenges of Mass Production.” The National WWII Museum publication.

⁴ “Antibiotic/Antimicrobial Resistance.” Centers for Disease Control and Prevention. (2016)

⁵ “Antibiotic Stewardship Programs in U.S. Acute Care Hospitals.” American Pharmacists Association. (2016)

- 4 **Action:** Implementing specific, proven interventions, e.g., antibiotic time-outs (reassess continuing need and choice of antibiotics within specified time period)
- 5 **Tracking:** Monitoring antibiotic prescribing and resistance patterns
- 6 **Reporting:** Informing key stakeholders of progress with regard to antibiotic use and resistance
- 7 **Education:** Providing regular updates on antibiotic prescribing, antibiotic resistance, and infectious disease management using multiple means of communication

Proven and Powerful Clinical Successes

Successful ASPs are complex undertakings. When properly implemented, these programs are proven to reduce bacterial resistance and thus improve patient outcomes. Moreover, the return on investment has proven significant, with lower facility operating costs attributable to improved prescribing practices.

ASP Case 1 – Western South Dakota

Upon identifying a rapid increase in antibiotic resistance within a community, a pioneering infectious disease (ID) specialist, James M. Keegan, MD, spearheaded a long-standing ASP serving western South Dakota. This ASP involved a health system with multiple hospitals and their medical staff, including both employed and independent physicians. The regions served included urban, rural, frontier communities, and several Native American reservations. Dr. Keegan pursued partnerships with pharmacists and other colleagues to analyze prescribing trends, which revealed the overuse of antibiotics. He then enlisted a team to identify and implement specific interventions to reverse these trends. Armed with data, Dr. Keegan was able to provide valuable feedback and education for community providers, which generated an ongoing commitment to the ASP.

Within a short period of time, the community antibiogram stabilized. In fact, the protocols and processes limiting the use of antibiotics decreased the incidence of MRSA, *Clostridium difficile* (*C. difficile*), and resistant gram negative bacteria to numbers significantly below national averages.

ASP Case 2 – Rural South Dakota

With the support of the South Dakota Department of Health, Dr. Keegan and his team led the implementation of an ASP in a more rural South Dakota community. Participants included the community's physicians, hospital, pharmacy, long-term care facilities, and developmental center.

Within a year, the community moved its antibiogram from below, to significantly ahead of, the state average. The providers far exceeded CDC recommendations by reducing antibiotic use by 40%, including a nearly 60% drop in broad spectrum antibiotic use. A measurable decrease in resistant bacteria was noted, with greater improvement over time.

Impressive Returns on Investment

In both cases, the hospitals realized substantial savings in pharmacy costs and the associated expenses related to the reduced incidence of resistant bacterial infections. These results are also consistent with the findings of the Infectious Disease Society of America and Society of Healthcare Epidemiology of America, which reported the following returns on investment for hospital-based ASPs:

Facility	Beds	ROI	Team Leaders
Monroe, Louisiana Community Hospital	120	\$177,000 in 1 year	ID Specialist, Clinical Pharmacist
Dallas, Texas LTAC Hospital	60	\$159,580 in 15 months	ID Specialist, Director of Pharmacy
Dorchester, Massachusetts Community Hospital	159	\$200,000-250,000 in 1 year	ID Specialist, ID-Trained Pharmacist
Baltimore, Maryland Academic Medical Center	800	\$2,949,705 in 3 years	ID Specialist, Clinical Pharmacist
Winston-Salem, North Carolina Academic Medical Center	880	\$920,070 to \$2 million per year over 11 years	2 ID Specialists, 3 Clinical Pharmacists
Buffalo, New York Community Hospital	184	\$145,000 in 1 year	ID Physician Group, Clinical Pharmacy Group

According to data from the CDC and the Infectious Diseases Society of America, a comprehensive antibiotic stewardship program can reduce antibiotic use by **22-36%**.⁶ This provides a simple, yet reliable, way to estimate your organization's potential direct cost savings from implementing an ASP. Most likely, indirect savings from lower infection and complication rates will be greater than these direct cost savings.

Clostridium Difficile

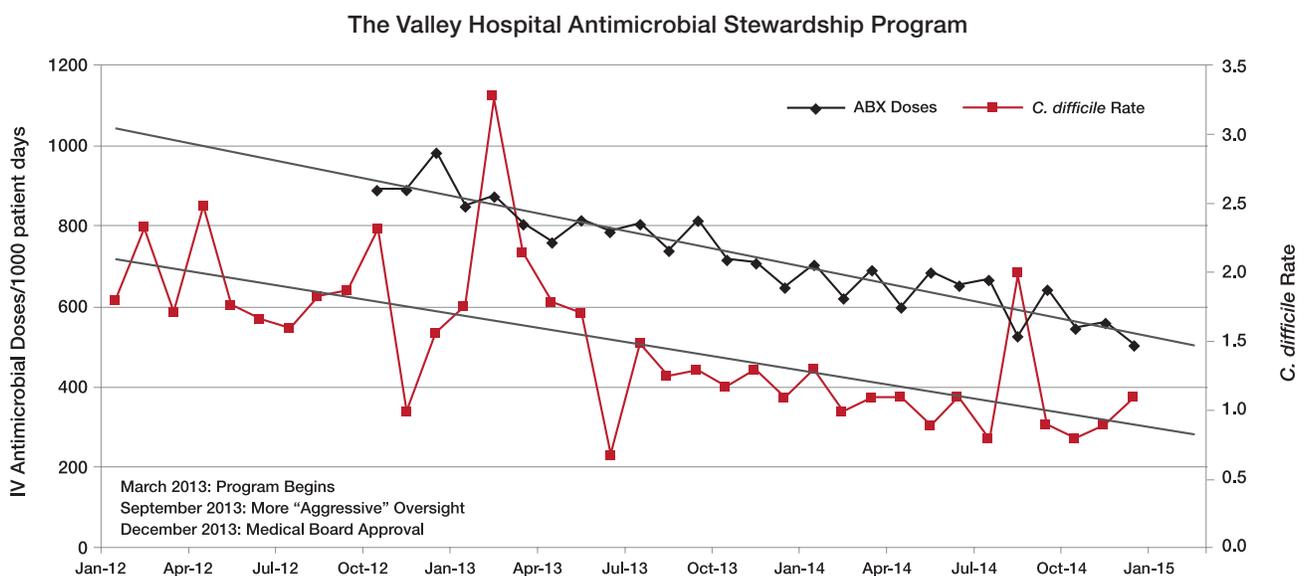
The CDC's antibiotic resistance threat assessment includes three bacteria in their highest-consequence, most hazardous, URGENT ranking. They are Carbapenem-resistant *Enterobacteriaceae* (CRE), drug-resistant *Neisseria gonorrhoeae* (cephalosporin resistance), and *C. difficile*.

C. difficile, a healthcare-associated infection, is spread through contact with contaminated surfaces. It is a spore-forming bacteria that is the number one nosocomial in the U.S. *C. difficile* causes inflammation of the colon and diarrheal symptoms, and 15,000 U.S. deaths are attributed to it annually. It is directly linked to antibiotic use and is present in most hospital settings in the U.S.

This relationship is depicted in numerous studies showing a reduction of fluoroquinolone use and other antibiotics with anaerobic activity correlated with a corresponding decrease in incidence of *C. difficile*.

1. CDC study showed that a 30% decrease in the use of antibiotics linked to *C. difficile* infections in hospitals could reduce the deadly infections by more than 25% in hospitalized and recently discharged patients.
2. Recent study from a Canadian hospital found that a 10% decrease in overall antibiotic use across different wards was associated with a 34% decrease in *C. difficile* infections.
3. CDC study among patients without a recent hospitalization or nursing home stay (*i.e.*, community-associated cases) found that a 10% reduction in the use of all antibiotics in outpatient settings could reduce *C. difficile* infections by 16%.
4. In England in recent years, the number of *C. difficile* infections has been reduced by well over 60%, largely due to improvements in antibiotic prescribing.⁷

Relationship Between Total Administered Intravenous (IV) Antimicrobial (ABX) Doses and the Rate of Clostridium difficile Infection



⁶ "Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship." Oxford Journals, 44(2), 155-159. (2007).

⁷ [CDC Newsroom Press Release](#). (February 2015).

According to Dr. Keegan, “As we learn more about the human microbiome, the use of broad spectrum therapy may be analogous to the use of chemotherapy. The latter is a strategy that, in order to treat cancer, ends up killing other normal healthy cells such as bone marrow, intestinal cells, and even cells that grow hair. Broad spectrum antibiotics, in treating a specific pathogen, also kill normal commensal bacteria that work within our immune system and help protect us from those very pathogenic bacteria [*C. difficile*]. An additional challenge for physicians in making antibiotic treatment decisions is they are not usually privy to the epidemiologic information available and therefore not aware of the epidemiologic impact of those decisions.”

Broad spectrum antibiotics compromise our beneficial gut flora and allow *C. difficile* to take hold. This deadly infection is extraordinarily expensive for healthcare providers to treat due to the need to segregate patients and the steep environmental costs related to disinfecting patient areas. With a national hospital incidence rate of approximately 7.5-7.6 cases per 10,000 patient days, the healthcare costs for *C. difficile* are staggering. PYA’s analysis of hospital-reported *C. difficile* cases revealed that 811 facilities in the bottom two performing quartiles have an aggregate *C. difficile* expense of \$695 million – based on an average \$10,000 cost per incidence. A 12% reduction of *C. difficile* cases for this group would add, on average, over \$100K to each hospital’s bottom line.



DIAGNOSED WITH *C. DIFFICILE* EXPERIENCED A RECURRENCE



PATIENTS AGED 65 OR OLDER WITH A HEALTHCARE-ASSOCIATED *C. DIFFICILE* INFECTION DIED WITHIN 30 DAYS OF DIAGNOSIS.

Building the Foundation for Population Health

ASPs also offer a “quick win” opportunity for clinically integrated networks (CINs) and accountable care organizations (ACOs). Many newly formed CINs and ACOs struggle to identify initiatives to build working relationships among their members. Given the structure and discipline of an ASP, the “all-in” nature of program participation, and proven potential for immediate financial and clinical results, these programs can serve as a foundation for broader collaboration among community providers.

A hospital ASP has been shown to improve patient care, reduce costs, and improve the overall health of a community. It delivers a Triple Aim result that pays for itself with direct cost savings alone.

“Ideally,” says Dr. Keegan, “providers and patients would benefit from an approach of **aggressive diagnostics and conservative therapeutics.**” Working together, providers can establish and enforce evidence-based standards of care to improve outcomes and reduce costs.

ASPs also provide a path for greater patient engagement. As Dr. Keegan explains, “Patients need to be informed of their diagnoses – whether viral or bacterial. If viral, a provider then can educate patients so they understand why antibiotics will not be prescribed and why this is best for them.” Avoidance of antibiotics for common colds and viruses will improve the body’s ability to respond to antibiotics, should they be necessary in the future to treat a serious bacterial infection. By sharing the science, providers can promote patient responsibility and greater satisfaction with their care.

“The problem of antibiotic resistance is about science and economics, and it faces society itself, locally and globally, with hard questions, too. It pits individual benefit against the common good: your sore throat, our ability to survive a hospital stay. It demands recognition that a personal benefit may at a distance have a much greater cost.”⁸

⁸ [The Guardian View on Antibiotic Resistance: Walk Softly, Carry a Big Stick.](#) (May 2016).

Supportive Leadership

Making the commitment to a successful ASP is the critical first step, but successful and sustained implementation of specific initiatives is the key to improved outcomes. This requires a coordinated, comprehensive approach with ongoing monitoring, reporting, and education.

Objectivity is imperative to ASP success. Physicians are motivated by evidenced-based, best practice initiatives. The PYA ASP team, led by Dr. Keegan, has a proven record of transformational change and success. Their driving philosophy is to partner and guide prescribers, provide timely feedback, and mentor the process to build conformity and consistency within the program.

Key PYA Services:

- 24/7 access and support from infectious disease physician and team
- More than 20 years of ASP experience with proven results
- Engagement of local physician and pharmacy champions
- Quality management practices guidance
- Concurrent monitoring of prescribing activity and microbiology patterns
- Ongoing review and data analysis to ensure ASP sustainability

- Transparent reporting of outcomes
- Robust safety bundle recommendations
- Transformational change
- Process improvements through Lean methodology
- Antibigram education
- Development of specific, individualized protocols based on local antibiograms

Utilizing the supportive leadership of a team with practical experience in employing evidence-based medicine and best practice solutions can make all the difference in improving outcomes and reducing costs.

To discuss how PYA's ASP team can serve you, please contact:

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