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Organization**



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Final Report

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ACRONYMS AND ABBREVIATIONS

AMR	antimicrobial resistance
ART	antiretroviral treatment
CDC	Centers for Disease Control and Prevention (United States)
CLSI	Clinical and Laboratory Standards Institute
CPE	carbapenem-resistant Enterobacteriaceae
DDD	daily defined doses
DTC	Drug and Therapeutic Committee
ESBL	extended spectrum betalactamase
HAART	highly active antiretroviral treatment
HAI	hospital acquired infection
HIVDR	HIV drug resistance
ICU	intensive care unit
IHR	International Health Regulations
IPC	infection prevention and control
KPC	<i>Klebsiella pneumoniae</i> carbapenemase
MDR	multidrug resistant/resistance
MRSA	methicillin resistant <i>Staphylococcus aureus</i>
NDM	New Delhi metallo-beta-lactamase
NRA	national regulatory authority
ReLAVRA	Latin American Surveillance Network of Antimicrobial Resistance (acronym from Spanish name)
RUM	rational use of medicines/drugs
TB	tuberculosis
WHA	World Health Assembly
WHD	World Health Day
XDR-TB	extensivelyrug resistant tuberculosis

INTRODUCTION

Dr. Francisco Becerra, Assistant Director, offered welcoming remarks and provided a summary of the Organization's rationale for strengthening the work of the Secretariat and Member States in the areas of resistance to antimicrobials and health care-associated infections.

In recent years, the development and spread of multi-resistant pathogens have jeopardized infectious disease control in the Region of the Americas, which, paradoxically, was the foundation for creating the Pan American Health Organization, over 110 years ago, in 1902. The spread of a new resistance mechanism, known as carbapenemases, poses serious challenges for national health services. Carbapenemases have already been identified in the Region in Argentina, Barbados, Brazil, Colombia, Nicaragua, Panamá, Uruguay, and Venezuela. Outbreaks of infections by *Klebsiella pneumoniae* carrying the carbapenemase mechanism have caused increased mortality. They have also proven difficult to control, and preventing the spread of the pathogen is difficult as well, thus making collaborative and coordinated infection control efforts are of utmost importance.

Currently, resistance to antimicrobials threatens public health, carries high socioeconomic costs, and requires a multisectoral response; therefore, the leadership of national governments is critical for success. In practice, the right approach would begin with a legal, political and regulatory framework covering all aspects of antimicrobial use, including laboratory surveillance of resistance, and control of health care-associated infections.

At a roundtable on antimicrobial resistance held during PAHO's 51st Directing Council meeting in 2011,¹ Member States asked the Pan American Sanitary Bureau "to prepare a regional strategy and plan of action for the containment of antimicrobial resistance that will serve as a guide for national policies and operating plans." Dr. Becerra highlighted the importance of this TAG in guiding the development and promotion of Regional and national plans to contain antimicrobial resistance (AMR).

Dr. Marcos Espinal, Department of Communicable Diseases and Health Analysis, reviewed the meeting's agenda, and provided an overview of its objectives. Dr. Espinal indicated that this Technical Advisory Group's recommendations would be presented to PAHO's Directing Council meeting in 2014.

Purpose and Objectives of the Meeting

The purpose of the meeting was to discuss and recommend strategies and policies to guide PAHO's program on antimicrobial resistance for the period 2014-2015. The meeting's objectives were:

1. To analyze the results and impact of World Health Day 2011.
2. To discuss a process for supporting countries in developing integrated national plans for AMR containment.
3. To guide PAHO on the most efficient approach to promote and support the development of AMR integrated national plans.

¹ Pan American Health Organization. Roundtable on Antimicrobial Resistance: Summary Report of the Discussions. 51st Directing Council. Washington, D.C., USA, 26– 30 September 2011. (CD51/15, Rev. 1, Add. I (Eng.)).

Proceedings

Dr. Patrick Kelly was the Chairman of the TAG.

Presentations were made by several participants, following the order in the agenda (Annex 1). Discussions followed each presentation. The recommendations at the end of the document reflect agreements reached by consensus in plenary sessions. The list of participants may be found in Annex 2.

Declaration of Interest

Members of the TAG completed PAHO's required declaration of interest form. No conflicts of interest were detected regarding the meeting's subject matter.

SESSION 1. REVIEW OF THE IMPLEMENTATION OF THE TECHNICAL ADVISORY GROUP'S RECOMMENDATIONS OF SEPTEMBER 2010²

Since 2010, a series of public health events required a modification of PAHO's programmatic priorities, and consequently, affected progress toward fulfilling the recommendations of the TAG 2010 meeting:

- The reintroduction of cholera in the Americas in 2010 delayed the work on antimicrobial resistance and infection control, including the development of clinical guidelines, and those for pathogen detection and sensitivity profiling. As a result, it was necessary to convene a sub-group of the TAG to provide answers to a number of concerns regarding the massive use of antimicrobials, and the screening of United Nations troops.
- World Health Day 2011 was dedicated to antimicrobial resistance. It was an extraordinary opportunity to disseminate, discuss, and raise awareness about the issue at the Regional and national levels.
- The emergence and spread of carbapenemases in the Region had already been detected in Argentina in 2010. In 2011, it was identified in a major hospital outbreak in Panama.
- New resistance mechanisms are constantly emerging and rapidly spreading in the Region, posing challenges to laboratories and infection control programs in charge of detection and containment.
- In 2012, there was an outbreak of plague in Peru that required support in infection control and clinical case management.
- Several neonatal outbreaks (an issue to be addressed following the TAG 2010 recommendations) took place, many of them caused by multiresistant bacteria. Said outbreaks required most of the staff's attention in 2013, especially in the English-speaking Caribbean countries.

Table 1 is a summary of the TAG 2010 principal recommendations, their implementation, and progress achieved during the two-year period following the last TAG meeting.

²Summary of a presentation by Dr. Pilar Ramón-Pardo, Advisor, Antimicrobial Resistance, Department of Communicable Diseases and Health Analysis, Pan American Health Organization, Washington, D.C.

Table 1. Implementation of the Technical Advisory Group's (2010) Recommendations on Antimicrobial Resistance

Recommendations	Progress
<p>1. Continue strengthening quality control programs in each country to focus on patients, bio-risk management (security, biosafety, biosecurity, safe transport, waste management and maintenance), timely usage and dissemination of information from local networks of antimicrobial resistance monitoring, and encourage the use of data analysis software in laboratories.</p>	<p>The External Quality Assurance Program of the Latin American Surveillance Network of Antimicrobial Resistance (ReLAVRA) coordinated by Argentina's Malbran Institute showed improved proficiency among national public health reference laboratories. Several workshops were conducted to promote WHONET in the Region. During the last meeting of the ReLAVRA, in Managua, Nicaragua, in December 2012, a number of challenges facing national networks were analyzed, especially those related to quality standardization in sentinel laboratories.</p>
<p>2. Currently, the Latin American Surveillance Network of Antimicrobial Resistance uses Clinical and Laboratory Standards Institute (CLSI) guidelines. PAHO will promote changes based on updated data and national experiences. The Organization will continue to support Spanish translation and dissemination of CLSI standards and other relevant documents to all countries in the network.</p>	<p>Translation of 2012 Standards (M02-A11, M-100 and M07 A9) was completed. A license agreement with CLSI allowed the distribution of 200 copies (pdf format) in Spanish to Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.</p>
<p>3. Support countries' initiatives to conduct molecular analysis and thereby strengthen molecular epidemiological surveillance and data gathering; support alliances with other monitoring programs in order to strengthen integrated resistance surveillance, including animal health and food production and processing.</p>	<p>Molecular analysis techniques were discussed in various workshops and training activities. A significant investment is needed for equipment and reagents. Referring national samples to the Malbran Institute and frequent communication with the Global Foodborne Network (GFN) and PulseNet are part of the molecular profile identification process. Efforts to integrate surveillance with animal and food safety programs are ongoing. An example of such collaboration was the editing and publication of a special issue of the Pan American Journal of Public Health,³ which included a specific section on antimicrobial resistance and food safety.</p>
<p>4. Encourage country training programs in the field of rational use of antibiotics, in partnership with stakeholders and concerned parties, including professional societies, and members of the scientific and academic communities.</p>	<p>Online courses have been offered, and an active collaboration with PAHO's Health Systems Strengthening (HSS) Department was established, specifically, with the Medicines and Health Technologies Unit.⁴ The publication and distribution of the 6th edition of infectious diseases treatment guidelines, <i>Tratamiento</i></p>

³ Pan American Journal of Public Health; Vol. 30, No. 6, November 2011. Available at:

http://www.paho.org/journal/index.php?option=com_content&view=article&id=97&Itemid=198.

⁴ <http://www.campusvirtuales.org/?q=es/curso-virtual-enfoque-practico-del-uso-racional-de-antimicrobianos-en-la-comunidad>.

	<p><i>de las enfermedades infecciosas 2013-2014</i>, was completed. This is a biennial effort in conjunction with PALTEX. The 6th edition was developed by infectious diseases specialists, with the active participation of the Pan American Society for Infectious Diseases (Sociedad Panamericana de Infectología). This is one of the most widely distributed PAHO publications (between 12,000 and 13,000 copies per issue).</p>
<p>5. It is recommended that responses to external performance evaluations should not exceed 15 days for international programs, and 10 days for domestic programs.</p>	<p>The external quality control program coordinated by the Malbran Institute established a response time of 30 days for each survey. The mean response time for participating countries was 34 days (SD=8; median=35; mode= 35); the range was between 16 and 47 days. Therefore, country responses failed to meet the period allotted for the survey. No data on the matter are available for national quality control programs.</p>
<p>6. Performance has improved regarding detection of antimicrobial resistance in the Region, with PAHO's support, but we must move towards more representative monitoring designs in each country, through the collection and systematization of information to generate evidence-based regional policies.</p>	<p>There still needs to be cross-country work to ensure that monitoring data can support evidence-based policies.</p>
<p>7. Include the participation of TAG members in the annual meetings of the ReLAVRA.</p>	<p>Two members of the TAG participated in the most recent annual meeting of the ReLAVRA Nicaragua in 2012.</p>
<p>8. Keep surveillance of health care-associated infections simple, with a limited number of easily obtained and meaningful indicators.</p>	<p>Work in this area has been extensive: manuals have been developed to determine which would be the key set of indicators for monitoring health care-associated infections.</p>
<p>9. Because neonatal ICUs are problematic regarding infections, especially in large hospitals, it is very important to add a pediatric surveillance module [to IPC manuals] in the future, as soon as surveillance of adult infections is strong enough.</p>	<p>The protocol for quick assessment of HAI surveillance,⁵ prevention and control was revised and published in 2011. The new version includes a neonatology module.</p>
<p>10. In the future, include progress monitoring regarding infection prevention and control infrastructure of participating hospitals.</p>	<p>Completed. See above.</p>
<p>11. Surveillance and management of health care associated outbreaks need to be addressed. Outbreaks are particularly critical in pediatric units, and the issue should be addressed as soon as adult surveillance has been instituted.</p>	<p>The ability to detect and respond to hospital outbreaks is a great weakness in the Region. Direct technical support was provided, and training courses conducted, on outbreak detection and containment in Barbados, Colombia, Dominica, Ecuador, Guyana, and Nicaragua.</p>

⁵ Organización Panamericana de la Salud. Guía de evaluación rápida de programas hospitalarios en prevención y control de las infecciones asociadas a la atención de la salud. Available at: <http://www.paho.org/hq/index.php>.

<p>12. Regarding practical training workshops to train national staff on the implementation of surveillance and infection prevention and control practices, the recommendation was to conduct these in classroom/hands-on settings, rather than virtually. Follow up may be conducted virtually.</p>	<p>Courses were developed and/or adapted to the needs of each country in the Region. These face-to-face workshops have been the most important tool for developing national capacity. Virtual follow up was included as part of the training.</p>
<p>13. The healthcare-associated infections (HAI) surveillance system should be capable of detecting and reporting to appropriate health authorities.</p>	<p>The degree of compliance with this recommendation varies from country to country.</p>
<p>14. Recommendations on infection control should include all levels of health care services (from primary to tertiary) and be cross-cutting through all disease programs.</p>	<p>Work with other infectious diseases programs, such as tuberculosis (TB), is ongoing. Joint efforts include the use of modules to characterize the risks of TB transmission in health care facilities.</p>
<p>15. Support ongoing training for health care workers on basic infection prevention measures. Training should be updated as new threats emerge.</p>	<p>Training contents and materials were updated as emerging pathogens in the Region were detected.</p>
<p>16. Promote accountability among all health care related personnel regarding prevention of infections among staff, patients, visitors, and others.</p>	<p>These types of responsibilities and implementation of standard precautions are promoted and disseminated through PAHO's website.</p>
<p>17. Health care workers must be protected by the universal implementation of standard precautions.</p>	<p>PAHO's role in this regard is to urge countries to implement standard precautions to protect health care personnel. This need for standard precautions is reiterated at every opportunity, including during country/institutional visits.</p>
<p>18. The International Health Regulations (IHR) has had a positive impact on infection control programs at the national level. It is recommended that the evaluation of core capacities continue, and that IHR indicators be used for that purpose.</p> <p>19. Include discussion of the IHR in all international meetings dealing with AMR and infection prevention and control.</p>	<p>The evaluation of essential core capacities in countries has been consistent, and a discussion of the IHR has been a part of all meetings related to antimicrobial resistance. Additionally, communications between national laboratories and the national focal point for the IHR have been stimulated by the identification of new or unusual pathogens, and emerging resistance mechanisms; reporting has complied with IHR requirements.</p>
<p>20. Biosafety and biosecurity issues must go beyond the laboratory, to include all bio-risks.</p>	<p>Included in the responsibilities of the Public Health Laboratory Advisor.</p>
<p>21. Not to promote the IHR just as a legal framework, but as a tool and opportunity to improve surveillance and response, and to strengthen infection control.</p>	<p>Ongoing.</p>

Discussion

Regarding WHONET, in 2009, a survey was conducted throughout the ReLAVRA to determine how many members were using WHONET. Results indicate that 14 of the 19 members were actively using the software. In the Region, WHONET is used for data collection. Data are kept in national databases, summarized, and analyzed; aggregate statistics are provided to PAHO's Communicable Diseases and Health Analysis Department.

Although WHONET use is recommended but not mandatory, it is currently being used in 700 sentinel centers. Implementation varies by country. In Colombia, for instance, over 200 sites use WHONET, which is required in all hospitals with infection prevention and control (IPC) programs. In other countries, implementation is complicated by the lack of computerized laboratory data systems.

The discussion also addressed issues related to data utilization, and the need to promote collaboration among infection control programs and other relevant public health stakeholders. There is some evidence that the antimicrobial resistance monitoring system is being used, as more recent users are sending data to national reference centers. However, there is no evidence of behavior change among clinicians regarding the use of the generated data.

Recent global discussions have highlighted the importance of convincing policymakers of the seriousness of antimicrobial resistance as a threat to public health, and the need to address it. To further raise awareness among decision makers, clear data obtained from population groups affected by AMR, and based on common denominators, including the burden of disease, are critical. In addition, AMR surveillance data should be shared with the population at large.

With respect to molecular analysis and an integrated system of resistance surveillance, including animal health and food production, PANAFTOSA collects surveillance data on resistant pathogens isolated from food and animals. PAHO has also requested that countries make an effort to integrate data on *Salmonella* isolates from all provenances.

Regarding laboratory quality programs, international standards have been promoted; nonetheless, these are voluntary and require an investment on the part of the laboratory. PAHO continues to assist countries in the implementation of minimum standards and requirements for all laboratories.

SESSION 2. ANTIMICROBIAL RESISTANCE ISSUES WORLDWIDE AND WHO'S APPROACH⁶

The real threats of AMR are: the eventual emergence of untreatable infections; the failure to prevent infection that leads to antimicrobial use; the inadequate use of antimicrobials, which further accelerate the rate of AMR; and the lack of adequate access to treatment.

Infection prevention and control are crucial not only to prevent infection per se, but also to avoid the increase of AMR. Improving the current situation will require comprehensive action, commitment from national authorities, development of surveillance and laboratory capacity, adequate access to essential drugs, rational use of medicines, and developing new drugs.

On World Health Day (WHD) 2011, devoted to antimicrobial resistance, WHO unveiled a policy package, and a call to action by Member States. WHO proposes a holistic approach that includes:

- A comprehensive plan, accountability, and civil society engagement

⁶ Presentation by Dr. Carmen Pessoa da Silva, Team leader, Antimicrobial Drug Resistance, World Health Organization, Geneva, Switzerland.

- Strengthened surveillance and laboratory capacity
- Access to essential medicines of assured quality
- Rational use of medicines
- Enhanced infection prevention and control
- Innovation and research, and development of new tools

This policy package also captures the need to transform AMR from an exclusively health issue into one that affects society as a whole, requiring, therefore, participation of other sectors, such as agriculture and finance, among others.

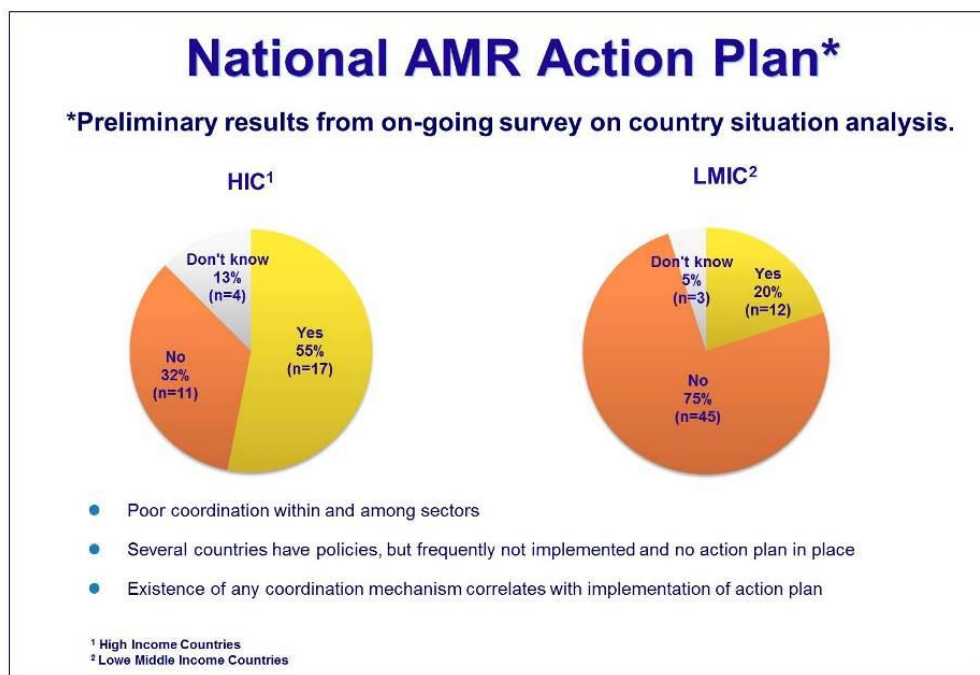
Following World Health Day 2011, WHO's Director General recognized that many activities to address the aforementioned points were the responsibility of various WHO components, especially those assigned to vertical programs, such as tuberculosis, HIV, and malaria. However, coordination was weak among the several initiatives, and in December 2011, a unit was established to facilitate coordination in this matter across WHO.

A first task of the new unit was to conduct a situation assessment in Member States, through a survey (on-going) with the following objectives (see Figure 1 for preliminary results):

- assess structures and practices suggested in WHD 2011 (6-point policy package);
- foster policy dialogue; and
- inform the development of global indicators.

The survey's methodology included a structured questionnaire to be answered by Ministry of Health staff, PAHO/WHO Country Representatives' offices, in workshops, and by WHO Regional Offices' databases.

Figure 1. Results of the WHO Country Situation Analysis on AMR, December 2013



Results of the survey highlight the lack of information as a challenge to policy making. Crucial areas of unavailable data include burden of disease, the impact of AMR on society and development, and intervention effectiveness.

In addition, diagnosis, quality assurance, regulatory, epidemiological and surveillance capacities are insufficient, as well are those to prevent and control the spread of drug resistant pathogens, and to control the channels through which antimicrobials are obtained.

The survey indicated that there is a lack of coordination among multiple partners and sectors.

In 2013, WHO and the World Economic Forum (WEF) collaborated on a chapter on the risks of AMR to humanity, to be included in the WEF's Global Risk Report. Data provided therein showed the estimated impact of antimicrobial resistance on the GDP, calling the attention of many Heads of the State, as said impact was estimated to be between 1.4% and 1.6%.

The survey was also aimed at identifying countries with AMR surveillance programs, types of surveillance systems in use, operational aspects of said systems, microorganisms/resistance under surveillance, etc. The upcoming WHO Global AMR Report on the above data reveals various concerns arising at the national level, which, in turn, have a global impact, including:

- No common targets and methods for AMR surveillance among or within countries.
- Lack of population-based data, as well as information on burden of disease.
- Lack of integrated surveillance, such as human and animal AMR surveillance, and across communicable diseases.
- Variable use of surveillance data to inform policy decisions and national or local standard treatment guidelines.

In December 2012, WHO convened a consultation with the purpose of developing a surveillance road map to address the aforementioned deficiencies. As a result, the following steps were identified: 1) publication of the WHO Global AMR Report (early 2014); 2) development of a collaborative platform for global surveillance to identify gaps and methods for data sharing and dissemination, as well as standard surveillance methodologies (2014-2015); and 3) implementation of pilot surveillance studies (2014-2015) to collect data on AMR burden, and test surveillance models and new tools for hard to reach areas (e.g., methods for sentinel surveillance, new and simpler diagnostic methods).

In an effort to further define a global action framework, in 2013 WHO established a Strategic and Technical Advisory Group (STAG) to review and assist in shaping a global strategy to address the growing challenge posed by antimicrobial resistance, and to advise WHO regarding its coordinating role in the fight against AMR. The STAG held its first meeting in September 2013, where the key elements of a global action plan were defined (Figure 2). The plan is to be discussed at the upcoming meeting of WHO's Executive Board and the World Health Assembly in 2014.

Figure 2. Key Elements of a World Health Organization Global Action Plan on Antimicrobial Resistance

Global action plan key elements



Comments⁷

AMR is a major and unprecedented problem, given the many elements that contribute to its complexity. We need to recognize how critical WHO's and regional offices' collaboration with countries is to improve surveillance and containment measures at the national level.

Historically, there have been three phases in surveillance: from 1964 to 1982, when it was made possible by mainframe computers, punch cards, worksheets and scanners. The process had very limited participation. From 1982 to 2014, when antimicrobial resistance surveillance was aided by personal computers, the Internet, and other tools that enabled wider participation; and from 2014 onward, with tools such as datacenter, Big Data, Discriminating Subtyping, Real-Time Algorithmic Analyses, a Global Microbial Sensor Network, and Automated Alerting of Responders.

The Global Sensor Network currently consists of multiple interconnected sensors measuring different indicators, such as temperature, ocean currents, industry inventory, among others, with time selective reporting. If a microbiologist laboratory were conceived as a real time sensor network, in which data could be uploaded and processed every day, it would be possible to have real time warnings about the emergence of new antibiotic resistant strains.

Discussion

The global action plan will comprise five key elements identified by the STAG. In order to avoid duplicating previous attempts, there is a need to develop a new business model and proper regulatory framework to stimulate innovation and manage the use of any new antimicrobial. New diagnostic tools to provide proper guidance in the use of existing or new antimicrobials should be developed. In

⁷ Comments by Dr. Thomas O'Brien, Associate Professor of Medicine, Medicine-Brigham and Women's Hospital, Boston, Massachusetts.

addition, there needs to be investment in operational research and innovation, especially regarding infectious diseases prevention, and the preservation of the lifetime and efficacy of existing antimicrobials.

Most health sector stakeholders are aware and support efforts to combat AMR. However, the problem's priority and understanding of its critical moments are not clear. Beyond the health sector, society as a whole is not aware of antimicrobial resistance issues.

In spite of issues related to data quality, comprehensiveness and other limitations, STAG members agreed that data collection and monitoring must continue, and should be made available. Surveillance should have clear objectives, as well as a central role in the design and monitoring of plans to address AMR at various levels. (A WHO consultation is being organized for March 2014 to discuss the objectives of a collaborative platform for global surveillance.)

SESSION 3 - STRENGTHENING SURVEILLANCE BASED ON LABORATORY EVIDENCE⁸

The awareness and impact of World Health Day 2011 will serve as a catalyst for mobilizing efforts and resources. Continuous attention to issues of infection control and resistance to antimicrobials (treatment schedules, weak surveillance, poor drug quality, weak infection control, lack of research, inappropriate use of drugs) should gain acknowledgement and support. For instance, the importance of rational drug use has been highlighted through its three main expressions: rising health care costs, growing episodes of adverse reactions, and emergence of resistant strains, with the consequent increase in the number of deaths from treatable diseases.

Globalization, with its growth in travel, commercial exchange, and tourism, constitutes a fluid and ideal framework for the transmission of resistant strains from one region to another, sometimes in very short periods of time. Figure 3, below, shows a worldwide distribution of resistant strains, particularly betalactamases, timely recorded and reported in the Region of the Americas. Reporting of these events was made possible by the surveillance network.

⁸ Presentation by Dr. Jean-Marc Gabastou, Regional Advisor, Public Laboratory Services, Department of Communicable Diseases and Health Analysis, Pan American Health Organization, Lima, Peru.

Figure 3. Spread of Different Metallo-beta-lactamases Causing Resistance in Gram-negative Bacteria



IMP, VIM, SPM, GIM, SIM, AIM, KHM, NDM, DIM: various metallo-beta-lactamases
Source: Reprinted from ¹⁹ with permission from Elsevier.

During the past few years, PAHO's AMR program has been collaborating with national public health laboratory services in the implementation of good laboratory practices for improved patient care, surveillance, and alert and response activities, within the framework of the International Health Regulations. Other capacity building activities have included bio-risk management, international shipping of infectious substances, training and technology transfer, and identification of essential supplies.

The Latin American AMR Surveillance Network grew from 7 to 20 national reference laboratories in the past 15 years. A key task of the network has been the selection of hospital and community pathogens to monitor. Currently, nosocomial bacteria under surveillance are *Enterococcus* spp., *Klebsiella pneumoniae*, *Acinetobacter* spp., *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, and *Enterobacter* spp. Community pathogens include *Salmonella* spp., *Shigella* spp., *Vibrio cholerae*, *Escherichia coli*, *Neisseria meningitidis*, *Neisseria gonorrhoeae*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Campylobacter*, *Streptococcus* β -hemolytic, and *Staphylococcus aureus*.

The network is coordinated by the National Institute of Infectious Diseases of Argentina (INEI [Malbran], by its Spanish acronym). For enteric pathogens, the Canadian National Microbiology Laboratory for Enteric Pathogens is the coordinating laboratory. Both networks use WHONET as their information system. In terms of standardization and quality control, PAHO has provided manuals for quality assurance/quality control, and conducted training activities. It also translates and distributes Clinical and Laboratory Standards Institute (CLSI) guidelines and periodic updates. Representatives of national reference laboratories participate in a biennial meeting aimed at information sharing, standardization, and networking.

The network participates in external quality assurance programs for bacteriology and antimicrobial resistance aimed at: improving bacterial identification and information sharing regarding resistant strains and other pathogens; providing continuous education to network participants regarding

processes and protocols; and channeling reference materials, such as specific resistance mechanisms and strains.

At the national level, relevant indicators (notably bacteria typing, and susceptibility testing correlation) are considered to be good, overall; however, there are deficiencies that need to be addressed at the local level, especially, in regard to patient care.

On the other hand, timely distribution and dissemination of epidemiological alerts and bulletins within the IHR framework allow national authorities to be adequately informed of eventual outbreaks or the emergence of new strains of bacteria in the Region, as was the case with *Klebsiella pneumoniae* carbapenemase (KPC) and New Delhi metallo-beta-lactamase-1 (NDM-1). Other achievements have been the identification of fluoroquinolone resistance mechanisms in isolates of *Salmonella* spp., the standardization of tests for its detection, and preparations for an eventual cholera outbreak.

In 2013, a special issue of the Pan American Journal of Public Health was dedicated to AMR, and provided an excellent opportunity to raise awareness of the matter. An unprecedented number of 27 papers from 12 countries were approved for publication in the peer-reviewed journal.

Bacteriology laboratories in the Region have improved significantly. Nonetheless, those achievements need to be consolidated. Specifically, regarding AMR surveillance, the existing detection capacity (automated systems) should not overshadow the important expertise provided by microbiologists, both in molecular diagnosis and characterization. Technology transfer should be encouraged among national laboratories within the Region and beyond, in order to ensure that the latest technologies and capabilities are broadly implemented. Quality assurance and bio-risk assessments shall be conducted periodically, and reinforced with training, in order to ensure that minimum requirements (as established by national regulations and certification processes) are met by laboratory services, both at the national and local levels. The establishment of a genuine sentinel laboratory system will require denominators to produce reliable information.

The inappropriate use of medicines, especially antibiotics, stresses the need for closer collaboration among laboratories, clinicians and epidemiologists, as well as a rapid flow of reliable information for reporting events of public health importance, as required by the IHR.

Publication is a critical endeavor when trying to raise awareness about AMR and its consequences, notably in connection with patient care. Collaboration with pathology associations, and the development of guidelines and flowcharts for the treatment of infections presenting new resistance patterns should also help to improve patient care.

In terms of infection control there are three areas which are critical and as such shall receive specific attention: 1) thorough and comprehensive investigation of nosocomial outbreaks; b) biosafety and containment (in transport, manipulation and storage of sensitive materials); and c) waste management and disposal.

For PAHO/WHO, the main challenges currently relate to financial shortcomings, which threaten the sustainability of programs and initiatives. Active resource mobilization efforts are needed based on a comprehensive plan. Progress in the area of rational drug use, and civil society engagements shall be

sought, perhaps within wider efforts to facilitate access to essential medicines of assured quality and effectiveness.

Results achieved in these last two years can only be maintained if laboratory based surveillance is strengthened and mainstreamed (at national and local levels).

Discussion

Regarding laboratory quality evaluation, rather than going through the complex, expensive, and not so technical process of ISO certification, PAHO's institutional approach is to enforce a set of minimum quality standards through national regulation (licensing). This mechanism, as proposed, is a rational, sustainable and self-financed approach, and it shall be mandatory for laboratories providing services.

The discussion also indicated that data on antibiotic use should not be exclusively derived from reference laboratories, but ought to reflect the reality of health care. In order for results to be useful for decision making, a set of standardized indicators tailored to each country should be applied. In addition, the flow of information between local and national laboratories should be sped up. In terms of epidemiological information provided by international reference laboratories, it is important to stress the need for reporting countries to get results in a timely manner, as this information is crucial to trigger a response by health authorities and other concerned parties.

SESSION 3 (CONT.) DATA MANAGEMENT FOR DECISION-MAKING⁹

Surveillance, including data gathering and interpretation, is critical to antimicrobial resistance containment and infection control. The questions that surveillance data must answer depend on their focus. For instance:

In terms of AMR

- In evolving microbial populations, what is happening where, when, and why?
- What is the impact on human health?
- What is the impact of interventions?

Related to antimicrobial use

- How much antibiotic is used?
- How are antibiotics used?
- What is the impact of interventions?

About healthcare-associated infections

- What is the morbidity, mortality, and costs associated with health care-associated infections?
- What is the impact of interventions? (What proportion of HAIs could be prevented?)

⁹ Presentation by John Stelling, WHO Collaborating Center for Surveillance of Antimicrobial Resistant, Boston, Massachusetts, United States.

In all three cases the impact of interventions should also be examined and recorded, as a way to evaluate their effectiveness.

Successful data collection greatly depends on the effective collaboration of diverse participants at various levels (e.g., microbiologists, pharmacy records and infection prevention personnel) sharing information with decision makers. At the local level, the latter include microbiologists, infectious disease specialists, clinical services, infection prevention, hospital administration, and information technology staff. In the national sphere, stakeholders include the Ministry of Health, regulators, educators, clinical societies, media, patient advocacy groups, academia, industry, food and veterinary sectors. At the global level, stakeholders are WHO, clinical societies, industry, academia, the media, and food and veterinary sectors.

A 1982 consultation on AMR surveillance convened by WHO identified the goals that would guide local, national and global efforts (Box 1). It should be noted that the only goal to be pursued by all parties involved relates to advocacy. The others depend, in great measure, on their closeness to the focus of attention. For example, outbreak detection and containment and evaluation of infection prevention and treatment practices are the responsibility of local actors, and benchmarking experiences in resistance and infection epidemiology are in the realm of national authorities.

Box 1. Goals of Antimicrobial Resistance Surveillance*

Local

- Laboratory capacity-building, clinical decision support
- Outbreak detection and containment, and evaluation of infection prevention and treatment practices
- Advocacy

National

- Benchmarking experiences in antimicrobial resistance and epidemiology of infections
- Guiding regional standard treatment guidelines and identification of emerging threats and outbreaks
- Mentoring facilities in data analysis, interpretation, and use
- Advocacy

Global

- Global warning to detect, contain, and treat emerging strains and resistance elements
- Benchmarking of national experiences
- Mentoring networks in data analysis, interpretation, and use
- Advocacy

*Adapted from 1982 WHO AMR Surveillance consultation.

It is important to determine the type of surveillance needed in various situations. A good example of alert surveillance was the early detection of vancomycin-resistant *Staphylococcus aureus*, which generated the following responses: confirmation; molecular characterization; diagnostic tools; active surveillance; reporting from health care providers and the general public; review of treatment guidelines; and, ultimately, the development of new agents. Work from the SIREVA network on serotyping provides evidence of the advantages of targeted surveillance. Finally routine surveillance has

been useful, among other things, for external monitoring of drug use (e.g., *Pseudomonas aeruginosa* and gentamicin), especially regarding data quality, or the comparative effectiveness of various drugs (for example, amikacin and gentamicin). Box 2, below summarizes the objectives and models for surveillance of antimicrobial use.

Box 2. Antimicrobial Data Use: Objectives and Surveillance Models

Objectives

- Health care planning, monitoring financial costs
- Tracking drug use practices: compliance, clinical outcome, impact of interventions, clinical outcomes
- Supporting the development and evaluation of resistance containment strategies

Models

- Quantitative
 - ESAC-Net: annual collection of national quantitative (DDD) use statistics
 - CDC NHSN Antimicrobial Use and Resistance Module: Monthly collection of facility/ward-level quantitative (days of therapy) use statistics
- Qualitative
 - Indicator studies
 - Determinants of drug use – knowledge, perceptions, economics; consumers, prescribers, dispensers

Identifying priorities in reference to data management is critical. In order to ensure that all participants in a given network or collaborative group have the same information, sound practices must be developed and implemented for data capture and management, which shall be automated and built upon a legal framework for security and privacy purposes. Equally important is to define mechanisms for information sharing, including data analyses and reporting. Appropriate levels of data access have to be accompanied by the automation of standard data analyses that allow timely feedback, and the development of data mining algorithms for recognition and tracking microbial subpopulations. Finally, it is important that all organizational structures and strategies contribute to the goal of supporting policy and decision-making.

Comments¹⁰

The Centers for Disease Control and Prevention (CDC) recently launched the document “Antibiotic Resistant Threats in the United States, 2013”.¹¹ The document includes all the episodes reported and resistant strains identified during a given period of time, and is aimed at communities beyond academia and scientific circles. It includes not only updated estimates of the number of annual deaths (23,000) and illnesses (2,049,442) resulting from antibiotic resistance, but also an analysis of threats posed by AMR. The assessment takes into account multiple factors, such as incidence (10-year projections, including worldwide trends), morbidity and mortality rates associated with a given type of infection or

¹⁰ Comments by Dr. Jean Patel, Deputy Director, Office of Antimicrobial Resistance, Centers for Disease Control and Prevention, Atlanta, Georgia.

¹¹ <http://www.cdc.gov/drugresistance/threat-report-2013/>.

strain, degree of transmissibility, availability of active (and effective) therapeutic agents, existing barriers to prevent further infections, and economic impact (expressed as direct and indirect costs).

Based upon the identification of threats, resistant bacteria are categorized by levels as urgent, serious, and concerning. Table 1, below, summarizes these categories' definitions, and the bacteria included in each category.

Table 2. Threat Assessment Categories of Resistant Pathogens

Threat Level Category	Definition	Pathogen
Urgent	Bacteria are immediate public health threats that require urgent and aggressive action.	<ul style="list-style-type: none"> • Carbapenem-resistant Enterobacteriaceae • Drug-resistant <i>Neisseria gonorrhoeae</i> • <i>Clostridium difficile</i>
Serious	Bacteria a serious concern and require prompt and sustained action to ensure the problem does not grow.	<ul style="list-style-type: none"> • Multidrug-resistant <i>Acinetobacter</i> • Drug-resistant <i>Campylobacter</i> • Fluconazole-resistant <i>Candida</i> (a fungus) • Extended spectrum β-lactamase producing Enterobacteriaceae (ESBL) • Vancomycin-resistant <i>Enterococcus</i> (VRE) • Multidrug-resistant <i>Pseudomonas aeruginosa</i> • Drug-resistant non-typhoidal <i>Salmonella</i> • Drug-resistant <i>Salmonella</i> Typhi • Drug-resistant <i>Shigella</i> • Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) • Drug-resistant <i>Streptococcus pneumoniae</i> • Drug-resistant tuberculosis
Concerning	Bacteria are concerning, careful monitoring and prevention actions are needed.	<ul style="list-style-type: none"> • Vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA) • Erythromycin-resistant Group A <i>Streptococcus</i> • Clindamycin-resistant Group B <i>Streptococcus</i>

Source: Centers for Disease Prevention and Control. Antibiotic Resistance Threats in the United States, 2013.

The report also includes background information on surveillance systems used to gather data, and mechanisms by which infections and resistances might be transmitted. In the practical approach favored by CDC, potential prevention measures are suggested for each specific threat. The report has pathogen-specific data on strains, resistance patterns, and prevention strategies. Special attention was given to the report's dissemination through the CDC website, pre-release activities, and follow-up actions after its release, such as briefings with partners, press interviews with the director of CDC, and op-editorials on antimicrobial resistance from experts. CDC references the report when discussing AMR program activities with partners.

Discussion

Data published in the CDC report¹¹ are collected through the Emerging Infections Program (EIP). The EIP is a national resource for surveillance, prevention and control of emerging infectious diseases. It is a network of 10 states health departments and other collaborators from various sectors. The EIP population is roughly representative of the United States' population, and therefore, the data collected from the 10 states allows for extrapolation to the rest of the country.

It is crucial that data needs be well known and defined prior to collection. We need to be clear as to the kind of information we are looking for when designing a data gathering system. Frequently, building massive surveillance systems to extract useful information is not necessary. What is really useful is to extract information that can be used for decision-making. For instance, in the United States, users would be Medicare/Medicaid, which make funding decisions based on data provided by CDC.

Regarding the CDC report, the identification of high-risk pathogens is particularly welcomed, especially those that require immediate action. Especially significant is the case of the carbapenem-resistant Enterobacteriaceae (CPE), for which not only no effective treatment is currently available, but there is nothing in the development pipeline that might be available in the foreseeable future. In these cases, a sound IPC strategy is the most effective measure to limit the spread of infection. In the Americas, the presence of CPE has only been reported in health-care settings, but not in the community, as is the case in the Indian sub-continent and North Africa.

The presentations made an excellent point regarding the importance of having good assessments of the data collected, and of using said data for decision making. Differences among types of surveillance data must be taken into account to determine how actionable they are, depending on their purpose. WHONET, for example, is an important tool for electronic capture of epidemiological information, and the provision of data in real time. The launch of a web-based version of WHONET will undoubtedly diminish the time elapsed between outbreak occurrence and detection.

Public motivation and participation cannot be emphasized enough when it comes to pushing national authorities to action. Street demonstrations in France, the United Kingdom, and, more recently, Panama, regarding outbreaks of *Klebsiella pneumoniae* carbapenemase (KPC), are examples of changes demanded by the population.

SESSION 3 (CONT.) HOSPITAL ACQUIRED INFECTIONS: ACHIEVEMENTS AND CHALLENGES IN THE REGION, 2011-2013¹²

Hospital acquired infections (HAI) were the focus of several recommendations of the last TAG meeting in 2010. Such recommendations covered surveillance, as well as infection prevention and control (IPC) programs, including capacity building and health practitioner accountability.

¹² Presentation by Dr. Valeska Stempliuk, Specialist, Infection Control, Department of Communicable Diseases and Health Analysis, Pan American Health Organization, Washington, D.C.

Surveillance

- It was recommended that a limited number of easily obtained and meaningful indicators be developed, both for adult and neonatal infections, and that HAI surveillance systems report their data to national authorities. It was also recommended that outbreak surveillance and management guidelines be developed for adult and neonatal infections.

In response, PAHO developed a pediatric module, especially geared to neonatology units, to be included as part of HAI surveillance programs. Infections in intensive care units (ICU) were emphasized, due to the recurrence of outbreaks in such settings.

Two new surveillance-related guidelines were developed: one on neonatology care-associated infections, which is already available to countries, and one on maternal health care-associated infections, which is under review, and will be added to the guidelines on ICU available since 2010. These materials have been disseminated, and integrated into workshops and other training activities.

- Surveillance capacity-building activities have usually consisted of three-day hands-on workshops, where practical exercises on numerator and denominator selection are discussed. Participants were introduced to the core components of IPC programs, and the general concepts of surveillance. Other areas of work have typically included general concepts of surveillance, stratification, rates and proportions, as well as data analysis. Capacity-building workshops were held for Belize, Ecuador, El Salvador, Paraguay, and the English-speaking Caribbean countries.

Hospital-acquired Infections - Outbreaks

- The identification and containment of outbreaks became another area of capacity building activities. A 3-day workshop was developed to improve surveillance and outbreak investigation skills (adult and neonatology care), which included the implementation of standard and additional precautions, and a practical exercise on establishing physical barriers for outbreak containment. This capacity-building activity was replicated in most Andean and English-speaking Caribbean countries, in addition to Belize and Paraguay; special attention was given to neonatology health care personnel.
- Direct technical cooperation was provided in cases of HAI outbreaks of infections due to multi-resistant strains in: Panama in 2011; Peru in 2012; and Barbados and Grenada in 2013. This cooperation was made possible in part by the effective and timely work of the AMR surveillance network and the infection control surveillance network. The latter were especially helpful in providing epidemiological alerts on outbreaks of New Delhi metallo-beta-lactamase (NDM) and KPC in the Region.

National Infection Prevention and Control Programs

- During the past few years, efforts to strengthen infection prevention and control capabilities have included the design, development and publication of guidelines on IPC for health managers. An updated version, developed in collaboration with PAHO's Health Systems and Services Department, was launched in 2011 with special emphasis on neonatology units. The guidelines incorporated

information yielded by IPC assessments conducted as of 2006, which used the PAHO hospital IPC assessment tool developed for that purpose.

- A 20-country HAI surveillance network was established, and a biennial work plan was developed. Members had their first meeting in 2012, with the participation of representatives from 20 Member States. Horizontal cooperation and exchanges are being promoted through virtual meetings, and other information exchange mechanisms.

PAHO's hospital IPC assessment tool was updated, and has been used in visits by international experts and PAHO technical officers at the request of national authorities. The assessment tool has proven extremely useful to gather information on national shortcomings regarding HAI prevention requirements. Since the last TAG in 2010, the following countries have had their IPC capabilities assessed, including those of neonatology units: Trinidad and Tobago (2010); Belize (2011); Panama (2011), Uruguay (2011); Paraguay (2012); Grenada (2013); and Guyana (2013). While there is room for improvement in the (formal) organization of infection control and prevention programs and surveillance, great advances were reported in prevention efforts. Infection Prevention and Control Strategies

- Hospital sterilization practices were the subject of several workshops and other training activities conducted for Brazil, countries of the Andean Area and the English-speaking Caribbean, and Paraguay. A manual on sterilization practices for health centers, was developed with the support of the United States Agency for International Development (USAID), and is undergoing its final review. Guidelines on HAI prevention in neonatology are being drafted in collaboration with the Latin American Center for Perinatology and Human Development.
- A project on creating an online IPC diploma is in progress; once the suitable legal framework is developed and partners selected, it is expected to become a reality by the second semester of 2014.
- The fact that there has been an increase in demand from countries to address IPC issues is an achievement. Ecuador launched its first ever national program, and other Member States, such as Trinidad and Tobago and other English-speaking Caribbean countries, are moving towards formally acknowledging IPC as a priority. There has also been an increase in the level and frequency of inter-country exchanges on best practices. PAHO has had the capacity to respond promptly and adequately to Member States requests for technical cooperation and other types of assistance, with the valuable collaboration of a group of international specialists able to mobilize resources and expertise to support these endeavors, such as IPC assessments.

In spite of the above achievements, multiple limitations remain, and threaten further progress. Many IPC national programs are in the early stages of development, and will require continued support if they are to achieve some sort of consolidation. This, in turn, will be difficult, as long as IPC remains a low priority for health authorities. Additionally, there are major differences in development among national IPC programs in the Region, where some countries have well established programs, and others have hardly been outlined. Drafting regulations and guidelines has proven to be a good strategy to counter such imbalances.

Access to microbiology services and expertise remains difficult for many health centers in the Region, and there is room for improvement in the implementation of minimum precaution standards, such as

sterilization. Furthermore, it will be necessary to address IPC at all levels of health care services, as well as in cross-cutting initiatives that affect all disease programs, both at the national and local levels.

While there is currently an acute scarcity of resources, political will to undergo necessary organizational and legal reforms should contribute to the implementation of the necessary changes.

A concerted effort will be required to get high level health authorities to properly consider HAI and AMR as public health problems that can have a profound negative impact on the population. As with other issues, advocating these programs to high level health authorities through efforts such as World Health Day 2011 or by making the case in PAHO's Directing Council will be needed in the immediate future.

Discussion

Regarding IPC capabilities assessment, it is common for health authorities to be surprised at the results; nevertheless, reactions have often been positive, as in Colombia, Guatemala, Paraguay, and Trinidad and Tobago. In Colombia, the issue was addressed by drafting new regulations, and setting up a national infection control program. Unfortunately, in other cases, there has been no response, as authorities might not have been convinced of the urgency of the matter, either at the health care level itself or among decision makers.

Chile has been successful in its IPC control efforts. The national IPC program just marked its 30th anniversary, and can show a dramatic reduction in infection rates. Endometritis is an example of such success, as its rates have been reduced by a systematic and periodic review of IPC settings (procedures and physical environment) in mid- and high level hospitals.

It should be noted that the IHR now require reporting of outbreaks and emerging/new resistant strains, which are considered strategic infection control elements for epidemic response, highlighting how critical it is to use this information for action.

SESSION 3 (CONT.). ANTIMICROBIAL RESISTANCE AND INFECTION PREVENTION AND CONTROL IN VERTICAL PROGRAMS (TUBERCULOSIS, HIV, SEXUALLY TRANSMITTED INFECTIONS, AND HEPATITIS) ¹³

Drug resistance is an issue of major concern in all established vertical programs (tuberculosis [TB], HIV and sexually transmitted infections [STIs]), and in more recent areas of work, such as hepatitis.

Tuberculosis

In the case of TB, the burden of disease is worsened by co-infections with HIV (which affects 12% of TB cases). Most countries of the Americas have reported cases of multi-drug resistant (MDR) TB, and a few

¹³ Presentation by Massimo N. Ghidinelli, Unit Chief HIV, Hepatitis, Tuberculosis, and Sexually Transmitted Infections, Department of Communicable Diseases and Health Analysis, Pan American Health Organization, Washington, DC.

countries have also reported extensively drug resistant (XDR) TB cases. Laboratory services are a major component of surveillance efforts, with a global network of laboratories working in coordination and sharing information. Detection of rifampicin-resistant *Mycobacterium tuberculosis* has been greatly enhanced by the development of the Xpert/MTB-RIF diagnostic test, which is available in several countries of the Region. Since 2004, surveillance of resistant tuberculosis has been based on national and subnational surveys and sentinel surveillance; however, starting in 2015, it will be primarily based on routine surveillance.

There are several challenges facing the Region in regards to TB and drug resistance, among them, a limited capacity of laboratory services to conduct first- and second-line drug sensitivity tests. This is due in great part to the slow implementation of new diagnostic technologies which are unevenly spread throughout the Region, hindering estimates of XDR-TB cases. There are also problems related to the development of laboratory information systems, affecting communications and dialogue with national TB programs. Finally, there are funding gaps, which could imperil the aforementioned transition to a routine surveillance scheme.

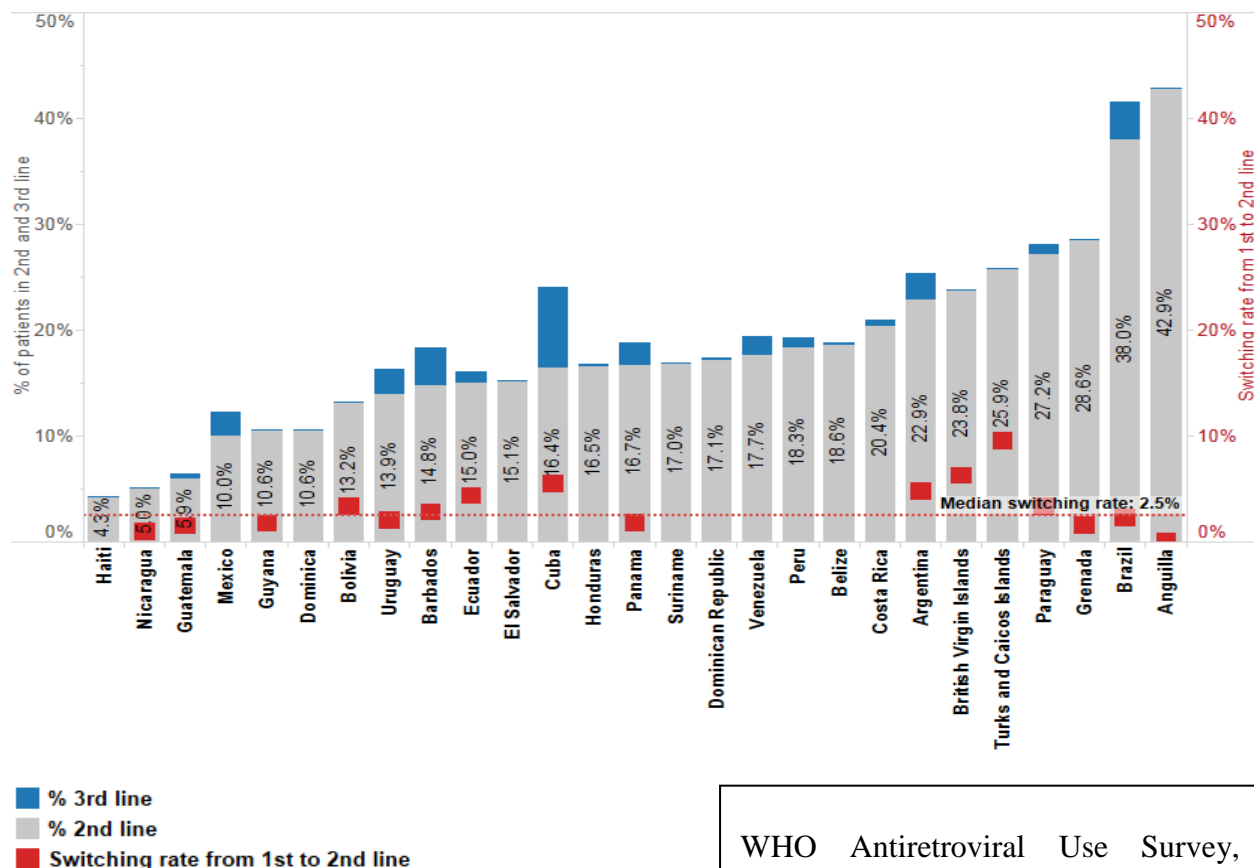
HIV

HIV drug resistance surveillance programs are not as well established as those for tuberculosis. Nonetheless, there is enough data to characterize the response to the epidemic in terms of treatment and possible episodes of drug resistance. There are currently an estimated 1,6 to 1,7 million people living with HIV, with a sustained increase in the number of patients in antiretroviral treatment (ART). It now seems that a “tipping point” may be close, namely, the number of new infections is growing at a slower rate than the number of cases under treatment. In fact, the Region of the Americas has the highest rate of ART coverage among middle-income regions of the world.

Of all patients on ART in the Region, about 70% take first line regimens; of these, roughly 25% will switch to second line regimens, and approximately 2,5% will require third line drug regimens (known as salvage treatment) after treatment failure due, in part, to drug resistance (Figure 4). When a patient switches from second to third line treatments, genotyping is routinely conducted in order to identify eventual viral mutations that might explain the resistance to established treatments. Due to multiple factors, chiefly lack of capacity, no genotyping is routinely performed for patients switching from first to second line treatments. One of the biggest challenges in the Region is the fragmentation of first and second line treatments, with over 30 different regimens in use.

Regarding HIV drug resistance (HIVDR), little data are available for decision-making. Currently, efforts are focused on prevention, monitoring and surveillance of HIVDR. A set of five early warning indicators have been identified, and articulated with four different approaches: surveillance of transmitted HIVDR among the recently infected; surveillance of HIVDR in persons initiating highly active antiretroviral therapy (HAART); surveillance of initial resistance among children; and surveillance of acquired HIVDR in patients on HAART.

Figure 4. Percentage of patients on second and third line treatments, and switch rate from first to second line treatments, selected countries of Latin America and the Caribbean, 2012



WHO Antiretroviral Use Survey, 2013.

The main challenges facing HIVDR are:

- Harmonizing methodologies of HIVDR surveillance with national representativeness.
- Strengthening the capacity for analysis, interpretation and use of HIVDR surveillance data as evidence for public health actions.
- Strengthening the laboratory capacity for HIV genotyping.
- Strengthening human resources on genotype interpretation and use.
- Promoting country-to-country technical cooperation, and articulating with international cooperation agencies.
- Consolidating and expanding access and participation to the Regional Technical Cooperation Network for Drug Resistance Surveillance.

Other Sexually Transmitted Infections (STI)

Regarding drug resistance in sexually transmitted infections, especially, chlamydia, gonorrhea, syphilis and trichomonas, PAHO follows WHO guidelines approved at the global level. For the last two decades, efforts have been focused on developing the Gonococcal Antimicrobial Susceptibility Programme (GASP), a global network of 64 countries (13 of them in the Americas), and three reference laboratories,

one each in Argentina (Malbran Institute), Canada (University of Saskatchewan), and the United States (CDC).

Implementing WHO's Global Action Plan to Control the Spread and Impact of Antimicrobial Resistance in *Neisseria gonorrhoeae* has mainly focused on adapting said Plan to the needs of the Region in two areas: strengthening surveillance, and improving national reference laboratory capacity to conduct *N. gonorrhoeae* AMR surveillance. The work done through the ReLAVRA and WHONET are especially valuable in this area of work.

We should take advantage of the synergy and complementarity of the ReLAVRA and GASP LAC networks. There is a need for greater harmonization of standards and methodologies regarding antimicrobial resistance surveillance. Both WHONET and GASP constitute good databases for such harmonization, as they support data collection, analysis and reporting. Dissemination of results and information follow two parallel routes: through GASP (ad hoc) or PAHO (institutional). Priorities for the immediate future are a) the establishment of a memorandum of understanding between the University of Saskatchewan and PAHO, and b) setting up regional an external quality assessment program for reference laboratory services provided by the Malbran Institute of Argentina.

Discussion

The discussion focused on what might account for the differences reported among countries regarding switch rates from first to second line treatments for HIV infections. Two factors could explain some of these variations. The first may be related to cohort differences, where one country's ART has been consolidated for a longer time, and patients have grown resistant to first line treatments. The second factor may be related to the availability of laboratory services able to detect such resistance, and the availability of second line treatments that might shorten the time lapse before switching.

Regarding the immediate future of vertical programs such as TB or HIV, the discussion dealt with the growing phenomenon of concomitant infections, such as TB and HIV, and other challenges to treatment adherence, such as mental disorders or other pathologies.

Strategies for Rational use of Drugs in the Americas¹⁴

Most of the principles and tenets of rational use of medicines (RUM) are applicable and interchangeable with the use of antibiotics, as is often the norm in pharmacosurveillance and drug and therapeutic committees (DTC). The work of PAHO's Medicines and Health Technologies Unit in regards to rational use of drugs was greatly strengthened by the approval of the sexennial working plan 2012-2019 by PAHO's 52nd Directing Council. RUM stands on four interconnected and equally necessary pillars: selection of essential medicines (e.g., using official essential drugs lists [EDL]); prescription following medical protocols approved by drug and therapeutic committees; dispensation, based on adequate official regulations and norms; and consumer use, which requires the provision of objective information. A study conducted in 2005-2006 on antibiotic use in Nicaragua revealed that 29.6% of interviewed

¹⁴ Presentation by Dr. Jose Luis Castro, Advisor, Rational Use of Medicines, Department of Health Systems and Services, Pan American Health Organization, Washington, D.C.

individuals (n=3000) had received two or more treatments in addition to what was originally prescribed, and that at least 34.2% had acquired antibiotics with no prescription.

A key strategic approach addresses strengthening of national regulatory authorities (NRA) and an overall RUM strategy. Capacity building on issues of quality control, drug and therapeutics committees and pharmacosurveillance committees are also emphasized. PAHO's 52nd Directing Council Resolution mandates the strengthening of NRAs based on a set of selected indicators, aimed at promoting cooperation among the various NRAs in the Region, in order to conduct assessments of each other's capabilities and shortcomings. To this date, five NRAs (Argentina, Brazil, Colombia, Cuba, and Mexico) have been assessed, and qualified as competent in the performance of basic and complex functions. Another important tool regarding NRA strengthening is their participation in the Pharmaceutical Harmonization Pan-American Network (PARF), which includes representatives from academia, professional associations, and consumers.

RUM is understood as the effort to promote the safe and effective use of medicines according to health needs in order to contribute to human health improvements, by facilitating access to equitable and quality health care. This is expressed through five lines of action: policy and structure; regulatory and legal framework; education and culture; management; and research. Research is the channel to provide feedback about the effectiveness or ineffectiveness of the previous four lines of action. It is for national authorities to implement and adapt RUM to their own needs and capabilities, with PAHO's technical assistance.

In terms of specific actions taken recently within the global RUM strategy, drafting (or updating) EDLs, through DTCs, and developing national therapeutic formularies as was the case in Barbados, Chile, and the Dominican Republic. Some considerations regarding products to include in EDLs are: the prevalence of the disease for which the product is indicated; effectiveness; safety; and cost-effectiveness.

As for capacity-building, the third virtual course on Selection of Medicines and Critical Analysis of Information was followed by over 200 health professionals. The course was developed in conjunction with the *Centro Universitario de Farmacología* based in La Plata, Argentina, a PAHO collaborative center.

In the future, the RUM strategy should have continuity, with some input from the pharmacosurveillance network, which could be used for antimicrobial resistance control and containment. Advancement in accountability mechanisms regarding sale and procurement of medicines is expected, with the ultimate goal of supporting the establishment of networks on RUM, centered around hospitals and DTC members.

Discussion

There are some differences between antibiotics and other medicines, especially regarding the dual therapeutic role of antimicrobials: against bacteria and on the human body, adding to the complexity of their performance. As for selection of essential medicines, it is important to take into account national realities; to not depend exclusively on data provided by the pharmaceutical industry; and to examine the quality of available information.

When it comes to antibiotics, resistance information is gathered, analyzed and provided by centers of reference, which have no understanding of the realities faced by health practitioners.

It might be necessary to determine who is actually using PAHO and WHO treatment guidelines. DTCs have to work with reliable information, and it should be a priority for them to use unbiased guidelines. Regarding prescription, enforcing prescription-only antibiotic sales would be a small victory (which was achieved in Chile), but over prescribing also needs to be addressed. Education is key in order to have informed patients and doctors. Pharmacosurveillance is an area that needs strengthening, which might be achieved by following the HAI-based model, which has shown its effectiveness in infection control and containment.

It is important to monitor also the levels of antibiotics present in the food chain (cattle and agriculture). Usually, only antibiotics for human administration are monitored/authorized, with few exceptions.

SESSION 4. DEVELOPING NATIONAL PLANS

When to develop national plans for AMR containment¹⁵

It is a reality today that the use, misuse and abuse of antibiotics contribute to AMR. There is even concern regarding the eventual irreversibility of this trend.

In the past 20 years, antimicrobial resistance surveillance and improvement of laboratory capacity in the Region of the Americas have been part of a concerted effort by the Pan American Health Organization, the Malbran Institute, the Pan American Infectious Diseases Society, and national laboratory networks. These efforts have yielded valuable information, which provides some of the evidence base for further planning and action. The first step in developing a plan for the containment of resistance is the communication of such evidence.

However, there is still a need to gather evidence on antibiotic use in Latin America and the Caribbean. According to a study conducted by Dr. Anahi Dreser,¹⁶ between 1997 and 2007 the use of antibiotics increased in most countries of the Region, the exceptions being Colombia and Mexico (Figure 5). Consumption continued to rise even in countries where regulations made the sale of antibiotics subject to prescription, mainly, because prescribers continued to prescribe these drugs.

Following are some approaches to the problem:

- Learn from other countries' experience. For example, in France, a global partnership against antibiotic resistance was developed with the goals of
 - Making all health professionals, consumers and policy makers understand that AMR constitutes an emergency.
 - Trying to protect antibiotics preciousness as a nonrenewable resource.
 - Taking into account the use of antibiotics in the animal world and the environment.
 - Assisting in providing access to new antibiotics.

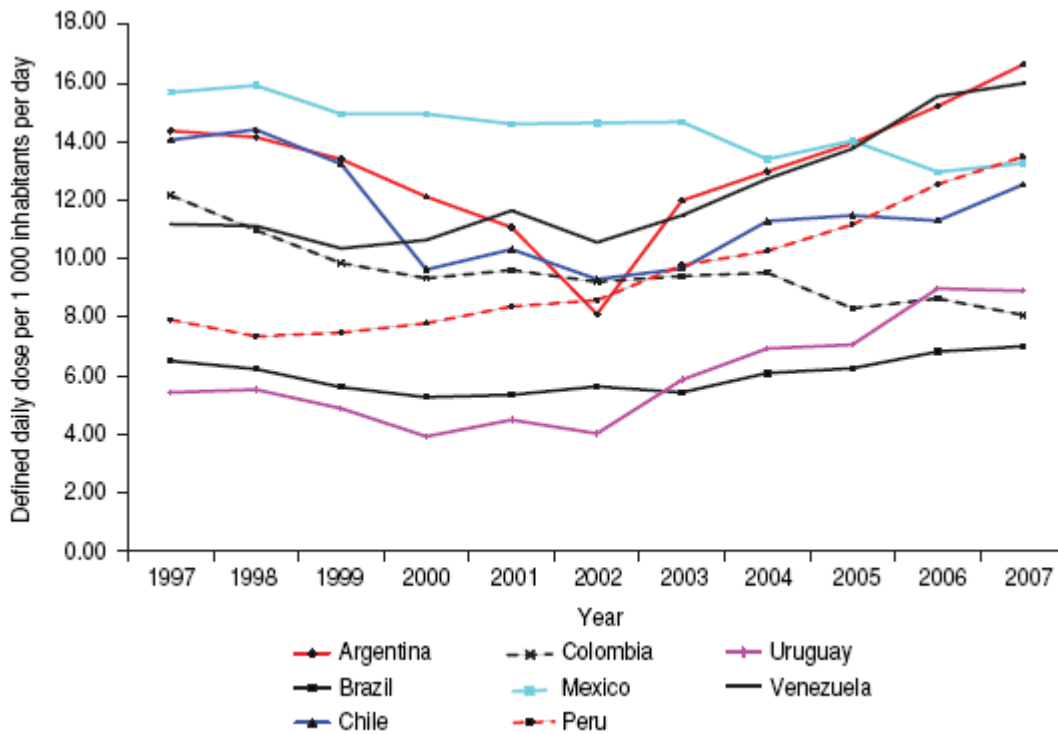
¹⁵ Presentation by Dr. Manuel Guzman Blanco, Hospital Vargas, Caracas Medical Center, Microbiology and Infectious Diseases Unit, Caracas, Venezuela.

¹⁶ Wirtz V, Dreser A, Gonzales R. Trends in antibiotic utilization in eight Latin American countries, 1997-2007. Rev Panam Salud Publica 27(3), 2010.

- Insisting on the need for surveillance programs.
- Providing surveillance results in real time.
- Education.
- Promoting prevention regulations that include not only infection control, but immunizations, as well.
- Improving communications between microbiologists and clinicians.
- Developing systems that allow quick access to information on antimicrobial resistance.

It should be emphasized that antimicrobial resistance monitoring programs must be maintained, as well as the software and guidelines that are currently in use.

Figure 5. Trends in Antibiotic Consumption (Daily Defined Doses per 1,000 population/day) in Eight Latin American Countries, 1997-2007¹⁶



RESPONSIBILITY FOR DEVELOPING NATIONAL PLANS. HOW TO INTEGRATE RELEVANT SECTORS?¹⁷

There are many reasons for antibiotic treatment failure, including those related to improper patient care, such as: delayed diagnoses; opportunities lost regarding the administration of appropriate

¹⁷ Presentation by Dra. Celia M. Alpuche Aranda, Dirección del Centro de Investigación de Enfermedades Infecciosas, Instituto Nacional de Salud Pública, Cuernavaca, Morelos, Mexico.

treatment; misdiagnoses; inadequate susceptibility testing; inadequate antibiotic concentration for the specific treatment (wrong doses, increased elimination of drug, increased protein binding, poor concentration on infection site), etc. Other factors include a decreased antibiotic activity; and issues related to the site of infection or host factors (drainage, necrotic tissue, immune response). And there is antimicrobial resistance.

Issues related to misuse of antibiotic and surveillance of antimicrobial resistance were illustrated in an evaluation study conducted in Mexico about pediatric residents' knowledge of the clinical use of antibacterial agents. Published results of that and other studies indicate that most pediatric residents do not improve their knowledge about antibiotics over time, and prescription practices reflect that fact. Based on those results, Mexico's National Institute of Public Health issued recommendations for a National Plan for Rational Use of Antibiotics (Box 3).

Box 3. Mexico's National Institute of Public Health: Recommendations for a National Plan for Rational Use of Antibiotics

The recommendations were to:

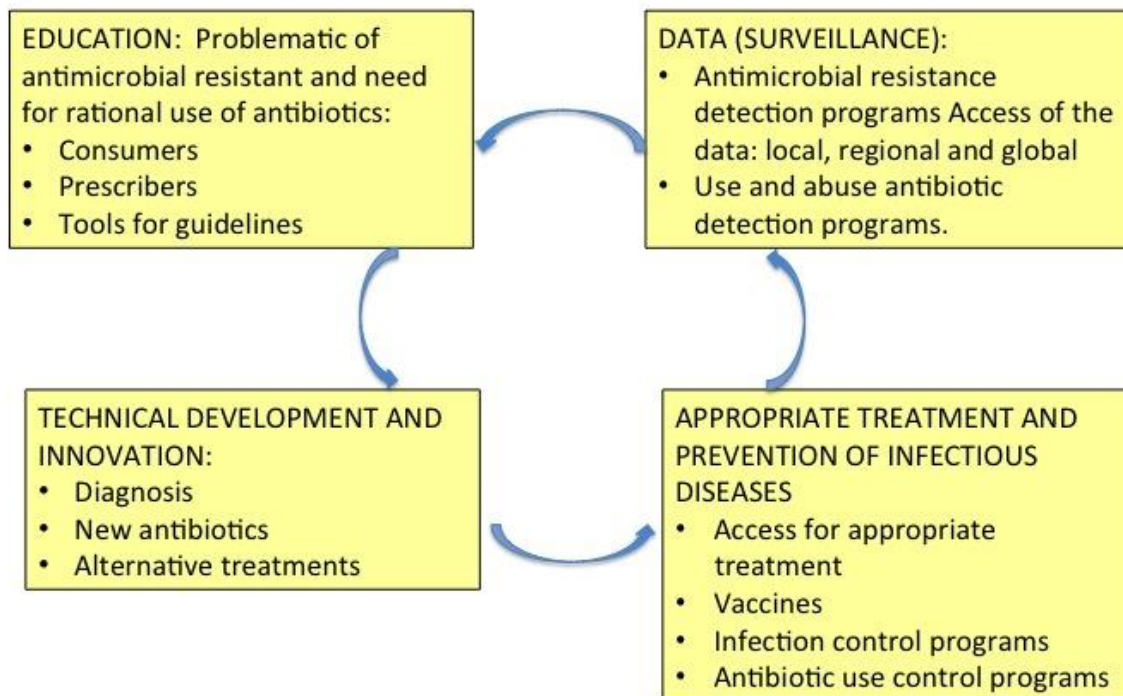
- Establish a multidisciplinary multisectoral national committee to monitor and evaluate a broad-spectrum strategy to improve antibiotic use.
- Strengthen the evidence on antibiotic use patterns and determinants.
- Harmonize and analyze available antimicrobial resistance information; strengthen and provide appropriate guidance to available antimicrobial resistance networks.
- Promote the use of available and appropriate antibiotic treatment guidelines.
- Improve quality assurance in susceptibility testing practices in clinical laboratories.
- Review and update basic lists of available antibiotics in public health care institutions.
- Include rational use of antibiotics and antimicrobial resistance as topics in medical school and other biomedical and microbiology graduate programs.
- Regulate antibiotic prescription and evaluate adherence to drug treatments.
- Develop educational programs for the general population.
- Evaluate programs to assess the effectiveness of implemented strategies.

Of all the above recommendations, only the one about regulating antibiotic prescriptions was implemented, and mainly as a consequence of the influenza (H1N1) pandemic.

On the other hand, antimicrobial resistance is a very complex problem, and solutions are difficult and scarce. Some of the main barriers faced by efforts to control AMR are: poor coordination within and among sectors; lack of (or ambiguous) regulations and/or implementation of regulations; insufficient information (burden of disease, cost, impact on society) to support strategies; and little data as evidence of intervention effectiveness, i.e., no evaluations. Figure 6 summarizes WHO's proposed strategy to combat antimicrobial resistance.

Figure 6.

STRATEGIES TO COMBAT ANTIMICROBIAL RESISTANCE



To ensure the success of national programs, coordination and multisectoral approaches to shape behavior in children and change behavior in adults with respect to the indiscriminate use of antibiotics is required. At the same time, prescriber behavior needs to change. Overall, within an integrated approach, coordination should be the responsibility of the health sector, as it has the basic knowledge to train others. However, efforts must take place within a multidisciplinary and multisectoral committee that includes educational and research institutions; health promotion; skilled communicators; regulatory agencies; the agriculture and livestock sectors; and relevant private industry.

DEVELOPING A NATIONAL PLAN: A COMPLEX PROCESS¹⁸

The development of a national plan must necessarily include strategic planning, in order to determine goals, and how to attain them. Such a plan will:

- Provide purpose and direction, i.e., a road map.
- Serve as framework for decisions or for securing support/approval.
- Assist in benchmarking, and allow for performance monitoring and evaluation.
- Stimulate change and become building blocks for future interventions and/or plans.

¹⁸ Presentation by Lic. Carolina Bascones, Pan American Health Organization, Washington, DC.

- Allow national authorities to exercise integrity, and apply a systematic approach in the moment of choice.
- Explain the “business” to others, in order to inform, motivate and involve.
- Increase efficiency and effectiveness.
- Better decision making and problem solving.
- Maintain momentum and focus.
- Improve understanding and better learning.
- Foster commitment.
- Serve as a tool for communications and public relations, coordination and alignment – common direction for joint action.
- Enhance organizational capabilities - increase influence and leadership.
- Facilitate resource mobilization and targeting based on priorities.
- Promote accountability and transparency, if there is a common method of monitoring and evaluation.
- Provide an expected way of doing things – good for organizational culture, and for building confidence among stakeholders.
- Increase political support – enhance organization’s legitimacy, broaden advocacy and supportive coalition.

Some problems frequently found in the formulation of national plans are:

1. Unclear identification of the central problem and priorities to be addressed in the planning period, as well as unclear statement of objectives/anticipated results and key performance indicators.
2. Limited consultative process among different groups involved in developing and implementing the plan.
3. Unrealistic targets and timeline for implementation.
4. Impractical indicators – desire to measure everything– no SMART (specific, measurable, achievable, relevant, time bound) attributes.
5. Time constraints for development and conducting the necessary consultations - limited participation/buy-in of all relevant stakeholders.
6. Unclear roles and responsibilities.
7. Absence of clear monitoring and evaluation framework.
8. Limited or no systematic documentation of lessons learnt, and their application to organizational learning and improvement.
9. Lack of coherence among the different components of the Plan (proposal – priorities – objectives/outcomes – indicators).
10. Limited integrated approach and alignment with established frameworks and response to stakeholders’ priorities.

Not every planned activity or intervention requires a plan; however, there must be some other instrument to determine their efficiency and effectiveness, i.e., continuous monitoring to evaluate progress.

One very important requirement of any plan is that it must respond, first of all, to national mandates, and must be aligned with approved frameworks, whether part of national, regional or global commitments. In addition, a good plan of work has the following attributes:

- It makes reference to the problem to be addressed and to the strategy already approved.
- It is conceptually sound and directional.
- It is realistic and attainable.
- It is executive in nature.
- It is meant for the medium to long term (5 years or more).
- It includes specific details on how to implement (strategy).
- It provides risk analyses.
- It is focused on matters of strategic importance.
- It makes reference to its alignment with higher mandates.

Once a plan has been developed and approved, efforts will concentrate on its implementation. At that point, there is a need for monitoring and evaluation, in order to assess progress, based on evidence. Progress reports based on evaluation mechanisms established *a priori*, will inform about the effectiveness of the interventions implemented, and the necessary corrective measures.

COMMENTS¹⁹

Without diminishing the importance of developing and implementing well-structured plans, when the goal is to improve a public health situation, one cannot disregard the impact of political will. As an example, in 1993, PAHO convened an emergency meeting on blood-borne infections, such as Chagas' disease, hepatitis B and C, and HIV. Blood transfusions posed a risk to the population who needed them. Of 17 countries invited to the meeting, only 7 attended, indicating perhaps how little interest there was in the matter. Twenty years later, all the countries of the Region have blood screening programs, and data from blood banks are reported annually to PAHO. One driving force behind these changes was the use of the media to communicate evidence about the risk of using unscreened potentially infected blood.

There seems to be agreement about the fact that resistance is a local issue, and needs to be addressed locally. However, multi-institutional and multidisciplinary efforts must be undertaken, as there are issues better addressed at the national and/or global level, e.g., policy matters. Industry must be approached to collaborate in several areas, especially in the development of antibiotics and reagents for microbiological diagnosis. Pharmacies should also be a partner in these efforts, and most importantly, the public and the media.

In order for a work plan to be properly implemented, it may be necessary to establish, at the national level in every country, a management body on the subject of AMR containment. This body would be in charge of coordinating all stakeholders in the matter. It is very useful to obtain the support and cooperation of a high-level prestigious individual, with conviction and political will, who will assist in driving the issue forward.

¹⁹ Comments by Dr. Gabriel Schmunis, Independent Consultant, Washington, DC.

Discussion

Participants recognized the importance of establishing and maintaining collaboration between the animal and human health sectors, and were pleased to hear that, in January 2012, an agreement had been signed by WHO, the Food and Agriculture Organization (FAO) and the World Organization for Animal Health for that purpose. The work of said alliance is starting to trigger developments in the countries.

In reference to planning, the benefits of constituting national, regional, and global alliances have become apparent following the mandates of the United Nations Millenium Development Goals (MDG), which since 2000 have influenced efforts on HIV, malaria and tuberculosis, among others, gathering support and resources to combat those three diseases. In that context, there seems to be an opportunity to address antimicrobial resistance as a development issue, and include it in the public health agenda. Another opportunity to highlight the importance of AMR would be within Universal Health Coverage , which has become a flagship for WHO across the board.

Experience indicates that for a plan to be successful the support of a personality or champion per se is not critical; however, having someone with political authority to mobilize all forces, such as a national president or highly visible and respected institution, is valuable. In terms of public relations, once the plan is developed, a personality could be charged with promoting it to the general public.

Monitoring and evaluation are crucial ingredients of a successful plan. Systematical monitoring and reporting go hand in hand with accountability, which, in turn, increases the possibility of sustained, if not increased, funding.

While there needs to be public participation in matters related to the use of antimicrobials, it is the health team that must propose alternatives for behavioral change among the population. However, institutional change must precede societal changes. There are some successful experiences of the sort regarding infection control programs. Achieving institutional change is helped by the identification and pursue of short-term goals and highly visible targets, which will validate individuals acting locally who might later become leaders.

SESSION 5 FINAL DISCUSSION

As TAG members agreed that countries in the Region should develop national plans to combat and contain antimicrobial resistance, this session was devoted to proposing a potential framework, including pre-requisites, to assist Member States in developing national plans (Annex III). It proposes the elements that might be included in a National Plan, as well as the kind of support that PAHO could provide regarding each element. The next step for PAHO would be to develop a road map and provide a clear vision of the ultimate goal. At the same time, PAHO would collaborate with countries, when requested, to develop the outline of national plans.

RECOMMENDATION

- Prioritize common Regional problems related to AMR to target interventions.

- Develop a strategy to communicate the urgency of dealing with antimicrobial resistance to policy-makers and national authorities.
- Promote the development of country-specific treatment guidelines for hospital and community use, similar to PAHO's infectious diseases treatment guidelines. Wider distribution of the latter may be helpful to educate and encourage countries to commit to locally effective drugs.
- Promote the development of national lists of essential antimicrobials of proven quality.
- Ensure the quality of laboratory testing, in order to provide better guidance on patient treatment.
- Promote responsible prescribing practices. There are simple and inexpensive diagnostic tools to discourage poor prescription habits. Early etiological diagnosis of infections is essential to prevent empiric, and irresponsible, administration of antibiotics.
- Promote that in every laboratory there be an appropriately trained microbiologist and other specialized staff.
- Promote the improvement of microbiology undergraduate and graduate curricula, and include laboratory practices.
- Encourage communications between the health and agriculture sectors to collaborate on issues such as the recent animal *Salmonella* infection that spread to humans in the Region.
- Develop mechanisms for the exchange of information and experiences among different groups working on AMR and health care-associated infections.
- Improve surveillance of AMR, and, as resources allow, integrate it with other relevant information
- Provide training on ways to counter antimicrobial resistance. (Currently, there are online courses available that are not available to all countries due to a lack of infrastructure.)
- Develop simple models for consolidation of surveillance data at the local level.

ANNEX I. AGENDA

DATES: 2-3 December 2013

VENUE: Room 1017, 10th Floor. Pan American Health Organization, Washington, D.C.

PURPOSE:

To discuss and recommend strategies and policies that will guide the PAHO Antimicrobial Resistance (AMR) Program in the next two years.

OBJECTIVES:

1. To analyze the results / impact of the WHD 2011 (Round Table Report). Policy Package WHA [sessions 1, 2, 3]
2. To discuss the process for supporting countries to develop integrated national plans for AMR containment.
 - a. Elements
 - b. Sectors [vertical programs]
 - c. Opportunities
 - d. Challenges[Sessions 3 & 4]
3. To guide PAHO on the most efficient approach to promote and support the development of AMR national plans. [Session 5]

Monday, 2 December 2013

8:30	Registration	
9:00	Opening session. Welcome remarks	F. Becerra
	Objectives - Review of agenda – Presentation of the participants - Nomination of Chairperson	M. Espinal
9:30	Session 1: Review of the 2010 TAG Recommendations COMMENT:	P. Ramon-Pardo P. Kelley
10:30	Coffee Break	
11:00	Session 2: AMR from a Global Perspective. What is WHO doing? COMMENT:	C. Pessoa T. O'Brien
12:00	Session 3: [focus on achievements and challenges of the Region, 2011-2013] 3.1a Laboratory Surveillance	J.M. Gabastou

12:30	Lunch Break		
13:30	Session 3 (Cont.): 3.1b Data management for decision making		J. Stelling
14:30	3.2 HAIs challenges	COMMENT:	J. Patel (CDC Report) V. Stempliuk F. Otaíza
15:30	Coffee Break	COMMENT:	
16:00	3.3 AMR and Infection prevention and control in vertical programs (TB, HIV, STIs, hepatitis)		M. Ghidinelli
		COMMENT:	M. Bell
	3.4 Strategies for appropriate use of antibiotics in the Region		J.L. Castro
17:30	Closing of the day	COMMENT:	L. Bavestrello

Tuesday, 3 December 2013

9:00	Session 4: Developing national plans: how?		
	4.1 When to develop national plans for AMR containment?		M. Guzman Blanco
	4.2 Who should be responsible? How to integrate the relevant sectors?		C. Alpuche
	4.3 Developing National Plans: a complex process	COMMENT:	C. Bascones G. Schmunis
10:30	Coffee Break (during Session 4)		
12:30	Lunch Break		
14:00	Session 5: Summary of discussion. Moving forward.		P. Kelley
15:15	Closing of the meeting		M. Espinal

ANNEX II. LIST OF PARTICIPANTS

MEMBERS:

Dr. Celia M. Alpuche Aranda

Dirección del Centro de Investigación
de Enfermedades Infecciosas
Instituto Nacional de Salud Pública
Av. Universidad 655, Sta. María Ahuacatlán
Cuernavaca, Morelos. C.P. 62100
E-mail: celia.alpuche@insp.mx

Dr. Luis Bavestrello

Asociación Panamericana de Infectología
Centro Médico Clínica Reñaca
Anabaena 336, Reñaca
Viña del Mar, Chile
E-mail: lbavestrello@gmail.com

Dr. Michael Bell

Deputy Director, Division of Healthcare Quality
Promotion
Centers for Disease Control and Prevention
1600 Clifton Road NE
Atlanta, GA 30333
E-mail: zzb8@cdc.gov

Dr. Manuel Guzmán Blanco

Hospital Vargas, Centro Médico de Caracas
Unidad de Microbiología y Enf. Infecciosas
Calle Maracaibo, Quinta Cachemira
Prados de Este, Caracas, Venezuela
Tel: (58 212) 552-2864
Mobile: (58-414) 235-8753
E-mail: mibeli03@gmail.com

Dr. Patrick Kelley

Director, Board of Global Health
Institute of Medicine
The National Academies
500 Fifth Street, NW
Washington, DC 20001
Tel: (202) 334-2650
E-mail: pkelley@nas.edu

Dr. Thomas O'Brien

Associate Professor of Medicine
Medicine-Brigham and Women's Hospital
75 Francis St.
Boston, MA 02115
Tel: (617) 732-6803
E-mail: tobrien@rics.bwh.harvard.edu

Dr. Fernando Otaíza

Control de Infecciones Intrahospitalarias
Departamento de Calidad y Seguridad del
Paciente
Subsecretaría de Redes Asistenciales
Ministerio de Salud
Mac Iver 541, Santiago, Chile
Tel: 011-562-25740-532
E-mail: fotaiza@minsal.cl

Dr. Jean Patel

Deputy Director
Office of Antimicrobial Resistance
Centers for Disease Control and Prevention
1600 Clifton Road NE, Atlanta, GA 30333
E-mail: vzp4@cdc.gov

Dr. Flávia Rossi

Facultad de Medicina
Divisão de Laboratório Central,
Universidade de São Paulo
Av. Dr. Éneas de Carvalho Aguiar Nº 155
2º andar - Bloco 3, Cerqueira César
05403000 - São Paulo, SP, Brasil
Caixa-Postal: 3671
Tel: 011-55-11-7724-41-10
E-mail: flaviarossi61@gmail.com
f.rossi@hc.fm.usp.br

Dr. Gabriel Schmunis

Independent Consultant
4256 Warren Street NW

Washington, DC 20016
E-mail: gabriel.schmunis@gmail.com

Dr. John Stelling

WHO Collaborating Center for Surveillance of
Antimicrobial Resistance
Brigham and Women's Hospital
75 Francis Street, Boston, MA 02115
Tel: (617) 935-9407
E-mail: jstelling@whonet.org

OBSERVERS:

Dr. Maria Allende

Medical Officer, Division of Anti-Infective
Products
Office of Antimicrobial Products
CDER – Food and Drug Administration
11903 New Hampshire Ave.
Silver Spring, MD, USA 20093
Bldg. 22 Rm 6239
Tel: (301) 796-2952
E-mail: maria.allende@fda.hhs.gov

Dr. Lynee Galley

American Society for Microbiology
1752 N Street N.W.
Washington, D.C., USA 20036

Dr. Sumanth Gandra

Center for Disease Dynamics,
Economics and Policy
Washington, D.C., USA
Email: gandra@cddep.org

Dr. Hellen Gelband

Center for Disease Dynamics,
Economics and Policy
Washington, D.C., USA
Tel: 202-328-5104
E-mail: gelband@cddep.org

Dr. David Lee

Director, Technical Strategy and Quality
Center for Pharmaceutical Management
Management Sciences for Health

4301 North Fairfax Drive, Office Suite 400
Arlington, VA 22203
Tel. +1-703-248-1612 (direct)
Tel. +1-703-524-6575 (reception)
E-mail: dlee@msh.org

PAHO / WHO Secretariat:

Dr. Sylvain Aldighieri

Unit Chief, IHR, Epidemic Alert and Response,
and Water Borne Diseases
Pan American Health Organization
525 23rd St. NW
Washington, D.C., USA 20037
Tel: (202) 974-3193
E-mail: aldighsy@paho.org

Ms. Carolina Bascones

Advisor, Planning and Resource Coordination
Pan American Health Organization
525 23rd St. NW
Washington, D.C., USA 20037
Tel: (202) 974-3026
E-mail: basconc@paho.org

Dr. Jose Luis Castro

Advisor, Essential Medicines and Biologicals
Pan American Health Organization
525 23rd St. NW
Washington, D.C., USA 20037
Tel: (202) 974-3483
E-mail: castrojl@paho.org

Dr. Jean Marc Gabastou

Regional Advisor, Public Laboratory Services
PAHO/WHO Country Office in Peru
Los Pinos 251
Urbanización Camacho
La Molina, Lima 12, Perú
Tel: +1 (868) 789-5007
E-mail: gabastouj@paho.org

Dr. Massimo Ghidinelli

Unit Chief, HIV, Hepatitis,
Tuberculosis, and Sexually
Transmitted Infections
Pan American Health Organization
525 23rd St. NW
Washington, D.C., USA 20037
Tel: (202) 974-3614
E-mail: ghidinellim@paho.org

Mr. Jorge Matheu

Specialist, Antimicrobial Resistance
IHR, Epidemic Alert and Response,
and Water Borne Diseases
Pan American Health Organization
525 23rd St. NW
Washington, D.C., USA 20037
E-mail: matheujo@paho.org

Dr. Carmen Pessoa da Silva

Team Leader
Antimicrobial Drug Resistance
World Health Organization

Avenue Appia, 20
1211 Geneva 27, Switzerland
Tel: +41 22 7912844
E-mail: pessoasilvacl@who.int

Dr. Pilar Ramón-Pardo

Regional Advisor, Antimicrobial Resistance
IHR, Epidemic Alert and Response,
and Water Borne Diseases
Pan American Health Organization
525 23rd St. NW
Washington, D.C., USA 20037
Tel: (202) 974-3901
E-mail: ramonpap@paho.org

Dr. Valeska Stempliuk

Advisor, Infection Control
PAHO/WHO Country Office in Uruguay
Ave. Brasil 2697, Apts. 5, 6 y 8
Esquina Coronel Alegre
Código Postal 11300
Montevideo, Uruguay
E-mail: stempliv@paho.org

ANNEX III. PRE-REQUIREMENTS AND COMPONENTS OF A NATIONAL PLAN TO ADDRESS ANTIMICROBIAL RESISTANCE IN COUNTRIES OF THE AMERICAS, AND PROPOSED SUPPORT AT THE REGIONAL LEVEL

I. Social mobilization

National plan

- Generate a sense of urgency to provide motivation to develop a national plan.
- Energize national leaders and the civil society.

Regional support

- Gather support for a study of AMR-associated costs conducted by a regionally recognized body in the financial area, such as the World Bank or the Inter-American Development Bank.
- Raise awareness of antimicrobial resistance and related issues through focal days or weeks.
- Explore innovative partnerships (e.g. Sesame Street), taking advantage of lessons learnt from the CDC, the European Centre for Disease Prevention and Control (ECDC), the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA), and the entertainment industry to move the conversation beyond the health sector.

II. National governance

National plan

- Propose, draft, and implement laws and regulations, for instance, regarding responsible drug prescription and dispensing, essential drugs, laboratory licensing, and infection control.
- Determine oversight and enforcement.
- Establish a steering committee.
- Develop coordinating mechanisms and processes.
- Include interagency participation.
- Intersectoral collaboration (including food and agriculture)

Regional support

- Develop sample regulations and laws. Review and update the publication *Legislación sobre antibióticos en América Latina*.²⁰
- Promote hierarchical reporting
- Take full advantage of the International Health Regulations to foster accountability
- Take advantage of lessons learnt from existing programs (i.e., tuberculosis, malaria, HIV)

III. Drug quality and access-supply chains

National plan

- Identify population groups at risk of death due to poor access to medications
- Revise essential drugs lists based on changing epidemiological situations in each country

Regional support

²⁰ <http://www2.paho.org/hq/dmdocuments/2011/amr-legis.pdf>.

- Conduct device approval processes.
- Support and improve the implementation of WHO's Medicines Quality Assurance System (MQAS) through collaboration with various partners collaboration and use of available tools
- Advocate for PAHO's Strategic Fund to include in said fund the antimicrobials (adult and pediatric formulations) recommended in PAHO's clinical guidelines on Treatment of Infectious diseases

VI. Surveillance

National Plan

- Provide AMR data on burden of disease and present it in lay terms to policy makers

Regional support

- Develop agreement on systems' objectives for both local and global real time laboratory surveillance data, interpretation, and response.
- Support of standardized data collection for regional laboratory based surveillance
- Foster improved cross-national comparisons through integrated reporting, real time algorithmic alerting, and feedback. For this purpose, research specifications for subtyping engine, consider modeling the concept through use of previous data, and consider conducting a pilot project to show proof demonstrate concept of real-time cross laboratory surveillance within a limited number of countries and labs and across all regions.

V. Epidemiology- detection and response

Regional support

- Facilitate access to courses and other training by generating a list of appropriate programs, and sharing said information with countries.
- Assist in providing access to high quality training scientific literature in Spanish and Portuguese.

VI. Communications and Education

National plan

- Develop appropriate and specific communications and education programs on AMR and health care-associated infections for policy makers, the community (adults and children), and for professional education (schools of medicines, pharmacologist, dentists, etc.).

Regional support

- Identify global programs that can be adapted for local media dissemination, especially those targeted to government ministries.
- Explore the potential use of social media, such as Twitter and Facebook, to stimulate journalists' curiosity on the subject of antimicrobial resistance and health care-associated infections.

VII. Standardized best clinical practices/guidelines, including for early diagnosis

Regional support

- For clinicians, add explicit treatment failure/resistance data to treatment guidelines (e.g. referral lab testing, switch to second line agent use, etc.).
- Explore more affordable large-scale disseminations of PAHO's treatment guidelines through alternative channels (e.g. Ministries of Health, universities, scientific journals, etc.) and

improve marketing.

- Continue to collaborate with WHO's Department of Essential Medicines and other partners, such as the International Network for Rational Use of Drugs, and Management Partners in Health on issues of common interest.

VIII. Laboratory Quality Assurance

National plan

- Determine the possibility of adapting quality control models from national reference laboratories to other laboratories participating in national networks (third level and private laboratories), which provide routine patient services. If implemented, these changes should be regulated, evaluated and documented, and include corrective measures.
- Ensure the availability of appropriate personnel (e.g., qualified microbiologist).

Regional support

- Evaluate the adoption of common breakpoints, such as those of CLSI, to reinforce the use of a common in the Region.
- Regulate and standardize external quality control for laboratories and insist on the need for documentation.
- Consider the application of quality assurance, external evaluation and documentation processes, when implementing a new technique in a given laboratory.

IX. Knowledge management/information management: knowledge exchange

National plan

- Define systematic information sharing regarding interventions and experiences.

Regional support

- Continue to provide online course on rational use of antimicrobials
- Explore technologically supported communities of practice, which have proved useful in the past, as was the case during the influenza pandemic.

X. Infection control/interventions

National plan

- Define systematic information sharing regarding interventions and experiences.

Regional support

- Develop new practice guidelines for infection control prevention, e.g., for surgical wounds.
- Support leadership development beyond the hospital level.
- Assess the use of prevention-oriented checklists to be used in health care settings outside the hospital, and promote suitable models.
- Improve access to training in Spanish and Portuguese.
- Expand the assessments of hospital infection prevention and control programs. Include the evaluation of the national IPC program or strategy, and develop checklists or other tools to assess hospital infection control programs.
- Develop a strategy for diagnosing and managing disease outbreaks, and to determine the occurrence of national emergencies.

XI. Research and innovation (e.g. simple field diagnostics)

National plan

- Develop new tools.
- Conduct operational research to improve the use of existing tools.

XII. Monitoring, evaluation, and dissemination of results for accountability

Regional support

- Continue publication of periodical epidemiological alerts
- Identify operational indicators, specifically those that can be used to determine whether there is an AMR containment strategy in place, and to measure the extent of its application.
- Develop monitoring and evaluation mechanisms for the following education; laboratory programs; infection control programs; surveillance and response systems; IHR implementation and compliance; and clinical performance.
- Define monitoring and evaluation processes in major strategies to contain AMR.