2nd High Level Technical Meeting on Surveillance of Antimicrobial Resistance for Local and Global Action

27–28 April 2017

Stockholm, Sweden

Meeting Report

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Meeting report

Background

There is growing concern about the impact of AMR on health and on entire societies and growing appreciation of the complex global and multisectoral aspects of the problem.

In December 2014, a two-day global consultation was held in Stockholm, which resulted in advice on preparation of a manual on early implementation of the Global Antimicrobial Resistance Surveillance System (GLASS).[1] The consultation brought together representatives from 30 Member States from all six WHO regions, international experts on AMR and WHO staff. Representatives of all countries expressed their commitment to participate in GLASS.

In May 2015, the World Health Assembly adopted the global action plan (GAP) on AMR, in which national and global surveillance is identified as a priority.[2] The plan and the related resolution request countries to prepare national action plans on AMR that are aligned with the global action plan, as well as relevant standards and guidelines, by May 2017.

In light of the significant challenge of AMR and the need for appropriate responses, a high-level meeting on AMR was convened during the United Nations General Assembly in September 2016. The political declaration of the meeting stresses the grave challenge of AMR and the need for a multisectoral "One health" approach.[3] It also reaffirms the GAP as a blueprint for tackling AMR and re-emphasizes the need for improved surveillance.

A key element of the global action plan is the sharing of data collected according to proposed surveillance standards to guide and evaluate interventions. An important step to this end was taken with the launching of GLASS; the next step is to support implementation and continue development and evaluation of the system.

Important progress has been made in recent years, but further action is required to strengthen capacity and ensure a comprehensive response to AMR. Antimicrobial resistance (AMR) has rapidly become a significant public health priority for countries worldwide.

Organization and procedure of the meeting

Objectives

- Obtain continued, sustained high-level commitment to build the required capacity for national, regional and global AMR surveillance.
- Exchange experience and identify ways to coordinate implementation of GLASS, with the goal of assessing the global spread of AMR.
- Agree on continued, sustained international collaboration to further develop GLASS.

Participants (see Annex 1)

- representatives of selected Member States enrolled in GLASS and Member States representing all six WHO regions (directors of ministries of health, public health agencies and other bodies with national responsibility for surveillance; and technical surveillance experts responsible for AMR surveillance, e.g. GLASS national focal points);

[1] Global Antimicrobial Resistance Surveillance System: manual for early implementation. Geneva: World Health Organization; 2015 (http://apps.who.int/iris/bitstream/10665/188783/1/9789241549400_eng.pdf?ua=1).

[2] World Health Assembly resolution 68.7 (WHA68/2015/REC/1)

[3] United Nations General Assembly resolution A/RES/71/3

- representatives of the World Organisation for Animal Health (OIE), the Food and Agriculture Organization of the United Nations (FAO) and other selected organizations and networks;
- representatives of WHO headquarters and regional and country offices;
- representatives of WHO collaborating centres supporting GLASS; and
- representatives of the Government of Sweden.

Procedure (see Annex 2)

On the first day, after the introduction, a plenary session was held to update participants on the status of AMR surveillance from national to global level, with a focus on implementation of GLASS. Examples of support provided by WHO collaborators and of recent development of GLASS components were followed by break-out sessions in which groups of participants from the six WHO regions (African, the Americas, Eastern Mediterranean, European, South-East Asian and Western Pacific) discussed a number of pre-set questions on early implementation of GLASS and the GLASS Emerging AMR Reporting (EAR) framework.

The second day of the meeting was devoted to participants' feedback and discussions on expected next steps and support for further development of national AMR surveillance systems and GLASS implementation.

Meeting proceedings

1. Global surveillance of AMR

The meeting was opened by Anders Tegnell, Deputy Director, Public Health Agency of Sweden, who said that hosting of the important meeting was the logical outcome of the work in Sweden on AMR over many years. The Agency had become the recognized coordinating body of a true "one health" network of many national authorities that among other activities were finding ways to ensure that both new and existing antibiotics remained accessible and safe to the healthcare system. He emphasized the importance of international collaboration, including bilateral projects, regional efforts (e.g. by the European Union) and partnerships with WHO. He looked forward to hearing the experiences of other countries in building their capacity to collect and report data on AMR.

Marc Sprenger, Director of the Antimicrobial Resistance secretariat at WHO, recalled that Sweden had been the frontrunner in addressing the threat of AMR. GLASS relied on national action plans, and he noted that, among the countries represented at the meeting, more than 60% had reported progress in preparing those plans. WHO stood ready to support countries in finalizing them and in ensuring adequate laboratory capacity.

Annika Söder, State Secretary for Foreign Affairs, Sweden, described the political and security aspects of the growing threat of AMR. International attention to the problem included the political declaration by the United Nations General Assembly, establishment of the Interagency Coordination Group on AMR, the Alliance of Champions of health ministers and the global network ReAct, with five regional nodes to advocate for global, regional and national action. It had been estimated that unless AMR were controlled, by 2050, it would cause economic damage comparable to that due to the economic crisis of 2008. AMR was recognized as a security issue in Sweden, as part of the national security plan and had been identified by the Swedish public as a threat on a par with that of climate change.

Carmem Pessoa-Silva, Coordinator of GLASS, outlined the steps that had been taken to foster global and national AMR surveillance since the first Member State consultation, in 2014. GLASS had been developed in response to a request by the World Health Assembly in 2015 that WHO support surveillance in Member States and that Member States share their surveillance data internationally. The aim of GLASS was to foster development of national surveillance systems and also to enable the collection, analysis and sharing of standardized, comparable, validated data

on resistance among countries. The system was being developed in stages, first focusing on AMR in humans and on selected specimens and pathogen–antimicrobial combinations, progressively increasing its representativeness and linking to surveillance of AMR in food, animals and the environment and use of antimicrobials. An information technology (IT) platform, capacity-building tools and guidance on diagnostic stewardship and data management had been developed. In March 2016, Member States had been called upon to enrol in GLASS, and, in only one year, 35 countries had enrolled. The strengths of the system were its coordination with WHO regional offices and with key international stakeholders such as the European Centre for Disease Prevention and Control (ECDC), the network of WHO collaborating centres and its ownership by Member States. The first GLASS call for data had been made on 1 April 2016, and the first GLASS report would be produced in 2017.

Sekesai Zinyowera, AMR and National Malaria Reference Laboratory Coordinator, Ministry of Health and Child Care, Zimbabwe, described progress in laboratory surveillance for AMR in her country. After the launching of GLASS, a multisectoral core group had been formed to ensure a "one health" approach, with a focal point in her Ministry and five technical working groups on various aspects of AMR. A situation analysis had been conducted, which showed that there was a strong, effective programme for notifiable conditions such as dysentery but ineffective laboratory-based surveillance, mainly because of the diversion of equipment to services for HIV infection and tuberculosis, which were high-burden diseases in the country. Samples from animals and from the environment were not tested for sensitivity to antibiotics. A national action plan had been drawn up and the country was enrolled in GLASS. The challenges included: the high cost of tests, which were not covered by health insurance; difficulty in obtaining urethral and cervical swabs; and lack of reagents for some pathogens. Furthermore, the programme was unclear about the culture media and data collection forms to be used and the populations to be reported on from district and central sites.

Hyukmin Lee, Yonsei University College of Medicine, Republic of Korea, described the increases in major antimicrobial-resistant pathogens in his country between 2002 and 2015 and the limitations of the previous AMR surveillance system. The representativeness, consistency and reliability of data in the previous system had been limited and were poorly translated into action. With the adoption of the National Action plan on AMR released in 2016 and establishment of Kor-GLASS with an increased budget, surveillance was being improved in humans and extended to animals and food. Over 12 000 samples were sent annually from six sentinel hospitals to the main centre, with clinical and epidemiological information, quality control and regular validation. The challenges in the first year were lack of information on *Shigella* species and *N. gonorrhoeae* and now the Kor-GLASS is progressing from an isolate-based" system to population-based surveillance, implementing the sample-based approach introduced by GLASS. The number of sentinel hospitals was to be increased, and the new system had resulted in effective discrimination between community- and hospital-acquired infections. The plans of Kor-GLASS included improved data management, a website to promote GLASS, an independent quality control centre and further international collaboration.

2. Next steps in implementation of GLASS

Johan Struwe, Public Health Agency of Sweden, presented NorthernGLASS, which was part of the Northern Dimension Partnership in Public Health and Social Well-being, comprising 10 countries in northern Europe and nine regional and international organizations. Eight of the countries were part of the NorthernGLASS project. The aims were to share lessons learnt from early implementation of GLASS to evaluate the process, the logistics and the applicability and usefulness of WHO supporting material. International surveillance of AMR in the region was undertaken by the European Antimicrobial Surveillance Network (EARS-Net) of ECDC and the Central Asian and Eastern European Surveillance of Antimicrobial resistance (CAESAR), which, however, provided data only from isolates obtained by invasive procedures (blood and cerebrospinal fluid). The activities for the coming year included discussion of manuals and

protocols in national workshops to present GLASS to surveillance sites and discuss problems encountered during early implementation. Issues that had already been identified in participating countries included unclear definition of national focal points, use of WHO material by countries that did not already have good surveillance capacity, adaptation of existing surveillance systems and laboratory information systems to GLASS, identification of a catchment area from national laboratory-based surveillance, avoiding duplicate reporting to different networks and, finally, use of GLASS to improve existing systems.

Malin Grape, Director of the WHO Collaborating Centre for AMR Containment, Public Health Agency of Sweden, described the support provided by the WHO collaborating centre network established in December 2016 to implementation of GLASS in Member States. Each centre performed the specific tasks laid down in its terms of reference and served as a global resource for WHO. To ensure transparency, as much information about the network as possible would be published on the WHO web site. Coordination of the network was delegated by WHO to one of the centres on a biannual basis. The work plan for 2017–2019 covered capacity-building and technical support to microbiology laboratories and to surveillance systems, development of GLASS and increasing understanding of the burden of AMR, with 12 target products.

In response to questions, Dr Pessoa-Silva said that the WHO Essential Medicines List was updated with regard to antibiotics on the basis of those critical for most common infections, epidemiology and susceptibility testing. She emphasized, however, that changes to the List were made on the basis of systematic reviews of published information; furthermore, data were lacking from countries in which surveillance was weak. Surveillance was the basis for meeting all five strategic objectives of the global action plan.

Sergey Eremin, WHO headquarters, presented a framework for emerging AMR reporting (EAR) and risk assessment. The framework covered the reporting of data on mechanisms of AMR in bacteria and fungi that were new or previously unrecognized. Those included exceptional phenotypes that had not been reported previously or were very rare and novel resistance genotypes associated with mechanisms of resistance that might have a strong public health impact or pose a serious challenge to laboratory detection or surveillance. Links would be made with other systems for monitoring the emergence of resistance, such as for *M. tuberculosis*, HIV and influenza viruses and *Plasmodium* parasites, and also with signals arising from surveillance in animals, the food chain and the environment. Most findings of emerging AMR, while "important to know", would not constitute a public health emergency of international concern, whereas when emerging AMR was reported via the International Health Regulations (2005) (IHR) channels, the GLASS-EAR platform would receive a signal from an IHR focal point. Signals should ideally be received from national coordinating centres, to which all surveillance sites in a country reported. An important barrier to timely reporting of emerging AMR was pressure to publish findings first in scientific journals, which could delay reporting considerably. Raw data on isolates obtained routinely and from active screening, surveys and other activities and clinical, demographic and other epidemiological data were to be triaged to detect unlikely, unusual and clinically or epidemiologically important events, as defined by international bodies such as the Clinical and Laboratory Standards Institute (CSLI) and the European Committee on Antimicrobial Susceptibility Testing (EUCAST), which would be verified by a national or supranational reference laboratory. The framework included a provisional list of critical resistance phenotypes, which should be reported within two weeks of their verification. Positive responses on the proposed framework had been received, and he looked forward to the results of the discussions that were to be held among the Member States at the present meeting.

3. Summary of break-out discussions and way forward

Problems encountered in enrolling in GLASS

- In the African Region, the problems had been: delayed responses from the GLASS secretariat; insufficient coordination between WHO headquarters, the Regional Office and country offices and between countries and WHO offices; insufficient access to supporting materials and training in languages other than English (most notably French); and inadequate sensitization of national ministries of health to the relevance and usefulness of GLASS.
- The group from the Americas Region reported that one difficulty in enrolling in GLASS was that central governments could not oblige states to participate in or to submit data in a specific format. Countries expressed interest in enrolling only after they had finalized their national action plans and had clarified the surveillance protocols and priority pathogens.
- Countries in the Eastern Mediterranean Region found that the GLASS manual did not clearly state the frequency of data collection and submission or of reporting. One participant commented that the enrolment process was not clearly described on the WHO web site. The group also noted that aligning GLASS with existing surveillance systems was also not sufficiently clearly explained.
- The European groups noted that, for most countries, the process of enrolment was easy, but the WHO website should be clearer. Communication through national AMR surveillance focal points should be improved. They were aware that data could be transferred directly to GLASS through EARS-Net from countries that preferred that route, but the process should be clarified. They also requested clarification of which structures received calls for data from GLASS and the timing of submission of data.
- Countries in the South-East Asian Region expressed the greatest difficulty in enrolling. They considered that the GLASS requirements were not immediately applicable because of difficulties of identification and/or official designation of national surveillance structures, differences from existing databases and lack of quality assurance mechanisms.
- In some countries in the Western Pacific Region, data from AMR surveillance were collected independently in several sectors, making it difficult for governments to set up national AMR surveillance structures that could generate national data for submission to GLASS. Furthermore, some countries would have difficulty in setting up a national reference laboratory and a national coordinating centre, a system for transporting specimens from sentinel sites, standard testing methods and training and an IT system. Obtaining financial support for logistics would be particularly difficult. In some countries, participation in surveillance was voluntary, so that obtaining nationally representative surveillance data would be problematic.

Areas that require strengthening to improve national AMR surveillance and to proceed with GLASS enrolment

- In the African Region, surveillance could be improved by institutionalizing surveillance, with the commitment of high officials in ministries of health, alignment of GLASS with existing programmes and increased funding from global health development partners, with better coordination among them. Many countries had already drafted their national action plans on AMR, but the plans remained to be approved. Coordination among sectors should be improved. Laboratory systems required strengthening in all aspects: physical infrastructure, human resources and capacity, quality assurance systems and regulation to ensure minimum laboratory standards. There is a need to ensure that epidemiological data are available and should be linked to microbiological data. Generic software and information management systems should be developed that could be adapted by countries, with contemporary IT, such as bar-coding and use of simpler devices such as mobile telephones. The WHONET should be disseminated and development of the server-based version expedited. Among additional issues raised were limited capacity for sample referral for confirmatory testing and for control of the sale of antimicrobials.
- The group from the Americas Region noted that improved surveillance methods were required to collect AMR data in the community and to move from collecting data only on consumption to data on use of antimicrobials.

- The Eastern Mediterranean Region, although it had a large number of laboratories, required organizational and political support and trained human resources with analytical capability. Countries had multiple health sectors, such as those of the military, private and education sectors. Other areas that required strengthening were laboratory capacity, surveillance sites, linkages with the animal and other sectors, licensing and accreditation of laboratories, data management and analysis and the involvement and regulation of the private sector, which varied widely from country to country. An interface was required to integrate AMR surveillance systems.
- The countries of the European Region considered that communication through national focal points should be improved. Laboratories in some countries required capacity-building and technical support, including for diagnosis and quality assurance. The group noted limitations to WHONET and commented that improved IT infrastructure was needed. Further development of data collection strategies (including collection of the GLASS variables and denominators (samples), which proved to be difficult) and data management approaches was needed to implement GLASS. The countries required better justification of the move from laboratory-based to sample-based surveillance and the collection of clinical and epidemiological variables, and needed solutions to overcome legal, financial and psychological barriers. The advent of molecular methods for testing would change many aspects of laboratory work and of reporting, and that should also be addressed.

Dr Pessoa-Silva commented that the pragmatic approach to answering policy-makers' questions about how much infection was due to AMR was to use sample-based data as a proxy for infection rates. In reality, the different systems and their shortcomings should be harmonized, and flexibility was essential to adapt to countries' capability.

- The countries of the South-East Asian Region faced shortages of human resources for laboratory services and for data collection and analysis; quality assurance of specimen collection and laboratory results was not widespread. Linking epidemiological and laboratory data was still a challenge. Advocacy was needed to bring the private sector into surveillance networks. Both national coordination centres and peripheral laboratory capacity required strengthening. Work was required to integrate AMR surveillance into other surveillance systems and to extract data from existing systems.
- The countries of the Western Pacific Region identified systems for transporting isolates from sentinel sites, establishing standard testing methods, training in their use and setting up an IT platform as areas for strengthening. Training in diagnostic stewardship was also required.

Support among countries

- The African Region considered that support could be provided in the form of exchanges of experiences.
- In the Region of the Americas, countries expressed a willingness to share plans and protocols. Colombia would design a survey of countries wishing to apply to the Caribbean Commission on Health and Development for funds and analyse the data through a WHO collaborating centre.
- The Eastern Mediterranean Region countries identified a need for training in antimicrobial stewardship, infection prevention and control, advanced diagnostic testing, data management and use of WHONET.
- The countries of the European Region said that WHO collaborating centres provide support through bilateral arrangements for in-country training, technical support and high-level advocacy. The Region could provide information on how the different systems had been developed.
- The countries of the South-East Asia Region recommended collating best practices and exchanging them with other regions and also sharing IT solutions. Regional workshops could be organized. They noted that the WHO External Quality Control Scheme (EQAS) provided proficiency panels through WHO collaborating centres.

- The countries of the Western Pacific Region noted that support among countries was practised in the Region. The WHO Gonococcal Antimicrobial Surveillance Programme (GASP) Collaborating Centre provided a quality assurance programme and training, including in diagnostic stewardship, and shared techniques. They noted that funding agencies preferred to support countries that were enrolled in GLASS, which could further facilitate the development of national surveillance and the global system.

Dr Pessoa-Silva said that WHO was collaborating with about 50 partners in the GLASS collaborative platform, which were working to harmonize their support to countries in implementing GLASS.

Reasonable goals to be attained in the coming two years

- The countries in the African Region wished to establish national coordinating centres and achieve accreditation of national reference laboratories and some sentinel surveillance sites and would generate and publish initial country and regional reports from AMR surveillance.
- In the Americas, countries expressed interest in enrolling in GLASS, finalizing their action plans and integrating AMR surveillance into the human, animal and food sectors. The Canadian Integrated Program for Antimicrobial Resistance could share its experience in that respect.
- The goals of the Eastern Mediterranean countries were to establish an AMR programme in national reference laboratories, establish national coordinating centres, develop the capacity of all laboratories in both the public and the private sector, ensure standardization in laboratories and introduce diagnostic stewardship. High-level commitment was required. Each country in the Region had at least one strong laboratory; IT structures were now needed to link epidemiological and laboratory data.
- In the European Region, the goals were to fully endorse GLASS; build capacity to ensure the basic quality and comparability of data and increase coverage, extend data collection and networks and establish national external quality assessment programmes. Further work would be done on priority targets, including other than those in the GLASS protocol, and collection of denominator data.
- Reasonable goals in the South-East Asia Region were considered to be enrolment in GLASS, integration of epidemiological data into the AMR surveillance data sets, establishment of national coordination centres, identification of national reference laboratories, extension of AMR surveillance to communities and harmonization of IT tools.
- In the Western Pacific Region, the goal was to improve surveillance methods and work on AMR policies.

In answer to a question from the Chair, participants considered that rapid global coverage of GLASS was important but with at least minimum quality of data checking.

Integration of AMR surveillance and antimicrobial use into various sectors

- Countries in the African Region considered that the relevance of surveillance would have to be demonstrated to each sector. The veterinary sector would require capacity-building before data could be integrated and the components of the system developed. The relevant legislation should be strengthened.
- The group representing the Americas Region asked for models from other countries. Lack of data on the use of antimicrobials (in addition to consumption) was a particular challenge.
- The Eastern Mediterranean Region asked for further definition of "integration" and its scope. Focal points would be required in each sector, and coordination among sectors should be strengthened. Current regulatory coverage should be reviewed. Legislation had been enacted in only a few countries, and implementation and enforcement were still weak.
- In the European Region, the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) involved most countries in the Region, but the added value of integrated

surveillance should be explored and better defined. Several countries in the European Union already had good systems for AMR surveillance in the veterinary field.

- Countries in the South-East Asia Region commented that political commitment would be required at the highest level. Databases and surveillance systems would have to be established for other sectors, with international guidelines for breakpoints in the animal sector and data on antibiotic consumption in all sectors. Sufficient linkages should be ensured among all the sectors involved as well as sharing of AMR data and experiences in tripartite sectors (WHO/FAO/OIE).
- In the Western Pacific Region, some countries had national committees for AMR, with members from the health, environment, agriculture and other sectors. AMR surveillance in the veterinary sector was much less advanced than in other sectors, and support from FAO and OIE was being provided. In view of the complexity of establishing integrated AMR surveillance, the group recommended that the system be initiated with one common target, such as extended-spectrum beta-lactamase (ESBL)-producing *E. coli*. Some studies had shown that certain resistance genes differed in humans and animals, even if the rate of resistance of bacteria was similar, indicating that genotyping might be required.

The Chair pointed out that the concept of "breakpoints" was not widely accepted in the veterinary sector. In the future, AMR surveillance might be extended to the trade sector, for identification of persistent microorganisms in products that were imported and exported.

Public health relevance of reporting emerging AMR, as described in the draft framework presented by WHO, and usefulness of GLASS-EAR

- The countries in the African Region commented on the importance of a system for rapid detection of new AMR. To avoid parallel systems, it could be integrated with existing laboratory information systems or the integrated disease surveillance and response framework, but should, however, remain a simple system. The countries listed the potential benefits as: timely response to the spread of resistance; guidance for the development or review of antimicrobial susceptibility protocols; guidance for the development or review of treatment protocols; and strengthening of inter-country collaboration by use of reference laboratories at collaborating centres.
- The Region of the Americas emphasized that initial risk assessment should be conducted at country level before reporting to global authorities.
- Countries in the Eastern Mediterranean Region agreed that GLASS-EAR would provide an early warning to stimulate rapid action, monitoring, assessment and studies to determine an adequate response to ensure health security. They commented that while GLASS requires annual reporting and supports policy-making, EAR would provide a surveillance mechanism for early warning of emerging new threats for immediate reporting and action. It would also provide additional links to AMR surveillance in other sectors and prevent cross-border and international spread of resistance.
- In the European Region, the Epidemic Intelligence Information System (EPIS) had rarely been used for AMR; therefore, concern was expressed that GLASS-EAR might add little value, considering also that IHR channels were already available as an early warning system. At the same time, a simple system for notifying rare events would be useful, such as e.g. the European survey of carbapenemase-producing Enterobacteriaceae (EuSCAPE). The United Kingdom had an alert system for exceptional resistance, as a basis for response, with information transmitted to the relevant people. Many events considered rare in European countries were not rare globally. The countries commented that GLASS-EAR might pressure countries to respond and create political will to fund specific areas. In developing countries, the system might provide opportunities to improve rapid detection and support for a national surveillance system.
- Countries in the South-East Asia Region commented that the ability to detect early and respond to emerging AMR threats was also important for updating treatment guidelines.

They noted that enrolment in GLASS was not a prerequisite for reporting under the EAR framework.

- In the Western Pacific Region, countries agreed that GLASS-EAR could lead to appropriate risk management. It would also permit rapid sharing of information to prevent the spread of resistance and timely revision of treatment protocols. Nevertheless, "emerging" should be defined more clearly, depending on the occurrence of resistance mechanisms in country. They considered that establishment of EAR would strengthen the detection and recognition of emerging resistance and thus appropriate control. Countries considered that the GLASS-EAR framework would ensure differentiation of true emerging mechanisms of AMR, as countries would have to verify their findings before reporting them, obviating errors due to poor quality or erroneous data entry, and so would have to conduct a proper risk assessment. The framework would also encourage countries to report emerging AMR as soon as possible, without waiting for publication. Special testing, such as sequencing, might be required to confirm emerging AMR, which might encourage countries to save isolates.

Dr Eremin commented that Member States had a mutual responsibility to report such events, as underlined by a number of World Health Assembly resolutions.

Relation between reporting to IHR and to GLASS-EAR

- Countries in the African Region noted that reporting to GLASS-EAR fulfilled the requirement of IHR core capacity.
- The countries in the Americas considered that the way of reporting would be determined by risk assessment. The greater the public health implications, the more likely reporting would be through IHR channels (IHR is legally binding). Ultimately, each country would judge whether the AMR was an "emergency" and therefore reported through the IHR, or "emerging" and therefore reported through GLASS-EAR.
- The countries in the Eastern Mediterranean Region proposed that the information could be shared with a national IHR focal point, who would decide on whether reporting to WHO should be done via IHR channels. Protocols at local, regional and global levels for reporting AMR-related events should be clearly defined to avoid overburdening IHR focal points.
- The group representing the European Region commented that a series of confirmation steps was required before reporting, and a more detailed flow chart would be useful.
- Countries in the South-East Asian Region noted that GLASS-EAR reporting was simpler, with a longer delay, than IHR and was not mandatory. Countries did not have to be enrolled in GLASS to report emerging AMR.
- The group representing the Western Pacific Region commented that IHR was a reporting platform for public health emergencies of international concern. Many emerging AMR events did not meet the definition of reportable diseases as defined under IHR but were events that were only "important to know". For example, in food safety, some events might have to be reported because of implications for either trade or public health. Member States should use the decision instrument of the IHR to decide how an event should be reported.

Potential challenges in implementing GLASS-EAR

- The countries in the African Region commented that the challenges were inadequate resources for confirmatory testing (which could be overcome by use of national and supranational reference centres and university and research centre laboratories), lack of standardization of testing protocols for some resistance phenotypes and the reluctance of academia to share data on some resistance phenotypes before publication.
- In the Americas, countries noted that GLASS-EAR should not be another formal reporting mechanism but should consist of formalized communication of emerging AMR to WHO,

which would decide whether to generate an alert. It was important to stress that countries did not have to be enrolled in GLASS-EAR to report events.

- The group from the Eastern Mediterranean Region commented that ensuring access to a collaborating centre or other institution for advanced testing such as sequencing and molecular testing would be essential.
- The countries in the European Region commented that the challenges would differ by country but included possible delays between identification of emerging resistance and the mechanism that made it exceptional. The proposed delay of two weeks for reporting might not be realistic, as it would depend on the steps required.
- In the South-East Asian Region, the challenges were lack of training and of human and other resources for taking action once a risk assessment had been conducted, lack of protocols for detecting emerging AMR and lack of political commitment. The impact of reporting emerging AMR on trade and on travel should also be taken into account.
- In the Western Pacific Region, it was noted that some countries preferred to publish their results before reporting them; this led to considerable delay in controlling the spread of resistance. Furthermore, an emerging AMR event might not be considered worth publishing, even if it had a significant public health impact; and not all publications were accessible by the general public.

The Chair remarked that most of the data reported to GLASS were routine laboratory findings; dangerous "bug–drug" combinations were also reported. However, findings reported by laboratories as unusual could often not be confirmed because the isolates had been thrown away. Dr Eremin said that WHO was increasing the network of laboratories available for verifying unusual findings. Participants proposed that WHO issue a protocol for storing resistant isolates.

Realistic timeframe and relevant procedures for reporting to GLASS-EAR

- The countries in the African Region considered that emerging AMR should preferably be reported within two weeks of verification, and done through the national coordination centre.
- The group of countries in the Region of the Americas agreed that the proposed two weeks after confirmation was acceptable.
- In the group from the Eastern Mediterranean Region, participants considered that reporting should be one week after confirmation or verification.
- The countries in the European Region considered that the procedures for reporting should first be better clarified.
- The countries in the South-East Asian Region suggested that the proposed two-week time frame should be reviewed in the light of requirements for training, protocols and resources.
- The group representing the Western Pacific Region agreed to a two-week time frame after verification of isolates.

Ensuring compliance with GLASS-EAR

- The countries in the African Region commented that the reporting requirements should be as simple as possible, minimizing the required paperwork and with data capture tools that were clear and easy to fill in.
- The group from the Americas Region proposed that compliance with EAR be included in national action plans.
- The Eastern Mediterranean countries considered that more discussion and engagement with Member States were required, with political leadership.
- The countries in the European Region considered that it would be difficult to ensure compliance, as reflected in the experience of EPIS for reporting AMR and health care-associated infections. Compliance could be improved by automating real-time data collection, which would require acceptance by academic research groups and countries. Political support should be sought, taking into account possible economic consequences. The use of submitted data should be clearly stated.

- The countries in the South-East Region said that WHO should ensure that no punitive action or repercussions would ensue from reporting to GLASS-EAR.
- The group from the Western Pacific Region suggested that the benefits of compliance be emphasized. Countries that did not comply for fear of embarrassment should be informed about the involvement of other countries, and politicians who blocked reporting should be educated about the consequences. Information could be shared with GLASS-EAR in stages.

Facilitation of data-sharing by both national bodies and other stakeholders

- To encourage reporting, researchers should receive guarantees against plagiarism and be sensitized to the relevance and ethical importance of reporting on emerging AMR. The national coordination centre should periodically prompt research laboratories, including in the private sector, to publish their findings, and reporting institutions should receive regular feedback.
- Countries in the Americas Region noted that the private sector and academics should report to the national authority, which would then report to WHO.
- The group representing the Eastern Mediterranean Region proposed that models for reporting emerging AMR within IHR be reviewed. Country capacity for reporting should be strengthened, particularly in those in conflict situations. Country capacity should be built for detection and reporting.
- Countries in the European Region commented that clear rules should be drawn up for data-sharing and that "closed" sharing, with limited distribution of information on events, should be differentiated from open sharing. They suggested that journals be encouraged to ensure that data on emerging AMR in papers submitted for publication had already been reported appropriately at international level.
- The South-East Asian Region suggested that review meetings could be held and that national strategic plans include data-sharing. Networks and private stakeholders should be integrated. Standard operating procedures for reportable diseases and pathogens should be updated.
- The group from the Western Pacific Region remarked that WHO had strict rules on reporting national data and very strict rules on data security. Although outbreaks of emerging AMR were reported on the WHO web site, the data were interpreted cautiously in terms of risk assessment and communication. WHO would provide guidance on confirming reports, the IT platform to be used and opportunities for benchmarking. Information on individual patients and the location of hospitals should not be provided. WHO planned to issue annual reports and interactive online tools, and AMR data would be linked to other global health indicators.

The Chair suggested that rapid surveys could be conducted in countries to determine whether resistance events were isolated or endemic. Countries that reported emerging AMR-related events would expect feedback on whether the events were considered important. One country suggested that lessons could be learnt from experience in pharmacovigilance.

More detailed guidance on risk assessment for emerging AMR

- The countries in the African Region requested guidance on conducting more detailed needs assessments and suggested that risk assessment be conducted on a regional basis.
- Countries in the Americas Region requested general guidance on risk assessment, the criteria for reporting findings and whether to report to GLASS-EAR or to IHR, which was applicable to all countries. Clearer guidance on within-country risk assessment was also requested.
- The group from the Eastern Mediterranean Region also asked for more detailed guidelines and tools for risk assessment, with table-top exercises for capacity-building. Clearer definitions of emerging AMR should be provided.
- The group representing the European Region commented that, although global risk assessments might be difficult, they were generally useful. The use to which the data would

be put should be explained clearly. National risk assessments were the responsibility of each country. Risk assessment and risk management should be better differentiated.

- The countries in the South-East Asian Region suggested that the draft framework be tested in the field and that protocols be prepared, including for the transport of isolates. Capacity-building and resources were recurrent needs.
- The group representing the Western Pacific Region said that countries that required more specific risk assessment tools would develop them as necessary. A proper risk assessment could be conducted only if the questions it addressed were specific enough. Risk assessment was essential for assessing the importance of a new AMR event. The existence of a risk assessment tool would ensure uniform results.

Dr Pessoa-Silva announced that a table-top simulation exercise would be conducted and invited countries to express their interest in participating. She summarized the proceedings of the meeting and noted the positive feedback on the GLASS programme, which offered an opportunity to review and build on existing systems. She was convinced that, by working together, the system would be successful.

4. Closing statements

The State Secretary for Health Care, Public Health and Sport, commended the progress that had been made in the surveillance of AMR. A problem of such magnitude and complexity required joint action by various sectors, and that was being done at the highest political levels. GLASS was in the interests of all. Much remained to be done, however, and the momentum must be maintained in order to meet the commitments that had been made. Sweden's pioneering work in AMR surveillance had been led largely by Professor Otto Cars, and the State Secretary presented him with a medal in recognition of his untiring work in the field.

Professor Cars said that the honour he had received would be shared with his collaborators. AMR was a major cause of concern in Sweden. The collective responsibility was to ensure a world free from the fear of untreatable infections.

The meeting was closed by Dr Johan Carlson, Director-General of the Public Health Agency of Sweden, who said that GLASS was the most important tool in controlling AMR, as it would provide the data that were the basis for action. He assured participants of the continued support of Sweden.

5. Summary

Challenges to national AMR surveillance and GLASS implementation

Among the numerous challenges to national surveillance of AMR and implementation of GLASS, most countries emphasized lack of political support and difficulty in identifying and/or official designation of national surveillance structures. Several countries noted that work was needed to align GLASS with existing national surveillance systems and international networks.

An important problem is gaps in communication with and within WHO and between different sectors and partners. Countries specifically attracted attention to the lack of supporting materials and training in languages other than English and the need to improve the WHO website and other means of communication.

Laboratory systems require strengthening in all aspects: physical infrastructure, human resources and capacity, quality assurance systems and regulation to ensure minimum laboratory standards. All those shortcomings limit the capacity for confirmatory testing. Epidemiological data are also required, linked to microbiological data, with capacity to generate meaningful data and analyse them to inform national AMR programmes and strategies.

The challenges to integration of AMR surveillance and antimicrobial use into various sectors also include a lack of political commitment, insufficient linkages among health, environment, agriculture and other sectors, and lack of surveillance capacity.

Reporting of emerging AMR and risk assessment

After the technical discussion on the emerging AMR reporting framework, countries agreed to advancement of the framework and said that they supported WHO plans to conduct a table-top exercise to test the reporting procedures. The countries emphasized that implementation of EAR requires strong political support and, ideally, should be included in national action plans on AMR.

Countries made several specific recommendations, proposing in particular that the list of bacterium–antibiotic combinations to be notified be revised and shortened and that WHO should issue a protocol for storing resistant isolates. They also requested that comprehensive guidance on AMR risk assessment be developed by WHO.

The way forward

All countries agreed that the necessary political support and resources could be obtained by implementing multisectoral national action plans, with AMR surveillance as a key strategic objective, as required by the Global Action Plan on AMR. Such plans will also improve coordination among various health and non-health sectors.

An essential step forward would be to establish core components of AMR surveillance in countries, as stated in GLASS (nominate national coordinating centres and reference laboratories, identify surveillance sites) and build capacity to ensure the quality and comparability of microbiological and epidemiological data. More guidance on explaining and implementing the GLASS method at local and national levels will be provided to countries.

Further development of data collection strategies (including collection of the GLASS variables and denominators) and data management approaches is needed. Countries will further develop their surveillance methods to collect AMR data in the community and extend data collection from consumption of antimicrobials to data on use. The advent of molecular methods for testing will change many aspects of laboratory work and of reporting and should be addressed.

Software and information management systems should be developed that can be adapted by countries for standardized data collection, analysis and reporting and provide an interface for the integration of AMR surveillance systems. Training and exchanges of good practice and protocols will be necessary. Countries recommended collating best practices, exchanging them with other regions and sharing IT solutions.

It is of utmost importance to link AMR surveillance in humans to AMR surveillance in other sectors. Although the structures and capacity may differ, sufficient linkages should be ensured, with sharing of data and experience on AMR in tripartite sectors (WHO/FAO/OIE).

Annex 1. Participants

2nd High Level Technical Meeting on Surveillance of Antimicrobial Resistance for Local and Global Action, 27 28 April 2017, Stockholm, Sweden

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Annex 2. Agenda

Programme

WEDNESDAY – APRIL 26

19.30–20.30 **Registration (hotel lobby at Scandic Continental Hotel)**

20.00–22.00 **Welcome reception (2nd floor at Scandic Continental Hotel)**

THURSDAY – APRIL 27

Moderator Dr Ann Fernholm

08.00–09.00 **Registration (3rd floor at Scandic Continental Hotel)**

SECTION I: AMR and global surveillance - where are we now?

09.00–9.30 **Welcome and introduction**
Dr Anders Tegnell, Acting–Director General, Public Health Agency of Sweden (PHAS)
Dr Marc Sprenger, Director, Antimicrobial Resistance Secretariat, WHO

Updates on the status of AMR surveillance work ranging from national to global level, with particular focus on implementation of GLASS.

09.30–10.00 **AMR at the international level - recent actions**
Ms Annika Söder, State Secretary for Foreign Affairs, Sweden

10.00–10.30 **Coffee break**

10.30–10.50 **GLASS Early Implementation - overview and update**
Dr Carmem L. Pessoa-Silva, Team lead, AMR Secretariat, WHO

10.50–11.20 **Examples of countries' progress with national AMR surveillance**

SECTION II: Next steps along the GLASS implementation road map

Examples of support provided by WHO collaborators for GLASS implementation as well as of recent development of GLASS components, followed by break-out sessions.

11.20-12.20 **– NorthernGLASS**
Dr Johan Struwe, Senior Expert, PHAS

– The WHO CC Network - support to GLASS implementation
Dr Malin Grape, Head of Unit for Antibiotics and Infection Control, PHAS

– GLASS Framework for emerging AMR reporting and risk assessment
Dr Sergey Eremin, Medical Officer, AMR Secretariat, WHO

12.20–12.30 **Instructions for break-out sessions**

THURSDAY – APRIL 27, continued

12.30–13.30	**Lunch**
13.30–14.45	**Break-out session 1** Sharing of experiences, expectations and needs regarding AMR surveillance and GLASS implementation, to provide feedback to WHO and discuss next steps.
14.45–15.45	**Coffee break and poster session**
15.45–17.00	**Break-out session 2** Provide feedback on the GLASS Framework for emerging AMR reporting and risk assessment to advise procedures for reporting of AMR data.
17.00–17.15	**Meeting adjourns**
19.00	**Conference dinner at Stockholm City Hall**

FRIDAY – APRIL 28

SECTION III: Summary of break-out discussions and way forward

Participants' feedback and discussions on expected next steps and support available for further development of national AMR surveillance systems and GLASS implementation.

09.00–10.00	**Reporting back from break-out sessions and discussion** Chair: Prof Gunnar Simonsen, Head of Norwegian Organization for Surveillance of Resistant Microorganisms
10.00–10.30	**Coffee break**
10.30–11.45	**Reporting back from break-out sessions and discussion, continued**
11.45–12.00	**Group photo**
12.00–12.40	**Meeting summary** Dr Carmem L. Pessoa-Silva, Team lead, AMR Secretariat, WHO **Final statement** Mr Gabriel Wikström, Minister for Health Care, Public Health and Sport, Sweden **Meeting closes** Dr Johan Carlson, Director-General, PHAS
12.40–13.30	**Lunch**