



Commentary

Is the Presidential Advisory Council on Combating Antibiotic Resistance missing opportunities?



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Antimicrobial resistance is a critically important impending public health crisis that not only threatens the treatment of infectious disease, but also the very foundations of modern health care from transplantation to cancer chemotherapy. Many types of surgeries and the health of immunocompromised patients, including those with diabetes, will be placed at risk if antibiotics are no longer able to prevent or treat infections. Even minor illnesses or injuries such as a scrape or paper cut become life-threatening in the absence of effective antibiotics.

In response to this impending public health catastrophe, President Obama issued Executive Order 13676, mandating the US Government to issue the National Strategy for Combating Antibiotic Resistance¹ and directing the development of a federal National Action Plan for Combating Antibiotic Resistance² (NAP) to direct interagency coordination and cooperation to address antibiotic resistance. In addition, Executive Order 13676 announced a planned doubling of federal funding for antibiotic resistance research to \$1.2 billion in the 2016 federal budget proposal.³

In addition to the NAP and increased federal research support, Executive Order 13676 also authorized the establishment of a 30-member Presidential Advisory Council on Combating Antibiotic Resistance (PACCARB). The goal of this article is to review the current direction of PACCARB, identify gaps in health care policy coverage, and highlight areas that need further examination and development.

BACKGROUND

National and international organizations have identified antibiotic resistance as a major public health problem. The World Health

Organization issued a comprehensive report on antibiotic resistance surveillance,⁴ outlined options for action,⁵ and has developed a global strategy⁶ to address this emerging public health crisis. In the United States, the Centers for Disease Control and Prevention issued a threat report on antibiotic resistance and the “catastrophic consequences of inaction.”⁷ The President’s Council of Advisors on Science and Technology issued recommendations on addressing the problem of antibiotic resistance.⁸

The defining characteristic of the NAP is the need for a sustained, coordinated, and integrated approach to antibiotic resistance prevention and control. A One Health approach addressing humans, animals, and the environment is recognized in the National Strategy and NAP as the foundational model for antibiotic resistance-prevention activities. The vision of these efforts is that “the United States will work domestically and internationally to prevent, detect, and control illness and death related to infections caused by antibiotic-resistant bacteria by implementing measures to mitigate the emergence and spread of antibiotic resistance and ensuring the continued availability of therapeutics for the treatment of bacterial infections.”¹

The scope of the NAP addresses pathogens identified as urgent or serious public health threats by the Centers for Disease Control and Prevention. The 5 overarching goals of the National Strategy and NAP are shown in [Table 1](#). The first goal recognizes that “it is also critical to prevent transmission of bacteria-causing infections that are resistant to treatment across community and healthcare settings. Outbreaks can be prevented through regional efforts to rapidly detect and control infections that are hard to treat, and also through prompt communications regarding the management and transfer of infected patients within and between healthcare facilities.”¹

The five goals of the NAP are:

1. Slow the emergence of resistant bacteria and prevent the spread of resistant infections;
2. Strengthen national One Health surveillance efforts to combat resistance;
3. Advance development and use of rapid and innovative diagnostic tests for identification and characterization of resistance bacteria;
4. Accelerate basic and applied research and development for new antibiotics, other therapeutics, and vaccines; and

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Conflicts of interest: KTK has received partial conference attendance and meeting support from the US Department of Health and Human Services, National Quality Forum, National Patient Safety Foundation, and Consumer Union. He has served on the Centers for Medicare and Medicaid Services’ Technical Expert Panel for Hospital Acquired Conditions, was recently appointed to a Strategic Working Group of the Agency for Healthcare Research & Quality for quality indicators and is an associate editor for *Journal of Patient Safety*. He has a first-degree relative who is involved with the development of a cancer therapeutic agent.

Table 1
Opportunities for expanded expertise on the Presidential Advisory Council on Combating Antibiotic Resistance

Discipline	Sample source organizations	Areas that need analysis and policies formulated to prevent infections, drug resistance, and person-to-person spread
Drug regulation	Food and Drug Administration	In alignment with the Presidential Advisory Council on Combating Antibiotic Resistance mission to accelerate new drug discovery and diagnostic tests, the Food and Drug Administration can play a role in the approval and licensing of new tests. The Food and Drug Administration also sets regulations regarding drug indications, which is important for implementation of antibiotic stewardship
Worker safety	National Institute of Occupational Safety and Health Collective bargaining organizations (unions)	Person-to-person spread is not just patient to patient, but also involves health care workers. The safety and working environment of health care workers need to be addressed. Recommendations for pathogen screening and exposure to pathogens should be established
Hospitals	American Hospital Association Regional hospital associations	Preventing infections from antibiotic-resistant bacteria in hospital settings through prevention of infections, antibiotic-resistant bacteria transmission, and stewardship requires organizational and management support of these efforts. Leadership engagement is recognized as a core component of stewardship programs. Antibiotic-resistant bacteria not only place patients at risk, but also health care workers and the operational integrity of a facility. Hospitals need to commit ample resources to the accomplishments of these goals
Nursing	American Nurses Association American Academy of Nursing	The 3.4 million registered nurses in the United States administer every dose of antibiotics in hospitals and are at the front line of patient care in nonacute care programs. Nurses play critical roles in patient education and patient safety and have been shown to be an important factor in the prevention of infections and when they occur, in preventing the spread of pathogenic bacteria
Infection prevention	Association of Professionals in Infection Control and Epidemiology	Infection preventionists are responsible for surveillance, detection, control, and prevention of health care-associated infections. Infection prevention programs must work synergistically with antibiotic stewardship programs to reduce the risk of infection and transmission of antibiotic-resistant pathogens. In addition, there are concerns for worker safety and staffing limitations that hinder adoption of prevention protocols
Pharmacists	American Pharmacists Association National Community Pharmacists Association	Pharmacists play critical roles in stewardship programs, in patient education, and in detection of inappropriate antibiotic use. As experts in drug utilization, they must be included in effective stewardship programs
Private insurers	UnitedHealth, Kaiser Foundation, Weelpoint, Aetna	Insurers can exert a tremendous influence by incentivizing antibiotic stewardship and proper infection control through payment policies. Currently, evaluation and management visits are tiered, and have differing payments depending on the complexity of the visit. Prescription of an antibiotic is a way a higher tier and payment can be justified. This financial incentive needs to be reversed.
Primary care clinicians	American Academy of Family Physicians American Academy of Nurse Practitioners American Academy of Physician Assistants	Appropriate antibiotic use in primary care settings is influenced by patient demand and delays in obtaining culture- or lab-based pathogen identification. Antibiotics may be inappropriately prescribed in 60% of outpatient diagnoses. In these settings, care is often provided by teams of physicians and other advanced practice providers who must engage with setting-specific stewardship practices
Public policy expertise	American Public Health Association	Incentives for inappropriate antibiotic use or overuse of diagnostic test can be driven by public policy regarding reimbursement, and expertise in public policy should be included to comprehensively address antibiotic resistance
Health professions education	American Association of Colleges of Nursing National League for Nursing American Association of Medical Colleges Association of Public & Land Grant Universities American Association of Veterinary Medical Colleges	Education and training are important elements of stewardship. By educating and training health professions students, future practice can be influenced. Interdisciplinary curricula that are evidence-based and outcomes-oriented programs should be developed for practicing clinicians and students
Social and behavioral expertise		Social determinants of health and health disparities are widely recognized as an important issue and can help address the sociocultural determinants of antibiotic use and resistance
Biomedical informatics expertise	Electronic medical records experts and vendors	Surveillance for antimicrobial resistance relies on high-quality data available from a variety of sources. Stewardship programs must have allocated data collection and analysis capacity, and including expertise in data collection and storage is critical to a coordinated approach
Retailers	Grocery stores Retail clinic administrators	Driven largely by consumer demand, antibiotic-free meat products are increasingly popular. This represents an opportunity to address the demand-side of inappropriate antibiotic use. The rise of loss-leader "free antibiotic" programs by some retail pharmacies is a worrisome trend and requires the engagement of industry and trade groups. In addition, retail-based clinics provide increasingly important access points for upper respiratory infections, urinary tract infections, and other conditions for which an antibiotic may be prescribed. Although current evidence does not show that antibiotics are overused in these settings, it is important to engage grocery stores and retail clinic providers

5. Improve international collaboration and capacities for antibiotic resistance prevention, surveillance, control, and antibiotic research development.

RESPONSIBILITIES OF PACCARB

Executive Order 13767 specifies that PACCARB is to provide advice, information, and recommendations to the Secretary of Health and Human Services regarding the optimization of antibiotic use; acceleration of research on combating resistance, including stewardship; advancement of human and animal diagnostics; research on new treatments; the development of antibiotic alternatives for livestock; dissemination of information to the public, human, clinical, and veterinary audiences; and improvement of international collaboration. In addition to this charge, Health and Human Services Secretary Sylvia M. Burwell⁹ issued a task letter to PACCARB requesting that the committee consider and address the best ways to incentivize new drug and nondrug therapeutics, novel diagnostic tests in humans and animals, and to prioritize elements to promote maximum influence.

Although addressed in the National Strategy and NAP, the spread of antibiotic-resistant pathogens, either by preventing infections or by avoiding patient-to-patient transmission, was not specified in the directive. As a result, it receives little attention in the PACCARB initial assessment¹⁰ of the NAP.

In contrast, other countries emphasize infection prevention and control as a key component of addressing antibiotic resistance. For example, an action plan produced by UK health officials specifies as their second intervention to “improve sanitation and prevent the spread of infections.”¹¹ The United Kingdom has had significant success in reduction of methicillin-resistant *Staphylococcus aureus* (59% reduction between 2007 and 2009) through the implementation of standardized national protocols to prevent spread.^{12,13} In currently available international action plans, infection prevention and control is highlighted as a key strategic initiative. A library of these national strategies is available at <http://www.who.int/drugresistance/action-plans/library/en/>.

PACCARB EXPERTISE

Following an internal selection process, the Department of Health and Human Services announced the 30 members of PACCARB during March 2015. A total of 30 members were appointed, including 15 (50%) voting public members, 5 (17%) nonvoting liaison members, and 10 (33%) nonvoting ex-officio members. Among all voting and nonvoting members, 19 (63%) are men. Physicians account for 53% of voting members (8 out of 15) and 53% of the total membership (16 out of 30) with all physicians having infectious disease backgrounds (identified by designation such as Fellow of the Infectious Disease Society of America or serving as an Infectious Disease Society of America organizational representative). Of the members appointed, 33% of the voting membership (5 out of 15) and 30% of the total membership (9 out of 30) are trained in agriculture or veterinary sciences (identified by holding a doctorate in veterinary medicine, food science, or veterinary epidemiology). One registered nurse serves as a nonvoting liaison representative from long-term-care administration, and a single consumer representative was appointed as a voting public member.

PACCARB POLICY ANALYSIS

To date PACCARB has taken on a wide range of policies that have stressed antibiotic stewardship in both human and animal populations, along with the development of new antibiotics. Both national and international concerns have been addressed, as has the lack of

organized health care systems in some foreign countries and the problems of implementing stewardship initiatives in these settings. Stewardship policies are extremely important; without them development of new antibiotics may be a futile endeavor. Antibiotic stewardship is essential in the prevention of activation and spread of *Clostridium difficile* in carriers.

GAPS IN PACCARB POLICY ANALYSIS

Given the importance of a coordinated, integrated approach to addressing antibiotic resistance, it is critical that PACCARB policy analysis integrate a wide range of professional expertise and engagement of relevant stakeholders. This includes infection preventionists, who are essential in the formulation of policies to prevent infections from occurring and to avoid person-to-person spread. In addition, allied health care sectors, including the testing industry, Food and Drug Administration Occupational Safety and Health Administration, and the insurance industry are integral in both implementation and enforcement of recommended policies.

PACCARB must fully address all aspects of infection prevention and if an infection does occur, avoidance of person-to-person spread, so that the National Strategy and NAP can be fully implemented and the federal government can prioritize issues and investments in antibiotic resistance. With intense pressure on industry to control this emerging epidemic, conflicts of interest of PACCARB members need to be publicly declared. To date, there has been limited disclosure of conflicts of interest. Conflicts—whether actual or perceived—could undermine public confidence in PACCARB and its findings, although its members are well-regarded and respected researchers, academicians, policy makers, and clinicians. Additional areas of policy formulation that would help advance the mission of PACCARB are given in Table 1.

Antibiotic resistance is a global issue that requires comprehensive action. For example, limited US control over production of antibiotics in China and India may contribute to the emergence of resistance. Antibiotic residuals and resistant organisms have been demonstrated in the water supply of China, India, and other developing countries. However, US and international agencies (eg, US State Department, World Trade Organization, and G7) that can influence international trade policies, foreign aid, and travel incentivizing proper antibiotic use are not represented on PACCARB.

The daunting task of prevention of international spread of bacterial resistance in third-world countries with underdeveloped health care delivery systems also underscores the importance of having an effective system for surveillance of carriers and prevention of person-to-person transmission. This is a component of the National Strategy and NAP that is mentioned but noticeably underdeveloped in PACCARB's action plan.

WHY IT IS CRITICAL TO GET IT RIGHT

The timeline of the history of medicine has a number of crucially important milestones. We are rapidly approaching one of the most important—the looming threat of a postantibiotic era. Losing the ability to fight infection may reverse many important medical advances and have a tragic influence on public health and longevity.

Expanding the policy initiatives of PACCARB would permit the group to address antibiotic resistance in a coordinated, integrated fashion using a One Health perspective.

These additional areas include prioritized research needs and substantial investment in research on the standards for infection prevention research to ensure that research findings are valid, reliable, and generalizable.¹⁴ Adequate attention to infection prevention requires sustained organizational investment in infection prevention and control programs. Because infection prevention is the key

way to combat antibiotic-resistant infections and their dissemination, it should serve as a cornerstone of national efforts. Infection prevention is the ultimate antibiotic stewardship program: If an infection does not take place, an antibiotic agent is not given. Because many infections are nurse-sensitive outcomes, it is important to support adequate staffing across settings. Furthermore, the influence of antimicrobial resistance as an occupational or employee health issue should be addressed to ensure that the health care work force is protected from occupationally acquired infections.

Strict standards for environmental cleaning in health care and community-based facilities, including occupied and terminal room cleaning, should be developed based on the best-available evidence and research should be supported to determine the influence on environmental pathogen load and the development and dissemination of antibiotic-resistant organisms.

Similarly, over-the-counter antiseptics and antibiotics should be closely evaluated. Two notable examples are the use of triclosan, a suspected environmental toxicant, in consumer antibacterial products, and polymixin in topical over-the-counter products, which may induce resistance to other polymixins such as colistin.

A One Health approach should also pay attention to the health of an individual's microbiome. It is increasingly recognized that the microbiome confers both beneficial and potentially harmful effects.

Attention should be paid to financial incentives and novel economic models, including linking federally funded drug development to antibiotic stewardship initiatives.

CONCLUSIONS

Similar to other industrialized countries with national health care, the United States needs to set prioritized standards that can be implemented with near uniformity across the health care system. This will not be an easy task, but how the leaders in public health and infectious disease address this epidemic at this juncture will be studied and their actions dissected for centuries to come. Their decisions will determine their legacy and the future of modern health care as a whole.

References

1. United States White House. National strategy for combating antibiotic-resistant bacteria. Available from: https://www.whitehouse.gov/sites/default/files/docs/carb_national_strategy.pdf. Accessed January 6, 2016. 2014.
2. United States White House. National action plan for combating antibiotic-resistant bacteria. Available from: http://www.whitehouse.gov/sites/default/files/docs/national_action_plan_for_combating_antibiotic-resistant_bacteria.pdf. Accessed January 6, 2016. 2015.
3. Obama B. Executive Order 13676: Combating Antibiotic-Resistant Bacteria. 184, 56931-56935. Available from: <https://www.whitehouse.gov/the-press-office/2014/09/18/executive-order-combating-antibiotic-resistant-bacteria>. Accessed January 6, 2016. 2014.
4. World Health Organization. The evolving threat of antimicrobial resistance: options for action. WHO Publ. 1-119. Available from: http://apps.who.int/iris/bitstream/10665/44812/1/9789241503181_eng.pdf. Accessed January 6, 2016. 2014.
5. World Health Organization. Antimicrobial resistance: global report on surveillance 2014. Available from: http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf. Accessed January 6, 2016. 2014.
6. World Health Organization. Antimicrobial resistance draft global action plan on antimicrobial resistance. 1-19. Available from: http://www.wpro.who.int/entity/drug_resistance/resources/global_action_plan_eng.pdf. Accessed January 6, 2016. 2015.
7. Centers for Disease Control & Prevention. Antibiotic resistance threats. Available from: www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf. Accessed January 6, 2016. 2014.
8. President's Council of Advisors on Science and Technology. Report to the President on Combating Antibiotic Resistance. Available from: https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_carb_report_sept2014.pdf. Accessed January 6, 2016. 2014.
9. Burwell S. Task letter: combating antibiotic-resistant bacteria. United States Department of Health and Human Services. Available from: <http://www.hhs.gov/ash/advisory-committees/paccarb/meetings/upcoming-meetings/june-21-22-2016-public-meeting/index.html>. Accessed January 6, 2016.
10. PACCARB. Initial assessments of the National Action Plan for Combating Antibiotic-Resistant Bacteria. March. Available from: <http://www.hhs.gov/sites/default/files/paccarb-final-report-03312016.pdf>. Accessed January 6, 2016. 2016.
11. O'Neill J. Tackling drug-resistant infections globally: final report and recommendations. The Review on Antimicrobial Resistance. May. Available from: http://amr-review.org/sites/default/files/160525_Final%20paper_with%20cover.pdf. Accessed January 6, 2016. 2014.
12. Dancer SJ. Response to: evaluation of the national Clean your hands campaign to reduce *Staphylococcus aureus* bacteraemia and *Clostridium difficile* infection in hospitals in England and Wales by improved hand hygiene: four year, prospective, ecological, interrupted time series study. *BMJ* 2012;344:e3005.
13. Agha M. Epidemiology and Pathogenesis of *C. difficile* and MRSA in the light of current NHS control policies: a policy review. *Ann Med Surg (Lond)* 2012;1:39-43.
14. Kavanagh KT, Tower SS, Saman DM. A perspective on the principles of integrity in infectious disease research. *J Patient Saf* 2016;12:57-62.