

Antimicrobial Stewardship

The View From California

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Abstract: The passage of California Senate Bill 739 in 2006 created a mandate for the Healthcare-Associated Infections Program at the California Department of Public Health to conduct healthcare-associated infections surveillance, prevention, and annual reporting in all general acute care hospitals as well as mandatory public reporting of specific process measures. Specific wording requires “that general acute care hospitals develop a process for evaluating the judicious use of antibiotics, the results of which shall be monitored jointly by appropriate representatives and committees involved in quality improvement activities.” This makes California the first and still only state in the United States to enact such antimicrobial stewardship program legislation. This article discusses the available up-to-date specifics of this legislation allowing one to speculate that mandatory hospital-based antimicrobial stewardship programs may be on the horizon across the entire United States.

Key Words: antibiotic stewardship, California AntibioGram Project, antibiotic resistance, California Antimicrobial Stewardship Program Initiative

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Antimicrobial stewardship is currently one of the most popular buzzwords in infectious diseases (ID). The concept of antimicrobial stewardship should have been a basic tenet of medical training for more than 50 years and part of fellowship training almost as long as fellowship training started. However, 30% to 60% of antimicrobials prescribed in the hospital^{1–3} and 25% to 75% of antimicrobials prescribed in long-term care facilities remain unnecessary and inappropriate,⁴ evidence that current training is insufficient, ineffective, or unable to change the culture of overprescribing.

It is generally accepted that antimicrobial resistance directly reflects the frequency of use of various antimicrobial agents, with an impact on selective pressure. Even in 1979, Ma et al^{5,6} wrote about a single institution’s experience with the development of resistance in common healthcare-associated pathogens, gram-negative bacilli, due to antibiotic use. More recently, in 2007, the Infectious Diseases Society of America and the Society of Hospital Epidemiology of America produced guidelines for developing multifaceted “institutional programs to enhance antimicrobial stewardship, an activity that includes appropriate selection, dosing, route, and duration of antimicrobial therapy”

with the goal of optimizing “clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms . . . and the emergence of resistance.”⁷ Most resistant pathogens have no survival advantage over their susceptible relatives other than their resistance to antimicrobial agents, and are usually less fit.⁸ Remove the agents, and their survival advantage is also removed. Darwin would undoubtedly be a strong supporter of antimicrobial stewardship.

The issues of patient safety when using unnecessary and inappropriate medications coupled with an increasing financial burden of health care–associated infections (HAIs) due to resistant organisms has gained the attention of the press, public, health insurance industry, state legislators, US Congress, the President, and the health insurance industry. This has increased the selective pressure on hospitals and clinicians to establish antimicrobial stewardship programs (ASPs).

California, often considered a leader and harbinger of future change, enacted Senate Bill 739 in 2006, equivalent to California Health and Safety Code sections 1288.5 to 1288.9, establishing the HAI Program at the California Department of Public Health (CDPH). The HAI Program is mandated to conduct HAI surveillance, prevention, and annual reporting in all general acute care hospitals as well as mandatory public reporting of specific process measures. Legislation enacted in 2008 subsequently mandated HAI-specific public reporting. Of note, Senate Bill 739 also established the California HAI Advisory Committee, which is required to provide recommendations related to public reporting and the use of national guidelines for HAI prevention to CDPH.

Specific wording of Senate Bill 739, under California Health and Safety Code section 1288.8.a, stipulates that “by January 1, 2008, [CDPH] shall take all of the following actions to protect against health care associated infections (HAI) in general acute care hospitals statewide 4: Require that general acute care hospitals develop a process for evaluating the judicious use of antibiotics, the results of which shall be monitored jointly by appropriate representatives and committees involved in quality improvement activities.” (California Health and Safety Code section 1288.8[a]). Without a regulatory backbone as of yet, CDPH’s interpretation of the law is that each general acute care hospital in California must have an ASP, making California the first and still only state in the United States to enact such legislation.

CDPH has gradually established infrastructure to support this unfunded mandate via the California ASP Initiative. This Initiative was started in February 2010 as a part of the HAI Program. The objective of the California ASP Initiative is to assist all California hospitals and long-term care facilities optimize antimicrobial use to improve patients’ outcomes.

Specific activities of the California ASP Initiative are noted in Table 1. Special settings that the California ASP Initiative is focusing on include long-term acute care hospitals, small and rural hospitals, and long-term care facilities. One justification for the role of public health in promoting antimicrobial stewardship

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TABLE 1. Activities of the California Antimicrobial Stewardship Program Initiative

- Assess ASPs Statewide
- Assist hospitals to develop/strengthen ASPs Programs
- Provide data for administrative buy-in
- Identify successful setting-specific strategies
- Develop regional collaborations
- Strengthen legislation/regulations

is the absence of published recommendations for stewardship programs in these settings. Stewardship programs had initially developed primarily in academic centers, dependent on resources such as ID training programs and ID pharmacists unavailable elsewhere. Additionally, an Antibiotic Metrics Working Group charged with developing external and internal benchmarking recommendations with respect to ASPs across all California hospitals has been established. Their proposed benchmarking metrics are listed in Table 2 and will be submitted to the CDPH’s HAI Advisory Committee for support in 2012.

To collect antimicrobial susceptibility data, the HAI Program revived the California AntibioGram Project in July of 2011 to monitor resistant organisms such as extended-spectrum β-lactamases and carbapenem-resistant *Enterobacteriaceae* as well as a variety of other antibiotic/organism combinations listed in Table 3 deemed to have public health importance. To date, more than 25% of California hospitals have voluntarily submitted their data for 2008–2010, including which Clinical and Laboratory Service Institute breakpoints were used to identify resistant organisms.

As more criterion standard approaches to antimicrobial use surveillance are developed and as hospitals establish clinical decision support systems to sustain internal infrastructure, there are preliminary plans for developing and implementing an annual Web-based voluntary antimicrobial utilization surveillance system specific to California hospitals. This system would guide hospitals in comparing antimicrobial utilization with similar hospitals of such data. The metric to be used would likely be annual days of therapy/1000 patient days for specific antimicrobials; however, details about the proposed system are still under development.

EDUCATIONAL REQUIREMENT

As referred to earlier, the CDPH HAI Advisory Committee has made recommendations to CDPH regarding ASPs that are being incorporated into California regulations. One such recommendation, made in February 2011, requires a formal education course on ASPs for the hospital ASP physician and pharmacy champion. Although recommended, this is not yet required because the regulation has not been finalized, but it is likely that this will be a requirement for general acute care hospitals in California.

Many professional societies and some independent educational contractors have begun to offer symposia and/or courses on ASP, including the Infectious Diseases Society of America and the Society of Hospital Epidemiology of America, both online

TABLE 2. Proposed External Benchmarking Metrics for California Antimicrobial Stewardship Programs

1. Antimicrobial susceptibility data
2. Antimicrobial use data
3. *Clostridium difficile* rates from hospitals

TABLE 3. Resistant Organisms to be Monitored by the California AntibioGram Project

| Organism | Antibiotics |
|---|--|
| <i>Enterococcus faecalis</i> and <i>Enterococcus faecium</i> | Ampicillin |
| | Vancomycin |
| <i>Staphylococcus aureus</i> | Oxacillin, methicillin, or nafcillin |
| | Clindamycin |
| | Tetracycline, doxycycline, or minocycline |
| | Trimethoprim/sulfamethoxazole |
| | Vancomycin |
| <i>Klebsiella</i> species and <i>Escherichia coli</i> and <i>Enterobacter</i> species | Rifampin |
| | Ceftriaxone or cefotaxime |
| | Cefepime |
| | Piperacillin/tazobactam |
| | Ertapenem |
| | Imipenem, meropenem, or doripenem |
| | Ciprofloxacin or levofloxacin |
| | Trimethoprim/sulfamethoxazole |
| | Gentamicin or tobramycin |
| | <i>Acinetobacter baumannii</i> and <i>Pseudomonas aeruginosa</i> |
| Cefepime | |
| Piperacillin/tazobactam | |
| Imipenem, meropenem, or doripenem | |
| Ciprofloxacin or levofloxacin | |
| Gentamicin or tobramycin | |
| Amikacin | |

and in person. The Infectious Diseases Association of California also began to offer an ASP course specifically geared to the California legislative mandate. The first was held in Marina del Rey, CA, on August 13, 2011, with an overflow attendance. The elements and goals of the course were to give attendees a toolkit to develop an ASP. This included:

1. Understand California-specific ASP mandates and the components necessary for an ASP to satisfy requirements CDPH.
2. Understand the importance of collaboration among physicians, pharmacists, microbiologists, informatics personnel, infection preventionists, quality department personnel, and hospital administrators to ensure successful ASP implementation.
3. Understand the roles of the antibiogram, rapid diagnostic modalities, and drug use monitoring in an ASP.
4. Identify “low hanging fruit” that can be addressed when starting and sustaining a new ASP.
5. Discuss advanced strategies, “beyond the essentials,” to enhance an ASP.
6. Identify strategies on presenting a “return on investment” (ROI) to hospital administration.

FACILITY-SPECIFIC ASPs

Whereas certain tenets of an ASP are basic to all facilities, differentiation between small and rural hospitals, semi-urban community hospitals, and tertiary/teaching centers is essential. The California ASP Initiative has acknowledged that ASPs developed at each health care facility may look different. The issues and problems that need to be addressed at each facility vary not only by hospital bed size but also by patients’ demographics, length of stay, and levels of prior health care contact in the community. It is envisioned that there will be adaptive variations

to ASP activities performed at the individual facility based on those cited factors. The California ASP Initiative is continuing to assist health care facilities to best levy their own resources in fostering successful facility-specific ASPs.

In addition, it is the economic and fiduciary responsibility of physicians, hospital administration, and hospital staff to establish ASPs for the primary purpose of improving the quality of patient care with collateral benefits on reducing costs and limiting the development of resistance.

In April 2012, the Society of Healthcare Epidemiology of America, the Infectious Diseases Society of America, and the Pediatric Infectious Diseases Society issued a policy statement on antimicrobial stewardship including a recommendation that ASPs be required through regulatory mechanisms, specifically, that the Center for Medicare and Medicaid Services require participating health care institutions to develop ASPs.⁹ This statement should add to the impetus for other states and potentially the federal government to follow California's lead.

In conclusion, California is the only state to require hospitals to monitor antibiotic use to date. The California ASP Initiative was established to support this unfunded mandate and has uncovered a huge need for education, guidance, and benchmarking regarding ASPs. Thus far, the Initiative has mobilized current state momentum by assisting hospitals and long-term care facilities in developing ASPs and provides a model for other similar state initiatives.

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