

Executive Digest

An innovative approach to tackle
Antimicrobial Resistance

An innovative approach to tackle Antimicrobial Resistance

Relevance of this topic to Digital Health

It is estimated that by 2050, 10 million people could die each year due to antimicrobial resistance (AMR). Indeed, recent data based on predictive statistical models estimated 4.95 million deaths worldwide associated with bacterial AMR in 2019, including 1.27 million deaths attributable to bacterial AMR. At the regional level, all-age death rate attributable to resistance were highest in western sub-Saharan Africa, at 27.3 deaths per 100 000, and lowest in Australasia, at 6.5 deaths per 100 000. Lower respiratory infections accounted for more than 1.5 million deaths associated with resistance in 2019, making it the most burdensome infectious syndrome.

AMR occurs when bacteria, viruses, fungi and parasites no longer respond to medications, making common infections more difficult to treat and increasing the risk of the disease spreading, resulting in serious illness and death. Antimicrobials include antibiotics, antivirals, antifungals, and antiparasitics. If left unchecked, antimicrobial resistance can jeopardize society's health benefits, as it hinders the ability to perform common surgical procedures and other medical treatments, and pose a threat to health security, negatively impacting trade and damaging economies. In the absence of coordinated and large-scale multilevel actions, with global-level, regional-level, and country level strategies to attenuate the emergence and spread of AMR, there is the risk of moving towards the so-called "post-antibiotic era" in which even minor infections can lead to death.

The contrast to AMR is grounded on data sharing across sectors (typically human and veterinary medicine, agriculture, and environmental monitoring) as well as on the implementation of innovative and advanced and faster approaches for the detection of infections and of environmental contamination. This sort of implementation requires not just a technological deployment, but also a collaborative effort from multiple health care professionals that have a significant role to play in addressing this issue a complex problem that requires institutional buy in and active participation and dialogue among these actors to pursue the desired outcomes and impact.

Digital technologies play an extremely relevant role in effectively tackling AMR, considering the existence of a dynamic market with available solutions, a growing interest in tackling this issue, emergent technologies and approaches, that together present a common interest from the demand-side and the supply of solutions, that:

- provide a number of validated tools to strengthen the quality-of-care processes that contribute to preventing AMR not only in the hospitals but also in community care
- support surveillance ensuring data integration and sharing across sectors and within health care systems, including for clinical bacteriology laboratories
- contribute to improving appropriateness of antimicrobial prescriptions and usage
- support adequate customisation of training content to be provided through antimicrobial stewardship programs
- provide advanced tools for environmental monitoring (air, water, soil, surfaces)
- support the development of innovative vaccination campaigns targeted to specific audiences to improve adherence
- improve the data source bias due to the combination and standardisation of data from a wide variety of providers that pose coding challenges due to multiple causes of death and to hospital discharge data

All these features and incentives for technology to enable new solutions to a complex and evolving challenge as AMR seldom involve tackling more than a single solution, but rather a holistic approach.

Keywords

Antimicrobial Resistance, AMR, Innovation

Current focus of policy, legislation, standards, emerging practices in this landscape

AMR is a global challenge and as such it takes advantage of a Global Action Plan aimed at ensuring harmonized action on a global scale to avoid systematic misuse and overuse of antimicrobial products in human medicine and food production. Several manuals and plans have since been developed, to stimulate coordinated and consistent action to tackle AMR, and to be integrated in the national development agenda and sectoral strategies and budgets across sectors and stakeholders. Also, costing and budgeting tools have been made available to facilitate the implementation of national action plans on AMR, eventually leveraging additional funding, as well as tools supporting the implementation of national action plans.

Finally, a Roadmap on antimicrobial resistance for the WHO European Region 2023–2030 has been recently made available. It is organised around an "AMR Compass" that identifies five action areas, and six enablers

based on a combination of the best available evidence and expert opinion. Such a roadmap can be adapted to country-specific national contexts. Each action area and enabler has a set of high-impact interventions that are intended as practical and adaptable tools for countries to convene all relevant national AMR stakeholders, reach consensus on their priorities and inform the investment cases for action on AMR. Health ministers and delegates from WHO/Europe's 53 Member States endorsed the new European Roadmap on AMR, which supports countries in the WHO European Region to identify, prioritise and implement high-impact interventions to tackle AMR. The commitment was undertaken by ministers and delegates during the meeting held on 26 October 2023 at the 73rd session of the WHO Regional Committee for Europe. The roadmap sets out 53 interventions, from which countries can make selections according to national context, public health priorities and cultural considerations. The interventions include traditional measures, such as improving hygiene and vaccination, and innovative approaches including digital solutions and whole genome sampling to improve environmental surveillance.

Implications for digital health uptake

The international perspective to be translated into planning and adequate financing measures refers at AMR from a 'One Health' perspective, calling for a whole-of-government approach, where all sectors are required to revise their ways of working and experimenting with new approaches at all levels, from global to local.

Taking into account the whole health system, the roadmap stimulates broad partnerships and alliances around a person-centred approach.

The successful implementation of the roadmap relies on data sharing between sectors and organisations, considering the need for policies that span multiple sectors to generate better data, deepen scientific understanding and get ahead of current and future threats.

The need to integrate public health considerations into environmental and developmental policies to improve community health and resilience in the future builds on the transfer of technologies and good practices across sectors, in the framework of innovation ecosystems.

Developers

- The silent pandemic of antimicrobial resistance requires the development of innovative multidisciplinary research-based digital solutions that addresses stewardship and prevention: leveraging big data, adapting machine learning approaches and algorithms, developing new rapid detection kits for point of care diagnostics and digital media are all possible targets for developers to create new market opportunities while addressing the AMR challenge.

Enabling Actors

- The global increase of AMR poses a threat not only to human health but also to the achievement of sustainable development goals, thus highlighting the need to engage a broader community in the one health approach identified to effectively tackle AMR through mutually reinforcing the actions directed towards the specific domains of the one health approach. Capacity building needs to be addressed towards ordinary people, public authorities and budgeting decision makers, healthcare settings, research, industry, and the economy.

Payers and procurers

- The improvement of differences on AMR between and within the Member States depends upon the access to dedicated resources and expertise, primarily in the human health and veterinary medicine sectors. Successful good practices have been progressing towards their ambitious targets thanks to the support of comprehensive data collection and surveillance systems. The combination of the latter with other measures such as antimicrobial stewardship has demonstrated rapid results in effectively reducing both AMR prevalence and excessive consumption of antimicrobials for human and veterinary use. Integrated digital solutions supporting national AMR platforms to design, implement and monitor national action plans are of paramount relevance, as they need also to allow integration with multiple health dataflows from the local and regional levels, including information deriving from advanced sensors for environmental monitoring (air, water, soil, surfaces) and point of care testing. Allocation of funding from public bodies in the public health sector is envisioned in the framework of the role and funding of the ECDC, particularly the ARHAI (Antimicrobial Resistance and Healthcare-Associated Infections) programme. The latter focuses on the establishment of a robust evidence base for practice and building mechanisms for monitoring key priority areas, connecting with the wider health and social care and public health system, and collaborating with key delivery partners including health boards, care providers and other appointed national bodies.

Users

- Smart approaches are envisioned to inform patients and agricultural users, and educate and train prescribers, pharmacists and other health professionals about rational use and available alternatives to antibiotics and are urgently needed.

Remaining gaps and issues

Efforts to build laboratory infrastructure are paramount to addressing the large and universal burden of AMR, by improving the management of individual patients and the quality of data in local and global AMR surveillance and bolstering national AMR plans of action.

Equally relevant is to ensure that large international databases integrate all information and tools dedicated to AMR, and access primary and secondary data sources for public health purposes.

In particular, it is important to:

- identify harmonised quality standards in EU-wide curricula for health professionals in AMR, which highlight the risks related to inappropriate prescribing, dosage, use, and disposal
- establish multidisciplinary common antimicrobial stewardship programmes
- identify new diagnostic tools, including rapid diagnostic tests
- introduce electronic decision support systems in the subscribing of antibiotics and boost laboratory capacities in early detection of AMR, enabling safety issues and overuse and abuse of antibiotics to be highlighted

Date of creation or latest update

Date: 06 September 2024

Lead Authors: Maddalena Illario, Vincenzo De Luca (Department of Public Health, Federico II University of Naples), Olman Alonso Elizondo Cordero (Agencia de Calidad y Evaluación Sanitarias de Cataluña)

Legislative, regulatory, policy or standardisation instrument, or good practice

Title

RaDAR PPI

Instrument status

Ongoing procurement of innovation collaborative cross-border procedure

Publisher or source

RaDAR PPI project, COSME Programme of the European Union, Grant Agreement N° 101036228

URL or reference

<https://radar-ppi.com/>

Summary of the instrument

The RaDAR project aims to address the European urgent need of a rapid detection and effective infection control system for antimicrobial resistance (AMR) through the implementation of a value-based cross-border collaborative procurement of innovative solutions. RaDAR is composed of a cross-border Buyers Group of public organisations from 3 different European countries (France, Spain and Italy). They collaborate as early adopters of innovative solutions to address common needs in facing the challenge of AMR. The RaDAR project brings together healthcare buyers to undertake a collaborative procurement of rapid AMR detection and control systems.

The collaborative procurement of innovation as an instrument to tackle a demand-driven challenge like AMR demands that the expected results in solving the clinical demands of a complex issue, that involves several different types of stakeholders, and that is bound to follow some local circumstances, both from the clinical setting, but also from the technological and legal adequacy of each of the buying institutions.

The collaborative effort from different types of buyers, health innovation ecosystems and legal frameworks, provides an example on how to align common elements on this fight against AMR, but also establishes a systematic approach to face this issue with a value-based procurement of innovation that involves the pursuing a long term impact by using the theory of change to define the outcomes, outputs, activities that are going to scope the object of the contract.

Systematically applying the desired results in a clinical setting for a rapid detection of AMR into the RaDAR PPI procedure

RaDAR aims to establish a new framework for an innovative solution to provide not just the best available technology, but also the transformation that each buyer institution requires within their multidisciplinary teams of professionals to align them and allow a cultural shift towards working together in a common global objective.

The RaDAR PPI is using a systematic approach to achieve the highest possible expected results of the procurement of innovation procedure. Starting from the unmet need and the clinical demand definition,

and then moving to assess that the innovative solution is effective in responding to the detected problem(s), there is a need for clarity on the expected pathway. The challenge-agnostic methodology designed in the EU funded PiPPi project (GA:826157) deliverable D5.4. A core set of outcome indicators provides a structured process to address the value that the intervention desired in a procurement of innovation should have, for these five levels of actors involved: patient, health care professional, health care provider, health system and society.

From a comprehensive list of results agnostic to any given challenge, the assessment and consideration of which results will drive the PPI including the tender, the awarding and the monitoring. Moreover, it is also useful to improve and follow-up the adoption process of the innovative solution not only at short and mid-term, also in the long-term.

The relevant factor in this process is to start with the results that are relevant to the patient, but also consider the professionals involved in the AMR process, and the issues the health care provider faces when addressing this situation. The link between the health care providers and the payers reflects on the way the system approaches the coverage of this situation harmoniously. In a more global perspective, AMR is global issue that no individual health care provider can address on its own. It's rather a systemic challenge that not only affects humans, but also animals and the environment, which is described in the one-health approach. All these different actors approach the AMR problem from a different perspective.

Cross-border procurement of innovation as an instrument to allow different types of buyers and markets to align.

The demand-driven role in addressing the most compelling challenges in health care provision in society, and in a broader perspective, any given complex social challenge in our society, find a special vehicle in procurement of innovation as a structured way to amplify the desired long-term results. The common definition of a clinical need, and the adaptation of their own particularities in call for tender will evolve into the implementation of different contracts awarded to different types of innovative solutions. The results of these implementation process will provide evidence for future adopters in terms of the change management and the definition of the local specificities to consider similar approaches to tackle AMR in different clinical settings.

Implication for digital health stakeholders

The Buyers in the RaDAR PPI have interacted with local and external experts in trying to understand the clinical need, and in determining the value and impact to solve the problem of AMR in healthcare settings. This multilevel understanding and engagement have been translated into the expected value and roles of different stakeholders from the demand-side, but also imply a clear picture for the innovators in order to shirt and focus their innovative solutions to try to fit the desired impact of this intervention.

Patient-level results

An episode of AMR triggers a systemic response. To control it is the main objective. But even then, once controlled, the resistance may alter the scope of treatment that the patient may be administered, and that changes the entire patient journey. Each case represents a unique situation, and the local situation of where the patient is treated may vary from healthcare setting to another.

The awareness of citizens about AMR is generally low. Yet the implications to the health system and the implications that an informed citizen may have regarding the antibiotic use and personal health history, may provide a social trigger to look for systemic solutions for a global problem. Our experience during COVID-19 enhanced this awareness.

Healthcare professional-level results

Since COVID-19 healthcare professionals have experience an intense activity. This continuous effort and struggle have come at a cost, and while the system responded as well as it could, but several weaknesses were exposed. Is the system better prepared to face a similar situation in the future? It depends on several factors, and on several transformational elements that need to happen at different levels. Addressing the view of healthcare professionals and establishing a systemic response is in line with the RaDAR PPI approach.

Healthcare provider-level results

Just as professionals have struggled with the effects of COVID-19 in their day-to-day activities, and the accumulative effort they have put in, the institutions have also been affected by these dynamics. The need

for a more resilient provision of services became an unavoidable emergency scenario that responded to a pandemic. Collaborative efforts and alignment with different providers are a current state of affairs in the provision of health in universal health systems. New needs emerged. A social wound has left a scar.

Healthcare system-level results

The AMR problem is a health system issue. The COVID-19 pandemic placed a heavy burden in the coordinated efforts of health systems to attend to the highest emergency. The preparedness of the system and the capacity to respond to the challenge have put on the agenda how health systems need to act and collaborate among them, in order to increase the resilience and sustainability of our health systems. The adoption of procurement of innovation in the systemic level allows risk sharing mechanisms between public and private actors. Multistakeholder co-creation and coordination of the strategic issues that will evolve into drivers of the cultural change that our public bodies need to embark in to provide incentives and actively play a role.

Socio-economic-level results

The implications of AMR at the socio-economical level remind us of the issues we dealt with in the COVID-19 pandemic. The toll taken by the health and social systems; the economic implications of a global pandemic beat the worst-case scenarios we had developed. And the response of our society and health systems showed many levels of forced resilience in order to adapt to the highest challenge we had ever faced. Healthcare was in the centre of the agenda, as so was the implications and the relevance of our health and social systems. The impulse of collaboration at a global level gave us as a result the fastest development of a vaccine that allowed, with sound inequities in the access, a way to recuperate control over and start over the rest of the economic activities, and our way of life.

This represents a collective work to face a shared challenge: target prescription of antibiotics with the support of smart systems that provide professionals better tools. In wider sense, the vehicle of procurement of innovation provides a vehicle to respond to AMR challenge providing a chance for economic operators to adapt their value propositions to attend this global challenge as opportunity to lead the creation of a new market.

Innovators: SMEs and industry

The implication for the demand-side stakeholders determines the impact and value that the innovative proposals in the RaDAR PPI are meant to drive with the implementation of their innovative solution that aims to improve the rapid detection of AMR while also provide a smart solution to trigger a control response in a coordinated fashion among the different relevant actors needed.

With the awarding of the contracts, the change management proposal of those innovative proposals will end up generating some evidence in the process of deployment of new solutions that co-created through the implication and effort from both demand and supply. That initial evidence, will provide new pathways towards the transformation of fight against AMR.