

CDC Strategic Priorities for Combating Antimicrobial Resistance

Report of a Workshop

December 6 & 7, 2011

Centers for Disease Control and Prevention
Atlanta, GA

CDC Strategic Priorities for Combating Antimicrobial Resistance: Report of a Workshop

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Introduction

Given ongoing governmental cost constraints, CDC, like all government agencies, must continually reassess how to best expend limited resources for maximal benefit. This is particularly true in the struggle to prevent and control antibiotic resistance. On December 6 and 7, 2011, CDC convened an invited panel of internationally recognized experts in clinical medicine, veterinary medicine, microbiology, public health and health policy to provide a diverse set of opinions regarding current and proposed national and international public health efforts for reducing the disease burden of infections caused by antimicrobial resistant microorganisms. Documents describing the charge to the expert consultants and the structure and function of the workshop can be found in Appendix 1. A list of participants, both invited consultants and CDC staff can be found in Appendix 2. During a series of breakout group discussions, consultants were asked to provide their individual assessment of the relative priority of a list of CDC activities drawn from the document *A Public Health Action Plan to Combat Antimicrobial Resistance*. (See Appendix 3 for an overview of the results of this process.) In addition, consultants were asked to suggest additional activities to add to those already listed. (See Appendix 4 for a summary of these project ideas.)

Strategic Priorities

A variety of methods were used to obtain feedback and input from the consultants. A review of notes from all the discussions which took place during the meeting, the written feedback from the consultants and the results of the breakout groups' discussions identified five general areas that fulfilled the criteria for **strategic priorities** as outlined in the charge to the consultants. These were:

- Domestic and international surveillance for antimicrobial resistant (AR) pathogens
- Public-private collaboration at the state and local level for preventing the spread of AR pathogens
- Activities to better monitor antimicrobial use and to continue to optimize antimicrobial prescribing in all healthcare settings
- Promoting the development of new technologies for more rapid diagnostic testing for antimicrobial resistance, especially in clinical specimens
- More precise assessments of the disease burden (especially morbidity, mortality and economic cost) attributable to AR infections

For each of these priorities, the consultants made a variety of recommendations for CDC to consider.

Domestic and international surveillance for AR pathogens

1. Early detection of new and emerging resistance: A priority should be ensuring early detection and notification of public health authorities and clinicians of the development and spread of new resistance patterns and new mechanisms of resistance.
2. Overall national and regional monitoring of the scope and magnitude of antimicrobial resistance: CDC should publish a national annual report detailing the "State of Antimicrobial Resistance" in the

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U.S., encompassing the most significant aspects of the national AR problem and including state-level breakdowns (as available) of notable resistance problems.

3. **Clinical and public health laboratory capacity building:** There is tremendous variability in the capacity of both clinical and public health laboratories to reliably detect and identify AR both for clinical and PH surveillance purposes. More detailed assessments of current capacity, needs, gaps and opportunities for improvement should be undertaken. Where capacities need to be enhanced, CDC should work with partners to identify and promote approaches to help accomplish such enhancements.
4. **Enhance interoperability:** The six principal CDC surveillance systems which provide data on antimicrobial resistance were developed for different purposes, use different data collection methods and sources, have different denominators for calculating rates and do not uniformly use consistent definitions of what constitutes a resistant microorganism. This is an unavoidable consequence of the clinical (as opposed to microbiological) origins of the surveillance models used for each system. However, this lack of interoperability limits the ability to use these systems to provide high-level estimates of disease burden attributable to resistance and to identify populations at high-risk for resistant infections across more than one surveillance category (e.g., foodborne disease, healthcare-associated disease, vaccine-preventable disease). Thus, it would be useful to implement strategies to increase interoperability of data from these systems, including statistical modeling, to complement current analyses with estimates of the impact of disease caused by antimicrobial resistance.
5. **Standard definitions:** For some bacteria, binary definitions of what constitutes resistance for public health surveillance purposes are clear and unambiguous (e.g., MRSA, CRE). For others, such as *P. aeruginosa*, *Acinetobacter* spp., and *S. pneumoniae*, the categorization of a particular microorganism as resistant or susceptible is subject to interpretation. As for other public health events, unambiguous surveillance case definitions (which may not be identical to clinical case definitions) may have value for public health purposes. Thus, developing uniform definitions for all microorganisms of public health significance should be explored.
6. **Syndrome antibiograms:** Models which combine data on the probability of particular microbial etiologies of specific syndromes in defined populations (e.g., pneumonia in nursing home patients in one region) with the likelihood of microorganisms being resistant to standard therapies are sometimes called syndrome antibiograms. It could be useful to conduct a formal evaluation of this tool using surveillance data to assess its utility for enhancing empiric antimicrobial therapy and improving patient outcomes.
7. **Improved timeliness:** CDC surveillance data on AR, including both raw data as well as analyses and interpretations, should be available to public health officials and clinicians in as close to real-time as possible.
8. **Better communication:** CDC surveillance data on AR should be more clearly and widely disseminated so as to improve understanding and awareness of the scope of the problem

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9. Availability of raw data: CDC surveillance data on AR should be available in raw form for analysis and inquiry online so as to improve opportunities for use of the data for both clinical and public health decision-making.
10. International surveillance: The factors described above for domestic (U.S.) surveillance all have parallels relating to AR as an international threat and global phenomenon. CDC should work with ministries of health and international health organizations to address gaps in international surveillance capacity, with particular attention to:
 - Capacity building
 - Timeliness of reporting (creating an “early warning system”)
 - Establishing communication channels to ensure information sharing

Public-private collaboration at the state and local level for preventing the spread of AR pathogens

The transmission of resistant bacterial strains in any geographic area is the result of a complex set of interactions:

- Among people in the community (non-healthcare settings), especially children and students in day care and schools,
- Between people and the environment, including food products, and
- As a result of the movement of patients across multiple healthcare settings (outpatient, including emergency rooms, clinics, dialysis centers, ambulatory surgery, etc., and inpatient, including acute care, long-term care, long-term acute care, etc.)

Thus, prevention efforts need to be coordinated to ensure that interventions are maximally effective (and cost-effective). The movement of persons among institutional settings can result in the persistence, reintroduction and/or amplification of resistance problems despite optimal efforts in a particular setting. For example, reservoirs of resistant pathogens in non-acute healthcare settings may reintroduce resistance into acute care hospitals despite stringent efforts in the hospital to control emergence and spread.

Such coordination needs to occur through collaboration between public health authorities, clinical providers and relevant community resources (schools and day-care providers, large employers, etc.)

This will require:

1. Increased clinical and public health laboratory capacity and regular reporting, either directly to public health authorities or other mechanisms, such as health information exchanges (see discussion above regarding surveillance).
2. Increased infection control capacity in all settings: Guidelines for preventing the spread (and treatment) of antimicrobial resistant pathogens and for optimal antimicrobial use are not followed in some instances because of a lack of awareness of what those guidelines are and/or how to implement them. Through public-private partnerships, all healthcare settings, including long-term care and outpatient environments, should have access to expert guidance on prevention and control

of AR infections and optimal antimicrobial use. CDC should work with public health authorities to develop capacity for sharing such expertise locally among facilities and settings.

3. Increased surveillance capacity: as discussed above under surveillance, local and state health departments need to have the capacity to provide information to clinicians and infection control experts in all settings on current risks and threats from AR pathogens in the community. This information should be made available in interpretable form to schools and other settings where potential transmission outside of healthcare settings may be a factor in spread. CDC should work with public health authorities to ensure that such capacity exists.
4. Demonstration projects: CDC should work with local and state health departments to establish demonstration projects to:
 - Provide proof-of-concept for regional collaboratives in which actionable information from surveillance leads to targeted responses to effectively prevent transmission and spread of AR pathogens.
 - Test a variety of strategies to ensure maximal cost-effectiveness
 - Identify variability among potential sites to ensure that interventions are adaptable and scalable
 - Identify suitable metrics and outcome measures to ensure viability of such programs

Activities to better monitor antimicrobial use and to continue to optimize antimicrobial prescribing in all healthcare settings

The use of antimicrobial agents in ways that are not optimized for patient care has been a subject of concern since shortly after the introduction of penicillin. A variety of factors, including a slowing in the development of new antimicrobials by the pharmaceutical industry (“the antibiotic pipeline”), an increase in the incidence of adverse consequences of antimicrobial use (especially *C. difficile* infection) and the excess expense incurred by non-optimal use of antimicrobials in an era of increasing fiscal constraints, have amplified this concern and increased the need for antimicrobial stewardship and judicious antimicrobial use in all healthcare settings. To enhance the uptake and success of antimicrobial stewardship activities, CDC should consider augmenting efforts to:

1. Obtain better data: There is a need for better information on all aspects of antimicrobial use
 - Quantitatively linking antimicrobial use to resistance: Studies conducted to date on limited populations (e.g., within a single hospital or other defined group) have not demonstrated a consistent and reproducible quantitative relationship between changes in antimicrobial use patterns and sustained changes in the bacterial resistance in that population. Conducting larger scale, population-based intervention studies would be logistically challenging and likely resource intensive. CDC should proactively assess the projected outcomes of such studies, the scientific validity of possible study designs, and the cost-benefits of such studies to determine whether such studies would be of value. Alternatively, the utility and value of conducting ecological studies using data from large databases of antimicrobial prescribing and microbiology laboratory reports, which would be less costly but of more dubious scientific validity, should similarly be assessed. Whether more quantitative models linking use and resistance can strengthen the case

for optimizing antimicrobial use based on a clear rationale of return on investment in stewardship will ultimately depend on the acceptability of the data used in the models.

- Standardizing use measurement: This is a long-standing problem that may be difficult to resolve, but any efforts to standardize the manner in which the volume or amount of use is characterized would help in measurement, particularly for international comparisons.
 - Prescribing patterns—inpatient and outpatient: Interventions to optimize antimicrobial therapy could be more effectively designed with better data on the circumstances in which antimicrobials are prescribed, dispensed and used. For human health, it would be helpful to know not just the relative amount of use in the outpatient and inpatient environments, but more specifically, which environments (doctors' offices, clinics [including drug store clinics and other rapidly expanding settings], ambulatory surgery, etc.), who is prescribing (e.g., internists, surgeons, family practitioners, physician extenders [in jurisdictions where they have prescribing authority], etc.), what drugs are most commonly prescribed in which environments and settings and whether differences between prescribing, dispensing and consumption remain relatively constant or vary across settings or patient populations. These are only some of the necessary data points that would greatly facilitate the development and implementation of successful interventions to ensure optimal antimicrobial use.
 - Better data on physician and consumer decision-making: Significant strides have been made in growing awareness of the need for and benefits of improving the use of antimicrobials, both among prescribers and the public/consumers. However, while educational campaigns are always necessary and beneficial, they may sometimes need to be augmented with targeted interventions to bring about the level of systemically significant change we'd optimally like to see. Further advances in changing prescriber behavior would be aided by having more knowledge of the complexities and drivers of prescriber decision-making. Studies designed and executed from the perspectives of behavioral science and economics are likely to be of considerable benefit in designing interventions.
2. New communications initiatives (building on *Get Smart*): The *Get Smart* program has been a tremendous success for CDC and has established a strong, internationally recognized brand. The most recent *Get Smart Week* campaign (November 2011) was the most successful ever in terms of national (and international) media coverage and had significant impact in local media channels in a number of markets. This argues strongly for continuing and expanding this successful program. This could be in the form of an extension of the brand using different channels or augmented content or could be an entirely new communication product as part of *Get Smart*.
 3. Promote the implementation of systems-thinking models: The last 10 to 20 years has seen rapid growth in the application of business-model management systems to clinical medicine. Although sometimes accompanied by unintended consequences, these systems—whether implemented for purely financial reasons, to address patient safety concerns, or for other reasons—have been used in some healthcare settings with measureable benefit quantified by epidemiologic studies, including case studies of hospital-based antimicrobial stewardship programs. CDC should consider adapting and translating successful programs into transferable best practices and exploring the feasibility of

promoting such best practices to third-party payers as well as to non-hospital networks (e.g., dialysis centers).

Promoting the development of new technologies for more rapid diagnostic testing for antimicrobial resistance, especially in clinical specimens

The development and successful implementation of more rapid diagnostic testing for antimicrobial resistance, especially in clinical specimens, would be of great benefit in improving clinical outcomes and promoting antimicrobial stewardship. Such tests could also be of great value in conducting trials of new antimicrobials by identifying eligible patients more efficiently, thus reducing the number of study subjects needed for initial enrollment, decreasing both the cost and time required to conduct such studies. This could serve to help restock the antibiotic pipeline with new drugs. CDC should work with public sector and private sector partners to help answer the following questions:

1. What is the optimum role for CDC to play in research, development, testing and diffusion of new, rapid diagnostic testing for antimicrobial resistance?
2. Can point of care (POC) testing for AR in clinical specimens be realized in the next five years based on existing technology?
3. If POC testing for AR in clinical specimens is not a realistic goal in the near future, what is maximally achievable in reducing the time from specimen collection to identification of AR in an infecting microorganism?
4. Can the benefits of rapid diagnostic testing in terms of better patient outcomes (as well as for stewardship and cost savings) be calculated for various time-frames? That is, what is “good enough”—do we need testing at the point of care or is six hours, or 12 hours adequately beneficial to achieve better outcomes? This information could help determine proposed levels of investment in developing and deploying new technology.

Disease burden assessment

Support for public health interventions generally, and infection control activities in particular, have sometimes been hampered by methodological difficulties in demonstrating their economic value as a return on investment by health care institutions and/or by a perception among some observers that such efforts are not fiscally cost-effective. In recent years, combinations of epidemiologic and econometric analyses have helped to demonstrate clearly the positive return on investment that may accrue from a variety of public health interventions, including healthcare-associated infection prevention and control. Augmenting the capacity to do such studies specifically for demonstrating the ROI of preventing the spread of antimicrobial resistance and preventing AR infections would greatly increase the awareness of the benefit of AR prevention and control activities.

5. Integrated burden assessment is more likely to lead to integrated prevention capacity: Many current economic analyses of AR problems are done for specific microorganisms (e.g., MRSA, *S. pneumoniae*) or for specific settings (e.g., acute care hospitals). This may significantly understate the actual burden of AR for which basic prevention approaches

(i.e., use antimicrobials wisely, detect early and control rapidly the emergence of new resistance, and interrupt transmission of known resistant problems) are similar regardless of microorganism or setting. CDC should explore methods for more accurately estimating the burden of antimicrobial resistance across the most impactful pathogens and across all settings. This could significantly enhance support for prevention activities at community, state and national levels.

6. More quantitative assessment of prevention effectiveness (PE) and return on financial investment (ROI): Similarly, CDC should apply to AR the increasingly sophisticated methods developed for measuring PE and ROI for other public health problems in the community and in healthcare settings.
7. Better quantification and description of the problem will permit more effective communication and likely lead to increased motivation for prevention. CDC should incorporate data on disease burden attributable to AR in communication efforts, including prevention campaigns and antimicrobial stewardship campaigns aimed at healthcare professionals, providers, payers, consumers and decision-makers.

Strategic Questions

In addition to the five Strategic Priorities, the consultants raised five questions bearing on strategy formulation and implementation that were recommended for consideration by CDC. These questions emerged as themes during discussions during the meeting and, in general, addressed how CDC wished to define its role in various aspects of its public health work on preventing antimicrobial resistant infections. These questions were prompted by, and in response to, the charge to the consultants containing the proposed criteria for assessing priorities (see appendix 1, page 2 and page 6).

These questions were:

1. Antimicrobial use in agriculture: Responsibility for regulation and oversight is the purview of FDA and USDA; CDC's role is primarily limited to issues surrounding human health. How does CDC work with other Federal agencies to address this public health concern and what role, if any, could/should CDC have in changing practices with regard to antimicrobial use in agricultural settings?
2. Research and development (R & D) of new diagnostic tests: R & D traditionally is the role of the private sector and/or NIH-funded extramural work, primarily in academic institutions. What can CDC contribute to encouraging, hastening, facilitating, deploying, and/or creating standards of practice for the use of new and more rapid diagnostic tests for AR?
3. Innovation vs. maintenance of ongoing activities: As in all areas of public health, CDC has been a leader and innovator for many years in developing programs to monitor, prevent and control antimicrobial resistance. Population-based surveillance of targeted microorganisms through the Emerging Infections Program, educational campaigns to improve antimicrobial use under the *Get*

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Smart programs, and support for prevention collaboratives have all demonstrated extraordinary success and have enabled significant improvements in public health. Given increasingly limited sources of funding, the resource needs of maintaining such established, valuable programs is in competition with the resources needed to develop the next generation of innovative, cutting edge programs to address the ever changing challenges of antimicrobial resistance. To what extent could CDC explore options for out-sourcing, handing off established programs extramurally and/or redirecting current program emphases to encourage further innovation, proof-of-concept exploratory projects, and new program development and evaluation?

4. Clinical guideline development: Is this an optimal CDC function or should this be the purview of professional organizations? Does the CDC imprimatur carry such weight as to justify a greater level of CDC involvement?
5. Data for clinical decision-making: To what extent could CDC better present its surveillance data to assist clinical decision-making, especially with regard to empiric antimicrobial therapy based on local resistance patterns?

Next Steps: How this report will be used

When final, the workshop report will be posted on the CDC AR website. The final report will be one of several inputs to the newly-formed Antimicrobial Resistance Working Group of CDC's Office of Infectious Diseases Board of Scientific Counselors. The final report will also serve as a core document for further development of CDC's Strategic Plan for Combating Antimicrobial Resistance. In addition, the final report and the CDC Strategic Plan that follows will help guide CDC's submissions to the 2012 and 2013 updates of the Federal *Action Plan for Combating Antimicrobial Resistance* of the Interagency Task Force on Antimicrobial Resistance

Meeting Overview

The purpose of this meeting is to gather a diverse set of opinions from experts in clinical and laboratory medicine and public health to assist CDC in making decisions on how best to prioritize our work in the area of prevention and control of antimicrobial-resistant infections. Each consultant is encouraged to speak from her or his professional perspective taking into account CDC's responsibility to address national public health goals. There is no attempt to develop a consensus view or make a group recommendation.

CDC will continue to align its strategic priorities with the content of *A Public Health Action Plan to Combat Antimicrobial Resistance* (<http://www.cdc.gov/drugresistance/pdf/public-health-action-plan-combat-antimicrobial-resistance.pdf>). This Federal Action Plan, which is now revised and updated annually, lays out key goals and actions to which federal departments and agencies are committed in the areas of surveillance, prevention and control, research, and product development. While CDC has important roles in all of these areas, CDC is the coordinator for many of the actions in the sections on surveillance and prevention and control. Because the science and the public health imperatives in these areas continue to evolve rapidly, we wish to ensure that CDC's activities are maximally effective and fully integrated into the overall federal effort and the broad array of initiatives being carried out in the public health and clinical communities. Thus, we are seeking opinions and feedback from a selected group of consultants on potential strategic priorities and specific projects and activities that CDC might pursue during the next three years to fulfill its role in the Federal Action Plan.

Workshop Structure:

CDC Activities

For those action items in the Action Plan for which CDC is the coordinator, CDC is considering a variety of possible strategies as well as specific activities to ensure that the goals are achieved in the most effective manner, particularly in this time of global economic austerity. Through presentations by CDC staff on the first morning of the workshop, participants will be provided with overviews of these possible strategies and will be asked, during breakout sessions, to provide their individual insights and opinions on which activities may be most successful based on the following criteria:

- Disease burden prevented: Activities which could prevent the most morbidity, mortality, and economic cost
- Feasibility: Activities which are most likely to show measurable progress within a three year timeframe starting in 2013
- Scope of CDC influence: Activities for which CDC actions can have the most direct influence on prevention of AR diseases/infections
- Innovation: Activities which are innovative and offer new approaches to addressing existing or emerging problems.
- Opportunities for prevention:

Appendix 1: Meeting Materials

- Activities which fill gaps in prevention by addressing missed opportunities to implement known prevention strategies, especially if these prevention strategies are highly cost-effective (positive return on investment [ROI])
- Activities which fill gaps in prevention by developing prevention strategies where effective strategies are not known or proven
- Activities which fill gaps in prevention by working in critical areas where other groups/agencies/organizations are not currently active

Consultants will be asked to select a set of activities which they feel may have the highest priority for consideration by CDC in program and project planning during the next three years.

Partner Activities

We are also interested in hearing about activities in which consultants are currently engaged or which they plan to start within the next 12 to 24 months that could involve CDC as a valued collaborator. Participants are invited to discuss these ideas with a particular emphasis on what CDC's role as a collaborator might be.

Appendix 1: Meeting Materials

FAQs

- *Antimicrobial Resistance (AR) is a global public health crisis that encompasses a wide range of microorganisms. Why are we not explicitly discussing international activities? Why is the discussion limited to bacterial and fungal AR?*

Because of the breadth and complexity of the topic of antimicrobial resistance, we have limited the focus of this particular workshop to domestic priorities in the United States that address bacterial and fungal infections. A two-day workshop is insufficient to address the global burden of all AR pathogens.

We recognize that antimicrobial resistance is a global problem and that resistance problems complicating the treatment of viral, parasitic and mycobacterial infections around the world takes a toll in human life and suffering so extensive that international surveillance systems struggle to quantify it. We will apply the insights we gain during this workshop to the design of future engagements with international partners so that we can, in the near future, assemble a truly global agenda for CDC's scientific and programmatic collaborations with partners both in the United States and around the world.

- *Will the results of this workshop drive all CDC activities in antimicrobial resistance?*

No. Each CDC Center and Division needs to be able to prioritize its own activities within the context of the specialized needs of the public's health as it pertains to that Division's area of focus. The CDC Office of Antimicrobial Resistance coordinates across CDC Divisions and Centers and supports specific activities which promote an agency-wide perspective. The results of this workshop will be a critical part of the process by which CDC develops and promotes its broad-based agency goals for AR; these goals are complementary to, and in no way replace or compete with the disease-specific goals and objectives of CDC Divisions and Centers.

- *Will there be other opportunities for input?*

Yes, many and with some frequency. We just held the public meeting of the Interagency Task Force for Antimicrobial Resistance on November 15, 2011 and such meetings will be held annually. The Board of Scientific Counselors of the Office of Infectious Diseases at CDC is forming a Working Group on Antimicrobial Resistance. Meetings of the Board of Scientific Counselors are public meetings and are announced in the Federal Register (as are the public meetings of the Interagency Task Force). In addition to these formal venues, CDC will be continuing active engagement with partners and constituents in a structured way. Some possible avenues for this engagement will be discussed during the workshop.

- *What kind of follow-up can we expect from this meeting?*

Attendees will be given a chance to review and comment on the workshop report CDC. We are also eager to hear from you about ideas you may have for how to promote increased interaction with CDC regarding AR. Those attendees who wish can sign up for email updates when new material is posted on the CDC website on antimicrobial resistance.

Agenda-in-Brief

Day 1--Tuesday, December 6, 2011

7:30 AM	Participant Registration
8:30 AM	Convene Meeting
8:35 AM	Welcome on Behalf of CDC and Opening Remarks: The importance of preventing AR infections to public health and CDC's role
8:45 AM	Overview and Goals of the Meeting
	Meeting Logistics
9:00 AM	Panel 1: CDC Surveillance for AR: Status and Future Directions
10:00 AM	Break
10:30 AM	Panel 2: CDC Activities for Improving Antimicrobial Use: Status and Future Directions
11:30 AM	Panel 3: CDC Initiatives to Prevent Infection and the Spread of AR Pathogens —Translating Science into Program: Status and Future Directions
12:30 PM	Working Lunch
1:30 PM	Breakout Session I: AR surveillance: discussion of CDC's proposed future directions
2:45 PM	Break
3:30 PM	Breakout Session II: Improving antimicrobial use: discussion of CDC's proposed future directions
4:45 PM	Day 1 Wrap-up
5:15 PM	Adjourn
6:30 PM	Dinner (optional)

Day 2--Wednesday, December 7, 2011

8:30 AM	Review of Day 1 and Introduction to Day 2
9:00 AM	Breakout Session III: Preventing infections and spread of AR pathogens — translating science into program: discussion of CDC's proposed future directions
10:15 AM	Break
11:00 AM	Report from Breakout Session I, Groups A - D
11:30 AM	Report from Breakout Session II, Groups A - D
12 Noon	Lunch
1:00 PM	Report from Breakout Session III, Groups A -D
1:30 PM	Report from Enteric Diseases Breakout Sessions, Group E
2:00 PM	Panel and Discussion: Next Steps
3:00 PM	Meeting Summary and Follow-up Plans
3:30 PM	Adjourn

Breakout Sessions Overview

BREAKOUT SESSION GOALS

- To obtain consultants’ input into CDC’s consideration of priorities for antimicrobial resistance (AR) activities currently listed in *A Public Health Action Plan to Combat Antimicrobial Resistance* (Action Plan) (<http://www.cdc.gov/drugresistance/pdf/public-health-action-plan-combat-antimicrobial-resistance.pdf>) and which are continuing into 2013 and beyond
- To obtain consultants’ input into CDC’s consideration of priorities for AR activities for submission to next year’s update of the Action Plan
- To identify partner AR activities in which CDC could be a collaborator

HOW THE BREAKOUT SESSIONS WILL WORK

There are three breakout sessions:

- Surveillance and Monitoring—Tuesday, Dec. 6, 1:30 – 2:45 PM
- Improving Antimicrobial Use—Tuesday, Dec. 6, 3:30 – 4:45 PM
- Translating science into program: Preventing infections and spread of AR pathogens—Wednesday, Dec. 7, 9 – 10:15 AM

During each breakout session, there will be five breakout groups, Groups A, B, C, D and E (see Table 1).

- Groups A, B, C and D, will each review the same materials and seek the consultants’ input on relative priorities for CDC activities to go in the next version of the Federal AR Action Plan. (**Breakout Session Guide**, below).
- Group E, which is hosted by the Division of Foodborne, Waterborne and Enteric Diseases, will consider CDC’s collaborations and role in current and potential Federal AR Action Plan activities related to AR in enteric bacteria. For more information on these sessions, please contact Dr. Beth Karp, Office#: 404-639-5097, bkarp@cdc.gov

Table 1

	Tuesday, Dec. 6	Tuesday, Dec. 6	Wednesday, Dec. 7
	1:30 – 2:45 PM	3:30 – 4:45 PM	9 – 10:15 AM
	Surveillance and monitoring	Improving Antimicrobial Use	Translating science into program: Preventing infections and spread of AR pathogen
Group A	Action Plan priorities	Action Plan priorities	Action Plan priorities
Group B	Action Plan priorities	Action Plan priorities	Action Plan priorities
Group C	Action Plan priorities	Action Plan priorities	Action Plan priorities
Group D	Action Plan priorities	Action Plan priorities	Action Plan priorities
Group E	CDC role and collaboration in enteric diseases	CDC role and collaboration in enteric diseases	CDC role and collaboration in enteric diseases

Breakout Sessions Guide for Consultants, Groups A - D

- In each of the three breakout sessions—surveillance, antimicrobial use, and prevention, consultants will be provided with a list that includes:
 - Current CDC activities that are related to specific actions in the Federal AR Action Plan and that will be continuing into 2013
 - New and enhanced CDC activities that could be added to the Federal AR Action Plan for implementation in 2013 or beyond

- Looking at this list of current CDC activities continuing into 2013 and CDC activities that could be added starting in 2013, participants will be asked to review, discuss and provide their perspectives on the relative priority of these activities. Each activity will be assigned to one of three categories:
 - Highest priority – Has the greatest impact on public health by preventing AR infections and improving patient outcomes
 - High priority—Is valuable for public health by preventing AR infections and improving patient outcomes
 - Priority—Contributes to public health by preventing AR infections and improving patient outcomes

- Prioritization should take into account a national public health perspective and be based on the following criteria:
 - Disease burden prevented: Activities which could prevent the most morbidity, mortality and economic cost
 - Feasibility: Activities which are most likely to show measurable progress within a three year timeframe starting in 2013.
 - Scope of CDC influence: Activities for which CDC actions can have the most direct influence on prevention of AR diseases/infections
 - Innovation: Activities which are innovative and offer new approaches to addressing existing or emerging problems.
 - Opportunities for prevention:
 - Activities which fill gaps in prevention by addressing missed opportunities to implement known prevention strategies, especially if these prevention strategies have are highly cost-effective (positive return on investment [ROI])
 - Activities which fill gaps in prevention by developing prevention strategies where effective strategies are not known or proven
 - Activities which fill gaps in prevention by working in critical areas where other groups/agencies/organizations are not currently active

- Following this prioritization, activities suggested by partners with which CDC could be invited to collaborate will be added to the list. These activities will be discussed but will not be prioritized.

BREAKOUT GROUP PROCESS GROUPS A - D—STEP BY STEP

1. The Facilitator will ask the group members to introduce themselves and will briefly review the breakout group goals and process.
2. The Facilitator will ask the group to identify a consultant to accompany the recorder and represent the group in the summary meeting at the end of the session to prepare the breakout group report (see step 9).
3. Consultants will then have a few minutes to review the CDC activities under discussion (using the Activities Selection Form for that session) and ask questions of the CDC staff in the group.
 - All group members should complete the Feedback Form for that particular session making comments as desired relating to the discussion.
4. To initiate the prioritization process, consultants will then be invited to highlight three activities from the Activities Selection Form which they feel might be particularly important for achieving the public health goal of reducing the disease burden of antimicrobial resistant infections. The recorder will tally consultants' selections on the posters displayed in each room.
5. After additional discussion, consultants will then be asked to categorize each of the activities into one of three groups:
 - Highest priority – Has the greatest impact on public health by preventing AR infections and improving patient outcomes
 - High priority—Is valuable for public health by preventing AR infections and improving patient outcomes
 - Priority—Contributes to public health by preventing AR infections and improving patient outcomes
6. Consultants' selections will be tallied on a set of pre-printed posters (2.5' by 2.0') in each room. Consultants can place colored dots directly on the posters representing highest priority (red), high priority (yellow), and priority (green).
7. All group members will have an opportunity to review and comment on the consultants' selections.
8. Then, consultants will be invited to suggest activities which they or their organizations are currently conducting or plan to conduct and in which CDC could be invited to collaborate. These will be listed by the Recorder on the on the posters.
9. At the end of the session, the facilitator and recorder will collect the Feedback Forms from each group member.
10. Following the end of each session, there will be a break during which the Recorder and the consultant representing the each of the groups will meet, share the results of their sessions and prepare for the 30 minute breakout group report which will occur between 11 AM and 2 PM on the second day of the workshop. At this summary meeting, we'd like the consultants to identify one consultant who will volunteer to present the combined report for all four breakout groups.

Appendix 2: Invited Participants

David Andes, M.D.

Division Head, Department of Medicine, and Medical Microbiology and Immunology, University of Wisconsin

Paul Bartlett, M.D., D.V.M., M.P.H.

Professor, Michigan State University

Nikolay Braykov

Research Analyst, CDDEP Resources for the Future

Susan Coffin, M.D., M.P.H.

Medical Director, Infection Prevention & Control Children's Hospital of Philadelphia, UPENN School of Medicine

Ted Cohen, M.D., M.P.H., D.P.H.

Assistant Professor, Department of Epidemiology, Harvard School of Public Health

Sara Cosgrove, MD, MS, FSHEA

Associate Professor, Department of Medicine Director, Antibiotic Management Program, The Johns Hopkins Hospital Department of Infectious Diseases

Edward Cox, M.D., M.P.H.

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Appendix 4: Project Prioritization Exercise

Introduction

The purpose of the project prioritization exercise was to gather opinions from each of the expert consultants on their views of the relative priority of current and proposed CDC activities included in A Public Health Action Plan to Combat Antimicrobial Resistance.

The process is described in detail in Appendix 1. Briefly, there were three breakout sessions—one each focusing on surveillance, antimicrobial use, and prevention & control measure. During each session, consultants were divided into four groups led by a CDC facilitator. Consultants were provided with lists of current CDC activities that are described as specific activities or projects in the Federal AR Action Plan and that will be continuing into 2013, as well as new and enhanced CDC activities or projects that could be added to the Federal AR Action Plan for implementation in 2013 or beyond. Following a discussion period, consultants were asked to provide their individual views on the relative priority of those activities for addressing the problem of antimicrobial resistance in regard to CDC's mission to improve the public's health. Consultants were asked to divide the activities into three priority groups: highest priority, high priority and priority. The consultants' individual assessments were then reviewed and analyzed.

Caveats to analysis and interpretation

Although the discussions were facilitated and followed a similar structure, there was considerable latitude given to the groups in how they approached the tasks. For this and other operational reasons, although numerical rankings can be (and were) computed from the information obtained during the breakout sessions, a qualitative analysis appeared to be more valuable than a strictly quantitative one for guiding CDC's decision-making going forward. A review of all the information provided by consultants, including reviews of comment sheets, recorders' notes, and notes from the debrief meetings held after each session, indicated some clear patterns which were consistent with the numerical analysis.

General conclusions

In all three breakout sessions—Surveillance, Antimicrobial Use, Prevention and Control—consultants generally tended to favor activities that:

- Broader in focus—that looked at applicability across a range of pathogens, diseases, syndromes, care settings, patient populations, etc.
- Took a national perspective—activities that themselves had a national scope or were scalable to a national scope
- Provided actionable guidance to clinicians and public health officials
- Encouraged networking and accountability
- Were quantitative and provided data that were relevant for prioritization and decision-making

Qualifications on interpretation

- Only rarely did consultants feel any project did not have some valuable or importance
- Comments indicated that discussions generally did adhere to the criteria provided for prioritizing (i.e., most impactful, most practical, CDC filling a gap, etc.)

Appendix 4: Project Prioritization Exercise

- Some prioritization decisions related to opinions about the relevance of CDC's role in an activity, rather than the intrinsic value of the activity itself; specifically whether an activity could be better or as well conducted elsewhere in government or in by a non-governmental organization

Specific results

Surveillance—the activities that tended to be rated highly by individual consultants were often related to the idea of enhancing a national (and eventually international) surveillance network which has the following characteristics:

- Incorporates various pathogens of concern independent of location of colonization or infection or route or transmission
- Promotes electronic data capture and reporting
- Provides regular reports of national scope with enhanced regional/state capacity to identify “hot spots” or geographic foci of problems
- Provides for interoperable data systems and translation to consistent denominators
- Is population-based

Antimicrobial use-- the activities that tended to be rated highly by individual consultants often stressed the importance of:

- Working on identifying and promoting known “best practices” to improve antibiotic use.
- Working collaboratively with professional organizations and regulatory and accreditation agencies to develop quality measures and enhance compliance with measures to improve antibiotic use.
- Getting better data on prescribing—the “who, what, when and where” regarding antimicrobial prescribing, prescription fulfillment and consumption
- Getting better information on prescribers’ knowledge, attitudes and behaviors and what “triggers” or “levers” could best influence that behavior (and the same for consumers).
- Getting better data on accountability and outcome measurement for prescribers and clinical results (i.e., can we prove that improved prescribing performance [however measured] leads to better, or at least equally good, patient outcomes as well as improvement in resistance “ecology”)

Prevention and control-- the activities that tended to be rated highly by individual consultants fell into three general categories:

- Better and more rapid diagnostic tests for identification and resistance (preferably POC testing at the bedside or in the doctor’s office)
- Vaccines to prevent infections with resistant pathogens
- Developing state-based or regional collaborative efforts to address resistance problems across care settings with process and outcome evaluation, systems thinking, local surveillance benchmarked against national rates and structured interaction between public health and clinical professionals

Appendix 4: Specific Projects Proposed by Individual Consultants during Breakout Groups

During each of the breakout groups, consultants were invited to suggest additional projects, not listed on the handouts, in which CDC could partner with other agencies or organizations or build on existing projects to fill gaps in the public health portfolio for AR prevention. Similar ideas were expressed in more than one group and are categorized below.

Surveillance of Antimicrobial Resistant (AR) Pathogens

1. Projects to enhance surveillance of foodborne AR pathogens
 - a. Look for synergies between ABCs and NARMS data and methods
 - b. Synthesize the three NARMS reports for better correlation between animal and human isolates
 - c. Build on NARMS data and methods to further epidemiologic knowledge on transmission of resistance of pathogens (*MRSA*, *C. diff*) not currently tracked in NARMS from meat and other agricultural sources
2. Projects to enhance usefulness of CDC AR surveillance data
 - a. Develop communications strategies for various audiences
 - b. Publish an annual or biannual national AR report
 - c. Make surveillance data available in raw form to allow for interactive web-based access to these data for additional analysis as well as data dissemination and analysis (as is currently done with ILI surveillance)
3. Projects to enhance the accuracy and completeness of CDC AR surveillance data
 - a. Standardize MDR definitions and nomenclature
 - b. Promote better diagnostics to increase capacity to identify AR organisms more rapidly and more completely
4. Projects to enhance epidemiologic knowledge of AR in patients
 - a. Studies correlating surveillance data on specific patterns of resistance in blood culture isolates with patient setting, antimicrobial exposure and treatment and patient outcomes.
 - b. Studies of healthcare workers in a variety of settings (e.g., acute care, LTC, hemodialysis) with regard to incidence and prevalence of AR resistance in colonized HCWs, transmission to and from patients (possibly including family based transmission)
 - c. Studies to more completely characterize populations at highest risk for colonization and infection with multiply resistant gram-negatives

Antimicrobial Use

1. Projects to enhance surveillance of antimicrobial use (AU)
 - a. Continue periodic point prevalence surveys of inpatient AU
 - b. Accelerate data availability from the NHSN AU option
 - c. Expand AU surveillance (and interventions) to long-term care (LTC) and long-term acute care (LTAC)

Appendix 4: Specific Projects Proposed by Individual Consultants during Breakout Groups

- d. Expand the use of Veterans Affairs Health System data which is already available in electronic form
 - e. Studies to correlate longitudinal patterns of use in both inpatient and outpatient settings with resistance patterns of isolates from patients
 - f. Studies to correlate longitudinal patterns of use in patients with resistance patterns of isolates from patients in different geographical locations
 - g. Increase scope of AU surveillance to include national distribution and volume of AU in humans, animals, agriculture—analyzed by geographic area, by setting, and other demographic and operational variables correlated with resistance
 - h. Encourage data sharing about antimicrobial use from individual pharmacies and facilities all the way up to the national/global scale. (Researchers are blocked from getting use data other than from their own facility.)
 - i. Surveillance should include measures of inappropriate use
2. Projects to develop, test, evaluate, implement and disseminate Intervention strategies to improve AU
- a. Develop a “driver diagram” to include as part of the AU change package for use by facilities and practices
 - b. Studies to better describe KAB of both inpatient and outpatient prescribers to help focus and target interventions
 - c. Address concerns (medico-legal and others) about risk to prescribers of a bad patient outcomes after using “best therapy” or “guideline adherent” therapy rather than “maximal therapy”, i.e., will prescriber face consequences for not using “heaviest guns” for treatment in case of a bad outcomes, even if unavoidable.
 - d. Expand studies to include evaluation in various settings of the broadest range of interventions for changing prescriber behavior—financial incentives, institutional and professional culture, marketing, etc.
 - e. Explore use of surrogate markers and biomarkers for infections, especially in the ICU, to improve choices for empiric therapy
 - f. Develop specific guidelines for patients with pan-resistant infections
 - g. Work with accreditors and others (HEDIS, JCAHO, CMS) to develop inpatient and outpatient quality measures that can be used as benchmarks for prescriber behavior
 - h. Enhance communication efforts to stress accountability of prescribers and dispensers for AR problems due to inappropriate AU
 - i. Work with partner agencies in their efforts to develop or update educational materials on the judicious use of antimicrobial agents in food animals and make those materials available to veterinarians, veterinary students and food animal producers
 - j. Promote/conduct clinical trials to determine the appropriate duration of therapy

Prevention & Control

1. Infection Control (IC) Projects

Appendix 4: Specific Projects Proposed by Individual Consultants during Breakout Groups

- a. Work with WHO and other international organizations to promote infection prevention and control for AR in all settings globally
 - b. More clearly define those MDROs that should be subject to special IC attention, especially in LTC and acute care settings that share patients
2. Public Health System Projects
- a. Study the usefulness and impact of mandatory reporting of AR in LTC settings
 - b. Fill gaps in knowledge for established infection prevention guidelines
3. Laboratory Projects
- a. More fully define what role CDC will play in development of rapid diagnostic tests for AR in the laboratory
 - b. Enhance CDC's role in the long-term development of point of care diagnostic testing for AR
 - c. Explore ways of using CDC surveillance data paired with information on patient outcomes and antimicrobial treatments to assess the correlation between antimicrobial susceptibility testing (AST) data and treatment outcomes, for the purpose of updating or altering AST procedures/methods as necessary
 - d. Studies to correlate AST data and reporting of those data in clinical settings with AU and transmission of AR pathogens
4. Other Projects
- a. More fully define what role CDC will play in development of candidate vaccines for AR pathogens
 - b. CDC should establish training grants for AR research and prevention, both for individual investigators and at the institutional level to increase the pipeline of trained researchers and experts in the field