

Redefining the Antibiotic Stewardship Team: Recommendations from the American Nurses Association/Centers for Disease Control and Prevention Workgroup on the Role of Registered Nurses in Hospital Antibiotic Stewardship Practices

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Executive Summary

The purpose of this American Nurses Association/Centers for Disease Control and Prevention (ANA/CDC) White Paper is to inform registered nurses in the United States about the problem of antibiotic resistance and facilitate their embracing an expanded and clearly recognized role in hospital antibiotic stewardship programs (ASPs) and activities. The White Paper is the result of a series of online meetings, culminating in a one-day live conference with a selection of nurses identified by ANA and CDC as having expertise and/or interest in antibiotic stewardship. The purpose of the workgroup is to explore how nurses can become more engaged and take a leadership role to enhance our nation's antibiotic stewardship efforts. The first part of the White Paper reviews ASPs and the current state of antibiotic resistance. The second section is a summary of the workgroup's discussions on current barriers to full nurse participation in ASPs; gaps in nurses' knowledge and education about antibiotic stewardship; and the use of antibiotics in the 21st century. The third part explores opportunities for nurses to add their expertise to our nation's ongoing stewardship efforts and offers recommendations for future nursing education.

While often used interchangeably, the terms "antibiotic" and "antimicrobial" are not the same. Microbes include bacteria, viruses, fungi, and parasites; antimicrobials are agents against any of these. Antibiotics are agents that specifically target bacteria.¹

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While this White Paper is neither a formal nor a complete roadmap, it does succinctly outline the group's ongoing efforts to place the nation's 3.6 million nurses in central roles in antibiotic stewardship efforts.

Part I

Introduction

The need to improve antibiotic use is fundamentally a patient safety issue. Like all medications, antibiotics have side effects. Patients exposed to antibiotics can develop a variety of adverse drug reactions specific to individual agents, such as nephrotoxicity. However, patients exposed to antibiotics are also at risk for a variety of unique adverse reactions due to the antibacterial effects of the drugs, which can indiscriminately alter a patient's bacterial population (known as the microbiome). This disruption is known to increase risks for diarrhea, including a diarrheal super-infection caused by *Clostridium (C.) difficile*, which can be serious and even fatal. Moreover, there is growing evidence that disruption of the microbiome can lead to other serious adverse outcomes, such as sepsis.² When patients have serious bacterial infections, like sepsis, the benefits of prompt antibiotic therapy outweigh the risks. However, when patients get antibiotics they do not need, they are put at risk for totally avoidable adverse reactions. Unfortunately, many studies done in every practice setting have shown that antibiotics are often used when they are not needed.

Exposure to antibiotics also poses the additional risk of antibiotic resistance. This makes antibiotics unique in that their effectiveness wanes over time because bacteria inevitably develop resistance to them. Over the past several decades, antibiotic resistance has increased and spread dramatically throughout the world. The loss of effective antibiotic therapy jeopardizes not only the health of patients with infections, but also the capacity to safely deliver other medical care. Medical advances such as complex surgery, organ transplants, and chemotherapy are largely dependent on antibiotics to both prevent and treat common infectious complications. The threat of antibiotic resistance is compounded by the fact that it can be passed from one bacterium to another, and that antibiotic-resistant bacteria themselves can be spread from person to person. Therefore, the overuse and misuse of antibiotics not only have implications for the individual patient, but also for population and societal health.

The CDC report, *Antibiotic Resistance Threats in the United States, 2013*, provided the first comprehensive snapshot of the problem. Using conservative estimates, the CDC figured that each year more than two million Americans develop serious infections with bacteria that are resistant to one or more antibiotics, and at least 23,000 people die each year as a direct result of these infections.³ According to the CDC report, improving antibiotic use is one of the most important needs in reducing antibiotic resistance.

CDC Core Elements of Hospital Antibiotic Stewardship Programs

- **Leadership Commitment:** Dedicating necessary human, financial, and information technology resources
- **Accountability:** Appointing a single leader responsible for program outcomes – experience with successful programs shows that a physician leader is effective
- **Drug Expertise:** Appointing a single pharmacist leader responsible for working to improve antibiotic use
- **Action:** Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e., “antibiotic time out” after 48 hours)
- **Tracking:** Monitoring antibiotic prescribing and resistance patterns
- **Reporting:** Regular reporting information on antibiotic use and resistance to doctors, nurses, and relevant staff
- **Education:** Educating clinicians about resistance and optimal prescribing

Antibiotic prescribing in US acute care hospitals is common and often unwarranted. As many as half of hospitalized patients receive at least one antibiotic and in up to 50 percent of these patients, antibiotics are unnecessary or inappropriate.⁴ Such antibiotic misuse contributes not only to adverse drug reactions, like *C. difficile*, but to the emergence of antibiotic-resistant organisms, such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), and carbapenem-resistant Enterobacteriaceae (CRE).⁵ Most registered nurses are already aware that *C. difficile* infections are a major problem, spreading not only in hospitals but in outpatient and community settings as well. *C. difficile* has become the most common cause of health care-associated infections in US hospitals, and the excess health care costs related to *C. difficile* infection are estimated to be as much as \$4.8 billion for acute care facilities alone.⁶ In fact, *C. difficile* causes almost half a million infections annually, and an estimated 83,000 of the patients with such infections have at least one recurrence. Moreover, approximately 29,000 die within 30 days after the initial diagnosis.⁷

Given the high morbidity, mortality, and human and economic costs, in conjunction with a decline in discovery and development of new antibiotics, antibiotic resistance has been identified as one of the most serious threats to health in the United States and has led to the development of the National Action Plan for Combating Antibiotic-Resistant Bacteria.⁸ Part of this national imperative is the implementation of ASPs in all acute care hospitals by 2020.

Antibiotic Stewardship

In a consensus statement from the Infectious Diseases Society of America (IDSA), the Society for Healthcare Epidemiology of America (SHEA), and the Pediatric Infectious Diseases Society, antibiotic stewardship has been defined as “coordinated interventions designed to improve and measure the appropriate use of [antibiotic] agents by promoting the selection of the optimal [antibiotic] drug regimen, including dosing,

duration of therapy, and route of administration.”⁹

A growing body of evidence supports formalized stewardship programs as a viable avenue to decrease unnecessary exposure to antibiotics, improve infection cure rates, reduce adverse drug reactions, and slow the emergence of antibiotic resistance, with resultant significant cost savings for hospitals.

To help hospitals implement ASPs, the CDC developed in 2014 the *Core Elements of Hospital Antibiotic Stewardship Programs*, outlining seven components that have been linked with successful ASPs.¹⁰ The CDC core elements call for a multidisciplinary approach to improving antibiotic use. And as of January 2017, The Joint Commission is also requiring hospital ASPs to demonstrate inter-professional engagement to address core performance elements and expand antibiotic stewardship reach.¹¹ Both CDC and The Joint Commission specifically highlight the need to engage nurses as part of the multidisciplinary effort. Moreover, the central role nurses can play in hospital quality improvement has been well documented in efforts such as bundle implementation for the prevention of central line-associated blood stream infections (CLABSI) and nurse-directed catheter removal for prevention of catheter-related urinary tract infections (CAUTI).^{12,17,18} Yet, despite these and other recommendations to include bedside nurses in stewardship development, efforts to engage nurses in antibiotic stewardship have been limited.¹⁹

In response to the critical need to expand antibiotic stewardship and in recognition of the central role that nurses play in patient care and quality improvement, CDC (with a grant from the CDC Foundation) partnered with ANA to bring together a group of registered nurses to explore the nurse role in acute care hospital ASPs, and to identify practical and feasible areas for nurse engagement.

Part II

ANA/CDC Antibiotic Stewardship Workgroup

Capturing the work of registered nurses is crucial to demonstrating the value of nursing in ASPs. *Figure 1* shows the position of the nurse with patient and family at the hub of communication among all of the stakeholders in antibiotic use. This central role puts nurses in a unique and vital position in optimizing antibiotic use. In the annual Gallup poll on honesty and ethics, nursing is overwhelmingly viewed by the American public as the most trusted profession.¹³ Nurses are in the hospital, in the home, and in the community. As such, they can be educators, advocates, and ambassadors for widespread behavioral change to more vigilant antibiotic awareness in our society.

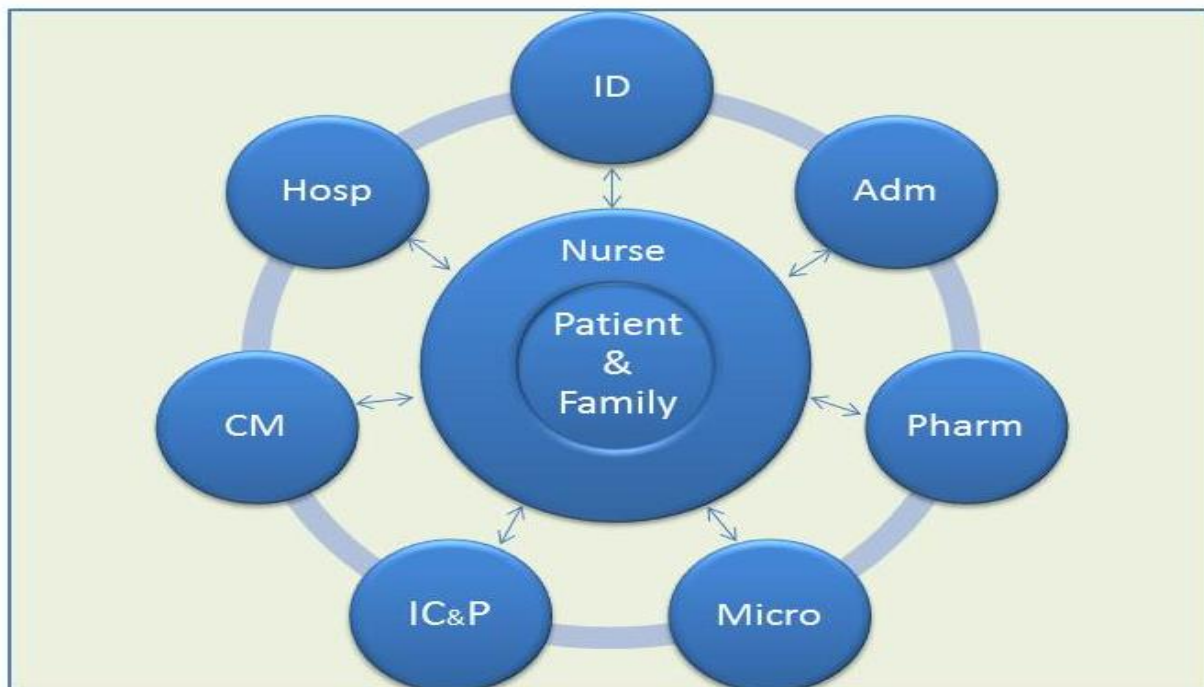


Fig 1: Workflow Communication

ID-Infectious Disease Adm-Administration Pharm-Pharmacy Micro-Microbiology
 IC&P-Infection Control/Prevention CM-Case Management Hosp-Hospitalist

In late 2015, ANA sent out a call to members soliciting interest in working with CDC and ANA to better define and expand the role of bedside nurses in antibiotic stewardship efforts in acute care hospitals. From these applications, staff at CDC and ANA selected about 30 members to serve on an expert advisory committee. Members were chosen to represent a diversity of geographic locations, expertise, and acute care hospital settings. The workgroup held a series of virtual meetings, culminating in a one-day live seminar in July 2016 at ANA headquarters in Silver Spring, MD.

Literature and Practice Review

To create a baseline from which to launch the antibiotic stewardship discussion, workgroup participants reviewed several relevant articles. In the first paper, *The Critical Role of the Staff Nurse in Antimicrobial Stewardship—Unrecognized, but Already There*, Olans, Olans, and DeMaria discuss how, although the registered nurse role has not been formally recognized in guidelines for implementing and operating ASPs or defined in the peer-reviewed literature, nurses have always performed numerous functions that are integral to successful antibiotic stewardship.¹² The paper provides a helpful table showing the overlap of what could be considered nursing antibiotic stewardship activities, with the traditionally identified activity stakeholder (e.g., infectious disease physician, pharmacist) who is usually assigned responsibility. In a related paper, Olans, Nicholas, Hanley, and DeMaria document that nurses recognize their educational gaps regarding both antibiotic use and antimicrobial stewardship.¹⁴

Those educational needs apply both to nurses in training as well as to nurses already in clinical practice to enable the successful integration of nurses into current antimicrobial stewardship activities.¹⁹

The workgroup emphasized that there are many areas where nursing and ASP functions already overlap. The tables below illustrate the variety of nursing antibiotic functions that coincide with existing antibiotic stewardship goals.

Table 1: Antimicrobial Stewardship Functions Performed by Nurses

Stewardship Activity or Task	CDC Core Stewardship Element	Role Responsible in Current ASP Models	Unrecognized Nurse Role in Stewardship Functions
Appropriate triage and isolation	Accountability Drug Expertise Education	Infection Preventionist	The nurse initially assesses the source of infection and identifies appropriate precautions. Consultation may come subsequently from the infection preventionist.
Accurate antibiotic allergy history	Accountability Drug Expertise Education	Pharmacist	The nurse takes the allergy history, performs medication reconciliation, and records this in the medical record.
Early and appropriate cultures	Accountability Drug Expertise Tracking	Hospitalist/Microbiologist	The nurse obtains the cultures before starting antibiotics and sends the cultures to the microbiology laboratory. The nurse monitors the culture results and reports results to the physician.
Timely antibiotic initiation	Drug Expertise Action Tracking	Hospitalist Infectious Disease Specialist or Preventionist Pharmacist	The nurse receives the orders, reviews dose/time for accuracy, checks for allergy, and administers and records the antibiotics.

Table 2: Clinical Progress & Patient Safety Monitoring

Stewardship Activity or Task	CDC Core Stewardship Element	Role Responsible in Current ASP Models	Unrecognized Nurse Role in Stewardship Functions
Progress reporting	Drug Expertise Action Tracking	Hospitalist Infectious Disease Specialist	The nurse cares for the patient 24/7, and monitors and communicates daily patient progress.
Antibiotic adjustment based on microbiology reports	Drug Expertise Action Tracking	Hospitalist Infectious Disease Specialist Microbiologist	Laboratory and radiology reports “chase” the patient and are typically received first by the bedside nurse. Results are coordinated by the nurse and communicated to treating physicians.
Antibiotic dosing, culture and sensitivity reporting, and de-escalation	Drug Expertise Action Tracking Education	Infectious Disease Specialist Microbiologist Pharmacist	The nurse updates clinical and laboratory renal function results, drug levels, and preliminary/final microbiology results.
Adverse events	Action Tracking Education	Hospitalist Pharmacist	The nurse monitors and reports to the physician and pharmacist any adverse events including diarrhea.
Antibiotic orders	Drug Expertise Action Tracking Education	Hospitalist Infectious Disease Specialist	The nurse reviews the patient’s clinical status and changes in medications.
Antibiotic resistance	Drug Expertise Action Tracking Education	Infectious Disease Specialist Hospitalist Microbiologist	The nurse reviews culture and sensitivity results, and reports bug/drug mismatches, time outs, and antibiotic de-escalation.
Superinfection / resistant infection	Action Tracking Education	Infectious Disease Specialist Infection Preventionist Microbiologist	The nurse monitors patient response and initiates appropriate changes in isolation precautions.

Table 3: Discharge

Stewardship Activity or Task	CDC Core Stewardship Element	Role Responsible in Current ASP Models	Unrecognized Nurse Role in Stewardship Functions
Transition IV-to-PO antibiotic, outpatient antibiotic therapy	Drug Expertise Action Tracking Education	Case Management Infectious Disease Specialist Pharmacist	The nurse monitors clinical progress and the patient's capacity to take oral medications.
Length of stay	Action Tracking Education	Administration Case Management Infectious Disease Specialist	The nurse monitors the patient's progress 24/7.
Patient education, medication reconciliation	Drug Expertise Action Education	Hospitalist Infectious Disease Specialist Pharmacist	The nurse continuously educates the patient and family, and performs discharge teaching.
Outpatient visiting nurse association (VNA)/skilled nursing facility (SNF)/long-term care facility (LTCF) transition management, re-admission to hospital	Action Tracking Education	Administration Case Management Infection Preventionist	The nurse communicates the patient's diagnosis, management, and medications to the nurse at the VNA/ SNF/LTCF.

Adapted with permission from Olans RD, et al. (2017). Good nursing is good antibiotic stewardship. *American Journal of Nursing*, 117(8), 58-63.

Workgroup members considered the CDC's *Infection Prevention and Control Assessment Tool for Acute Care Hospitals*.¹⁵ Divided into four sections, the tool is intended to assist acute care hospitals in the assessment of infection control programs and practices, to include: facility demographics; current facility infection control infrastructure; facility guidelines and other resources; and an optional onsite observation of facility practices. Of note, the assessment tool's Infection Control Program and Infrastructure checklist has specific focus on "Systems to Detect, Prevent, and Respond to Healthcare-Associated Infections and Multidrug-Resistant Organisms,"¹⁵ which include ASPs.

Workgroup members also reviewed the role of the nurse executive in antibiotic stewardship as outlined in Manning and Giannuzzi's article *Keeping Patients Safe*. In order for bedside nurses to fully engage in ASPs, and demonstrate the value of nursing in ASPs, they need full support of nursing leadership. The authors argue that nurse executives play a central role in spearheading strategic nursing engagement in institutional programs that keep patients safe. In such a role, nurse executives are in a prime position to influence ASPs.¹⁶

Suggestions from the Workgroup

The workgroup identified four key questions and developed suggestions to address each of them.

What are the roles that bedside nurses can and should play in working to improve antibiotic use?

- Obtain appropriate cultures, using proper technique, before antibiotics are started. Understand how the microbiology laboratory processes those samples.
- Use microbiology results to help guide the optimal selection of antibiotics and guide decisions to stop therapy in cases where culture results represent colonization, rather than infection.
- Help inform decisions to start antibiotics promptly at the time early signs of likely bacterial infections, including sepsis, are identified.
- Help ensure that practices to ensure good antibiotic use are embedded in other quality improvement efforts. For example, for sepsis, help ensure that antibiotics are started promptly and then reviewed once additional data, especially cultures, are available.
- Prompt, and participate in, discussions about antimicrobial usage including antibiotic de-escalation by evaluating each patient's clinical status and readiness for change from intravenous to oral therapy, when possible.
- Take a more detailed allergy history, especially around penicillin allergy. Help educate patients and families about what constitutes an accurate antibiotic allergy history.

What education and training resources are needed to help nurses perform these roles?

- Microbiology education and training on how to both obtain cultures and interpret the results.
- Education about infection versus colonization.
- Assertiveness training to engage in discussions with the health care team.
- Information on IV-PO switch criteria.
- Training on taking an allergy history.

How can we engage nurses more and encourage them to participate in antimicrobial stewardship programs?

At the national level:

- Explore avenues to have nurse engagement in ASPs included in American Nurses Credentialing Center (ANCC) Magnet Recognition Program® criteria.
- Use The Joint Commission's Medication Management standard and proposed Centers for Medicare and Medicaid Services Condition(s) of Participation on antimicrobial stewardship to guide nurse-relevant antibiotic stewardship tools and products.
- Bring stewardship issues to national stakeholder meetings.

- Add stewardship content to priorities for publication in nursing journals.
- Encourage nursing schools to integrate antibiotic stewardship concepts into currently required microbiology, pharmacology, and applied clinical education.
- Develop antibiotic stewardship content specific to unique specialties, e.g., oncology nursing.

At the hospital level:

- Provide antibiotic stewardship education for bedside nurses. This could be provided by nurses already engaged in stewardship activities, infectious disease physicians, pharmacists, infection preventionists, or microbiologists.
- Include nurses in stewardship rounds.
- Participate in journal clubs.
- Develop specific content and messages for nurses as part of any hospital effort to raise awareness about antibiotic use and resistance.
- Encourage nurse antibiotic stewardship champions at the unit level.

What can we do to engage nursing leaders in stewardship efforts?

- Highlight the fact that nursing involvement in antibiotic stewardship is required by The Joint Commission.
- Make hospital leadership aware that the Centers for Medicare and Medicaid Services has proposed making ASPs a Condition of Participation for acute care hospitals.
- Emphasize antibiotic stewardship as a key component of patient safety.
- Highlight the benefits of good antibiotic stewardship on nursing workload. For example, better IV-to-PO conversion will reduce time spent on medication administration.
- Add measures related to antibiotic use, like *C. difficile* infection, to Magnet Recognition Program criteria.

Knowledge Gaps

Workgroup members identified the following knowledge gaps, which present challenges to nurse involvement in stewardship efforts. First, nurses may be unfamiliar with the concept of antimicrobial stewardship. Second, nurses may be insecure about their knowledge of microbiology and antibiotic use. Third, nurses may believe that antimicrobial stewardship is not their function because they do not perceive themselves as antibiotic prescribers. Lastly, there is a lack of metrics that quantify nurses' impact on stewardship efforts.

As outlined in the articles the workgroup reviewed, nurses are essentially unacquainted with the phrase "antimicrobial stewardship." Such unfamiliarity is not surprising given limited efforts to engage nurses in

ASPs. The narrow discussion of antimicrobial stewardship in nursing literature also contributes to this problem.^{12, 14}

Workgroup members also felt that the current approach to microbiology and pharmacology education could be revisited to improve nursing engagement in stewardship. Many nursing schools deliver this content in a theoretical framework without discussion of how microbiology and pharmacology data can be applied to improve patient care. The workgroup would like to see this knowledge presented as an applied science whose relevance and application for nurses is regularly reinforced in their subsequent clinical practice. Under this model, microbiology and pharmacology principles that are the foundation of antibiotic stewardship would seem less divorced from the daily care of patients. Likewise, the workgroup felt that the challenges of antimicrobial resistance and the threat it poses to patient care need to be emphasized more in nursing schools.

Some specific suggestions for education included:

- **Microbiology**

- How specimens for microbiology testing should be obtained;
- How to interpret microbiology test results, especially susceptibility reports;
- How to interpret the hospital antibiogram; and
- Basics of distinguishing asymptomatic bacteriuria from urinary tract infection and colonization from active infection.

- **Pharmacology**

- Considerations for IV-to-PO conversion: what antibiotics and patients are good candidates;
- General information on antimicrobial spectra for various classes of antibiotics;
- Antibiotic interactions and incompatibilities;
- Common adverse reactions to antibiotics, with a special emphasis on recognizing and responding to suspected *C. difficile* infections;
- Information on therapeutic drug monitoring; and
- How to assess a patient for a potential allergy to penicillin.

Lack of Accepted Metrics to Quantify the Impact of Nurses' Work in Stewardship Activities

Evaluating nursing impact on antibiotic use should be part of the overall measurement approach of the ASP. Stewardship programs are encouraged to monitor outcomes like antibiotic use, *C. difficile* infections, and antibiotic resistance, and the impact of nursing interventions would be reflected in those outcomes. The workgroup suggested that adding key outcome measures of antibiotic use, like *C. difficile* infection, as measures in the ANCC Magnet Recognition Program could help drive more nursing engagement in stewardship efforts.

There are also a variety of process measures that could directly assess nursing roles in stewardship. These could include, for example, assessments of how often cultures are obtained before antibiotics are started, and the frequency of nurse-initiated antibiotic discussions or “time outs.” In some hospitals, nurses are playing an important role in recognizing patients with sepsis and initiating sepsis protocols. This could also be an important stewardship measure since the early initiation of proper antibiotic therapy is a key goal of stewardship programs. The workgroup agreed that more work needs to be done to better define the optimal process measures for nursing stewardship interventions.

Incentivizing Hospitals to Address Nurse Antimicrobial Stewardship Involvement

It is the natural progression to link nurses' role in antimicrobial stewardship with Joint Commission accreditation and Magnet® recognition. To that end, the ANA/CDC Workgroup proposed that the ANCC Magnet Recognition Program endorse two clinical indicators, specifically as related to antibiotic stewardship. *MRSA and C. difficile will be added as optional unit- or clinic-level nursing-sensitive clinical indicators in the 2019 Magnet Application Manual.*

Part III

Recommendations: Major Areas the Workgroup Will Continue to Pursue

At the end of the July Conference, the ANA/CDC Workgroup outlined key areas for continued development and advocacy:

- Develop and submit Magnet clinical indicators that promote engagement of nurses in stewardship (action completed).
- Expand education with new understanding of when and how best to use antibiotics. This should be made available to nursing students, to nurses in new-hire orientation, and as continuing education for practicing nurses.

- Identify and develop outcome measurement tools to assess quality measures for nursing.
- Develop and distribute a position statement (this White Paper) to align nursing contributions with those of other standardizing bodies, and with other infection and control prevention strategies and quality improvement efforts, like sepsis management.
- Pursue ongoing communication and collaboration of ANA with other health care organizations regarding optimal interdisciplinary antimicrobial stewardship activities.

The urgent need to improve appropriate, evidence-based antibiotic use cannot be overstated. With the current worldwide expansion of multidrug-resistant organisms, the question is not whether to involve nursing in antimicrobial stewardship, but how. An equally urgent need exists to engage nurses in front-line ASPs, as well as patient education efforts. The background information and recommendations contained in this White Paper provide an outline for strengthening the role of nurses in antibiotic stewardship. With an estimated 3.6 million workforce, nurses represent a powerful voice and cohort by which to mold interdisciplinary ASPs, enhancing patient safety and minimizing the spread of antibiotic resistance.

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