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Antibiotic Prescription Practices among Healthcare Professionals in Ukraine

MAIN FINDINGS

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Acronyms

AMR – antimicrobial resistance

HCF – health care facility

WHO – World Health Organization

AMS – Antimicrobial Stewardship

MDR – multi-drug resistant

AWaRe – Access, Watch, Reserve

BCI – behavioural and cultural insights

PHC – Public Health Centre of the Ministry of Health of Ukraine

MOH – Ministry of Health

RCDC – Regional Centre for Disease Control

IPCD – infection prevention and control department

CDH – central district hospital

NAP – national action plan

ICD - International Classification of Diseases

ISO - International Organization for Standardization

Executive summary

Antimicrobial resistance (AMR) is a critical global health threat with the current direct health care costs associated with AMR at US\$ 66 billion per year. In regions enduring war, like Ukraine, AMR becomes an even more formidable challenge due to disrupted healthcare services, widespread misuse of antibiotics, and the influx of patients with infected wounds who have been treated at multiple hospitals before arriving at their current facility. Despite the severity of this issue, there is a notable lack of research focused on understanding AMR within the Ukrainian healthcare context, particularly regarding the behavior of antibiotic prescribers. This knowledge gap significantly hampers the development of effective interventions to combat AMR in the country.

The purpose of this report is to identify key barriers and facilitators to behavior change in antimicrobial prescribing among secondary healthcare physicians in Ukraine. The insights gained aim to inform more effective strategies as part of the National Action Plan on AMR.

Compliance with national guidelines – which are generally viewed by respondents as beneficial – is impeded by resource limitations and in some cases, perceived inconsistencies with international standards. There is a lack of up to date national recommendations for the treatment of many infectious diseases. According to interviews, physicians generally prescribe antibiotics based on patient diagnoses, national guidelines or standards, their own experience and knowledge, and laboratory test results, though access to laboratories varies among hospitals. Microbiological investigation capabilities are limited due to restricted laboratory hours and logistical challenges impacting the timely processing of samples, which in turn affects the effective use of microbiological data in guiding antibiotic prescriptions. Consumables for culture sampling are available in hospitals in the vast majority of cases, but occasionally patients have to buy test tubes or urine containers at their own expense. Despite EUCAST is legally approved methodology for bacteriological labs its introduced in few of them. Often bacteriological labs are understaffed, underequipped and lack of disposables according internal self-reports. Training for healthcare providers on antimicrobial stewardship is somewhat irregular, and access varies widely between facilities. Trainings and webinars on antimicrobial stewardships and infection prevention and control conducted by Ministry of health, Public health center and partners, but some providers have expressed a preference for in-person training over online formats. Effective management involves regular monitoring of compliance, the organization of training programs, and the establishment of roles such as clinical pharmacists and infection control department. However, management practices within hospitals are inconsistent, affecting adherence to guidelines and rational antibiotic prescribing. Procurement of medicines performed by hospitals by their own (pharmaceutical committee headed by management of

HCF). Bad and nearsighted decisions of medicines procurement can cause poor choice or lack of some antibacterials.

The ongoing war with the Russian Federation has further exacerbated the problem where battle-field wounds with complications after wound contaminations and treated in multiple facilities using different available medications without consistent documentation of given regimens. The influx of external humanitarian aid has occasionally negatively impacted antibiotic prescribing practices.

Despite these challenges, Ukrainian physicians are motivated by a commitment to professional excellence and the urgent need to address AMR. The report suggests several measures to enhance antimicrobial stewardship, including regular updates to clinical guidelines, standardized training programs, ensuring adequate procurement of antibiotics by HCF, and reinforcing laboratory capacity. Implementing robust audit and feedback mechanisms and strengthening management practices will also be critical.

Addressing AMR in Ukraine requires tackling systemic issues related to antibiotic availability, healthcare professional training, laboratory capacity, and management practices. The insights from this study underscore the need for continued support from development partners, including Norway, in combating AMR in Ukraine.

Introduction

Antimicrobial resistance (AMR) presents a global threat with an estimated current direct health care costs at US\$ 66 billion per year (0.7% of global health expenditures),¹ further worsened in countries facing armed conflicts and wars. According to a recently published systematic review, causes of antibiotic resistance increase in these contexts, including in Ukraine.² At the same time, AMR has been a challenge in Ukraine already prior to the full-scale invasion. According to the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) report covering data from 2013 - 2018, multidrug resistance in *K. pneumoniae* was widespread in the WHO European Region, particularly in countries in the southern and eastern parts of the Region, which reported 50% or higher resistance.

¹ McDonnell A, Countryman A, Laurence T, Gulliver S, Drake T, Edwards S, Kenny C, Lamberti O, Morton A, Shafira A, Smith R, Guzman J. (2024). – Forecasting the Fallout from AMR: Economic Impacts of Antimicrobial Resistance in Humans – A report from the EcoAMR series. Paris (France) and Washington, DC (United States of America): World Organisation for Animal Health and World Bank, <https://doi.org/10.20506/ecoAMR.3539>.

² Granata et al. 2024. “The impact of armed conflict on the development of global spread of antibiotic resistance: a systematic review. *Clin Microbiol Infect.* 2024 Jul;30(7):858-865. doi: 10.1016/j.cmi.2024.03.029. Epub 2024 Mar 29. PMID: 38556213.

Among other things, to address effectively AMR, it is vital to understand and change individual prescriber behavior. According to Charani et al's systematic review (2011),³ to be effective, antimicrobial prescribing interventions must be based on primary research into prescribers' behavioral intentions and tailored to the target audience. However, to date studies of this kind have not been carried out in Ukraine, although there are several important surveys providing useful analysis of antimicrobial consumption in Ukraine, such as GLASS-AMC.⁴ The main objective of the report was to identify key perceived barriers and facilitators to behavior change in antimicrobial prescribing among secondary health care physicians in Ukraine to provide a basis for future recommendations for designing effective interventions as part of the National Action Plan on AMR.

At the same time, the Public Health Center of Ukraine – country's main public body responsible for essential public health functions – has implemented a number of activities on AMR, like legal acts, national guidelines and educational programmes, in the past five years, some of which have been specifically designed to address behavioral factors among physicians.

In 2019, the Ukrainian government approved a National Action Plan to Combat Antimicrobial Resistance, requiring hospitals to enhance infection control and prevention practices, establish antimicrobial stewardship programs, and reduce unnecessary antimicrobial use. As part of this plan, number of important steps has been taken, including strengthening of control of the sale of antimicrobials by prescription and developing digital prescription (e-recipe).

An important stage in the development was the Order of the Ministry of Health of Ukraine dated 03.08.2021 No. 1614 "On the Organization of Infection Prevention and Infection Control in Health Care Facilities and Institutions / Facilities Providing Social Services / Social Protection of the Population". According to this document, each healthcare institution is obliged to establish an infection control department, which includes a pharmacist and other specialists who have allocated working time to implement infection prevention and control measures.

To regulate the issues of prescribing antimicrobial drugs for empirical therapy and perioperative prophylaxis, the Ministry of Health approved two important orders:

- No. 822 of 17.05.2022 "On Approval of the Standard "Parenteral Perioperative Antibiotic Prophylaxis"

³ Charani E et al. Behavior change strategies to influence antimicrobial prescribing in acute care: a systematic review. *Clin Infect Dis.* 2011 Oct;53(7):651-62. doi: 10.1093/cid/cir445. PMID: 21890770.

⁴ WHO Regional Office for Europe Antimicrobial Medicines Consumption (AMC) Network. AMC data 2022. Copenhagen: WHO Regional Office for Europe; 2024. Licence: CC BY-NC-SA 3.0 IGO

- No. 823 of 18.05.2022 "On Approval of the Standard of Medical Care "Rational Use of Antibacterial and Antifungal Drugs for Therapeutic and Prophylactic Purposes"

One of the main documents guiding the use of antibiotics in Ukraine is the Order of the Ministry of Health of Ukraine No. 1513 dated 23.08.2023 "On Approval of the Standard of Medical Care Rational Use of Antibacterial and Antifungal Drugs for Therapeutic and Prophylactic Purposes". The order regulates the principles of prescribing empirical antibiotic therapy and contains clear indicators of the quality of medical care and the prescription of antimicrobial drugs, making it possible to assess the extent to which a healthcare facility complies with the requirements of the current legislation. Currently, Order No. 1513 is the main regulatory document for prescribing empirical antibiotic therapy by doctors of any specialty, making it a key reference for identifying barriers to compliance with national standards.

In 2024, a new National Action Plan Combating Antimicrobial Resistance (NAP) was approved, which identified new directions and goals in overcoming antimicrobial resistance. Revision and improvement of the order No. 1513 is in the new NAP.

In parallel with the approval of regulatory acts, PHCU made significant efforts to raise awareness among physicians. With the support of its partners, many in-person and online trainings and seminars were organized, reaching a wide audience of healthcare professionals. In addition, online continuing professional development courses were developed and posted on PHCU platform: "Antimicrobial Resistance and Infection Prevention and Control, which provide access to quality educational information for all interested professionals.

Methods

This is a qualitative study, using in-depth interviews with physicians in secondary healthcare organizations. Interviews were conducted between June-December 2024. In total 36 interviews were conducted with physicians in regional centers and general district hospitals. Participants were selected to represent different specialties and departments (Table 1). In addition, to complement the primary data collected through interviews a review of the literature from selected European countries and armed conflict and war settings was conducted. However, the current brief is limited to description of findings from the interviews.

Table 1: Regions and specialties of interviewees

No.	Region	Physicians of HCFs in regional centres	Physicians of general HCFs in districts of the regions
1	Dnipropetrovsk Oblast	3	3
2	Kirovohrad Oblast	3	3
3	Lviv Oblast	3	3
4	Odesa Oblast	3	3
5	Chernihiv Oblast	3	3
6	Kyiv city	3	–
7	Kyiv Oblast	–	3
Total Ukraine		18	18
		36	

The interview tool was developed using existing implementation science theory on behavioral change, used in other studies on AMR stewardship programs⁵. Key national guidelines, including the standard of care “Quality Use of Antibacterials and Antifungals for Therapeutic and Prophylactic Purposes” No 1513 (see Box 1), were used when developing and analyzing the results of the interviews.

Ethical approval

The study protocol and tools were reviewed and approved by the Ethics Committee of the PHC of Ukraine (FWA #00030968) and WHO’s Ethical Review Committee. Before the interview, all respondents read the informed consent, and the interview was audio-recorded only after receiving the participant's consent. All data that could identify the study participants were removed during the data analysis.

Main findings

In this section, the brief summarizes main findings of in-depth interviews, organized by a thematic area.

⁵ Borek AJ et al. How can behavioural science contribute to qualitative research on antimicrobial stewardship in primary care?, *JAC-Antimicrobial Resistance*, Volume 4, Issue 1, February 2022, dlac007, <https://doi.org/10.1093/jacamr/dlac007>

Turner R et al. A qualitative interview study applying the COM-B model to explore how hospital-based trainers implement antimicrobial stewardship education and training in UK hospital-based care. *BMC Health Serv Res.* 2023 Jul 19;23(1):770. doi: 10.1186/s12913-023-09559-5.

Wojcik G et al. (2023). Improving antibiotic use in hospitals: development of a digital antibiotic review tracking toolkit (DARTT) using the behaviour change wheel. *Psychology & Health*, 39(11), 1635–1655. <https://doi.org/10.1080/08870446.2023.2182894>

Antibiotic prescription process

Physicians rely on patient diagnosis, medical history, and lab test results (e.g., complete blood count). Availability of certain lab tests (e.g., procalcitonin tests) varies significantly among healthcare facilities (HCFs). Most specialists try to sample material for culturing before each antibiotic prescription. Sampling material for culturing before empirical treatment is mandatory for secondary healthcare organizations according to the order of the Ministry of Health of Ukraine (MOH). Prescribing is based on current orders of MOH, local guidelines and personal experience.

Themes that affect antibiotic prescribing

Choice of Antibiotics:

- a. **Availability:** The availability of antibiotics in HCFs influences prescription decisions. While many reported that availability is not an issue, others reported critical situation, stating that they cannot provide medicinal products on a regular basis, or have a very limited range, e.g. 1-2 access, watch and reserve group medicinal products. One of the interviewees, reported that only cephalosporin group was available, which is of serious concern.

"The range of antibiotics in the hospital is a little limited. Sometimes only the cephalosporin group is available. That does happen sometimes. If a person is, for example, allergic to cephalosporins, or has an antibiotic susceptibility pattern (insensitivity to cephalosporins), unfortunately, this makes difficulties." (rural HCF, RS-31)

- b. **Quality:** Several respondents are concerned about the quality of antibiotics, especially domestic ones. There is a preference for foreign drugs over domestic ones due to this perceived quality differences, although many note that the quality of domestic drugs are improving.
- c. **Usage of near-expiry antibiotics:** There are instances where almost expired antibiotics are used instead of more suitable antibiotics to avoid wastage. In one instance, an interviewee reported that they had to use meropenem, which is a carbapenem antibacterial with a broad spectrum of activity that includes gram-negative, gram-positive, and anaerobic bacteria, indicated primarily for resistant infections caused by bacteria resistant to other drugs.⁴

⁴ Papich MG. 2016. "Meropenem" in Papich MG, eds. *Saunders Handbook of Veterinary Drugs* (Fourth Edition). Raleigh, North Carolina. Pages 495-497. Available at <https://doi.org/10.1016/B978-0-323-24485-5.00369-7>.



"After the COVID-19 pandemic, we had much Meropenem in stock in the region! It was prescribed every day. Take it, take it, take it! And you think that it may be expensive. Or maybe you need to take it? And you prescribe it to write it off. It is almost expired." (rural HCF, RA-34)

- d. **Paper-laden processes for reserve group antibiotics:** Antimicrobial stewardship specialist (e.g. clinical pharmacist) following the order of MOH introduces restrictive procedures of reserve group antimicrobials prescription to reduce their misuse. Responders perceived that prescribing reserve group antibiotics can involve a bureaucratic process (pre-authorization form). Filling out additional forms hinders the work of doctors, so sometimes the completion of this documentation is formal and does not affect the rationality of antibiotic prescription.

"I cannot confirm its (order) impact. At all. Only more paperwork appeared." (rural HCF, RT-28)

Knowledge and Training

- e. **Gaps in knowledge:** Most respondents expressed confidence in their knowledge of antibiotic prescription, but many specialists have noted that they observe a lack of knowledge among other specialists, e.g. colleagues of their HCF, physicians of other hospitals, and most often, among outpatient care providers. Several respondents have noted that older physicians with long-term work experience do not wish to raise their awareness, drawing on their expertise and experience.
- f. **Positive impact of training:** Almost all the respondents have noted that training is an integral part of a physician's effective work and professional development, and successfully conducted trainings can have a significant positive impact on physicians' practice.
- g. **Varying access to training:** Access to training is different for different HCFs, depending on the presence of the IPC department and the involvement of the HCF management in the process of personnel training.
- h. **Sporadic and not systematized training:** About half of responders were trained on antibiotic prescription or antibiotic resistance, but it was often occasionally and irregularly. Such training often includes short



lectures organized by IPC departments of HCFs during weekly morning meetings.

- i. **Insufficient opportunities for face-to-face learning and interaction:** Not all physicians have opportunity to participate in face-to-face educational events, some physicians are trained online on their own initiative. Most specialists have noted that it is very useful to be able to view online training events in a saved record, but some have noted better learning and desire for exchange of experience with other clinicians through more face-to-face events.

"You see, the national congress on antibacterial therapy ...is the most optimal form of bringing modern information to practicing doctors. Of course, [it] should be offline. Since online, well, the doctor cannot treat and study at the same time. This is unreal. And I believe that this way of learning is ineffective and purely formal in nature." (city HCF, CP-13)

- j. **Resources limited by language barriers:** Access to international academic resources is limited for some specialists by language barriers.

Communication:

- k. **Inter-professional consultation is common:** For consultation on antibiotic prescription, doctors most often turn to a clinical pharmacist/clinical pharmacist (if he/she is available in the HCF), related physicians (according to the patient's diagnosis: infectious disease scientists, surgeons, anaesthesiologists, etc.) or their colleagues in the relevant department. A minority of the physicians interviewed do not consult with other specialists at all, drawing on their expertise, experience, and reliable information sources. Some respondents have noted that they do not consult because they do not know a trustworthy specialist in their HCF.
- l. **Inter-regional consultation can be challenging:** Respondents working in small HCFs in rural districts often need to consult with physicians at the regional hospital, due to the lack of specialists and diagnostic tools, but, according to them, that this is not always convenient or pleasant. *"We need more help from colleagues of the regional hospital. They need to communicate with colleagues from different regions in a*



non-judgemental manner. They set up as experts and treat everyone like dirt. It is very unpleasant.” (rural HCF, RS-23)

- m. **Clinical pharmacists are useful:** Several respondents have noted that the activities of a clinical pharmacist in the HCF are useful for them, simplifying the antibiotic prescription process, monitoring current prescriptions and periodic personnel training, creating cumulative antibiotic susceptibility patterns, which, according to many respondents, is very useful for a practical concept of antibiotic resistance.
- n. **Varying access to infection control department and clinical pharmacist:** Some specialists do not have an infection control department and clinical pharmacist, this is especially common in HCFs located outside cities. Some respondents have noted that they do not know whether such a specialist is available in the institution, and some respondents have expressed distrust of this position, considering it formal. One respondent has noted that in their HCF the clinical pharmacist position is held by a surgeon who works part-time, which puts certain obstacles in antibiotic prescription. In another facility, this position is held by a trained recent graduate, but senior colleagues do not consider his/her opinion to be competent.
- o. **Minimal influence from pharmaceutical sales representatives:** Impact has decreased in hospitals due to centralized procurement, but respondents note that it remains significant in outpatient settings.

Microbiological investigations

- p. **Limited laboratory capacity:** The main limitation of culturing is the limited laboratory hours, e.g. only in the day-time and only on weekdays. Small HCFs located in rural districts do not have in-house laboratories which significantly extends laboratory turnaround time. Some specialists have expressed concern about the quality of culturing due to resource constraints, e.g. laboratories cannot afford to test sensitivity to all necessary antibiotics. Some respondents explain that the results of bacteriological tests are not always used because the results take too long. By the time results are received, the antibiotic therapy is already over, and the patient can be discharged from hospital. But some respondents have noted that the quality and speed of testing

have improved recently, which may be due to the procurement of new equipment for the bacteriological laboratory or increased staffing.

- q. **Logistics challenges:** Some respondents have noted that they struggle with the logistics process of samples from the patient to the laboratory, e.g. improper and long-term storage in the department, due to the failure to deliver the material to the laboratory in very short order.
- r. **Improper sampling:** Some physicians also have noted that they have had questionable results of cultures due to improper culture sampling.
- s. **Occasional lack of microbiological sampling equipment:** Consumables for culture sampling are available in HCFs in the vast majority of cases, but occasionally patients have to buy test tubes or urine containers at their own expense.

"There are containers for wound sampling. But there are no containers for urine." (rural HCF, RU-33)

"Yes. In most cases, the patient buys the tubes themselves." (city HCF, CG-03)

Compliance with national guidelines

- a. Overall, the order is perceived as having a useful role with some facilities having developed several standard operating procedures (SOPs) to help with implementation. However, some implied that there were many SOPs being developed in short period of time and hence, difficult to keep track of.
- b. Also, some perceived that compliance with the Order could be challenging because some points are differed in its recommendations with international guidelines. This points to the need to further work with providers and continue work with clinical guidelines development process, supported earlier among other international partners.

"We have patients with urological disorders in our practice. And according to all treatment protocols, we start with levofloxacin. But according to Order No. 1513, levofloxacin is a reserve group

antibiotic. A dilemma arises. According to all conferences and guidelines, levofloxacin must be used. And according to Order No. 1513, it cannot be used. How can we replace it? Probably, we cannot. That is, levofloxacin must be prescribed. Although it is a reserve group antibiotic.” (rural HCF, RS-20)

- c. Practical considerations of having sufficient staff, functioning laboratories, availability of some of the antibiotics were also mentioned as important factors in improving compliance with the Order.

“If there is no antibiotic in stock and e.g. in a hospital, and low-income or insolvent patients are admitted, I prescribe available drugs. That is, when we have nothing but ceftriaxone, I prescribe it.” (rural HCF, RT-21)

- d. At the same time, respondents noted positive changes in
- improved provision of HCFs with antibacterial drugs
 - a decreased number and duration of antibiotic prescriptions
 - improved quality of bacteriological testing and increased testing capacity due to the procurement of new equipment and consumables for laboratories and an increased number of cultures conducted
 - the rejection of the intramuscular administration of antibiotics and a change for oral drugs.

- t. **Work overload can reduce compliance:** It has also been noted that antibiotic prescription is affected by task overload, which may be associated with an increased number of urgent patients due to hostilities, or with a shortage of skilled healthcare professionals, especially in rural districts.

“ I was treating a lot of wounded people, both military and civilians, a lot. And the workload was such that the prescription of medications was automatic, it happened regularly, and it was very difficult to talk about any ... we had no time to rest a little. And this is one of the main problems of such multidisciplinary, powerful hospitals. Doctors work beyond the norms, beyond their physical capabilities. These violations are not always reflected in the report

cards, in the schedules. In most cases, it is not quite formalized, but it is there, and it is a systemic problem." (city HCF, CP-13)

Management

- u. **Varying degree of inspections:** In general, respondents note that control over prescriptions is very important, and regular inspections are effective in controlling irrational antibiotic prescription. Regular inspections were reported to vary significantly in frequency and scope.
- v. **Role of management:** Physicians see the role of the management of HCFs regarding effective antibiotic prescription in monitoring compliance with orders, organizing training, creating the position of clinical pharmacist and infection control department, and developing internal regulatory documents. Some respondents have noted that they currently do not observe considerable efforts by the hospital management to improve antibiotic prescription practices and control antibiotic resistance. At the same time, a trend towards young personnel as managers in the HCF has been noted, which is positively assessed by the interviewed specialists.

Impact of recent events

- w. **Full-scale invasion of Ukraine:**
 - **Not all areas affected:** Some specialists did not notice any changes in the antibiotic prescription practices.
 - **Unpredictable flow of patients, which may impact how and what is prescribed:** Respondents working in HCFs located close to action areas, and providing emergency medical care, experienced a high workload because they delivered care to the population affected by the war.
"This month we may have fewer patients, next month we may have more patients. That is almost unpredictable. We have a lot of internally displaced persons. The hostilities continue. Our hospital is at the crossroads. Patients may be evacuated from a front-line city to us." (rural HCF, RS-20)
 - **Increased use of antibiotics due to war injuries:** Surgeons and intensive care providers noted an increase in number of patients with primary infected wounds, who received several

antibacterials during the stages of casualty evacuation from action areas, which, in their opinion, were often prescribed inappropriately. There were also difficulties with lack of full information on what the patient received, basis for determining a specific antibiotic, frequency of administration prior to patient's arrival to this particular facility.

"When soldiers are admitted, they have catheters with a note "ceftriaxone". That is, it has been injected. And we have no information: frequency of injections, administration site. We see a note "ceftriaxone, 6 PM". We do not know the number of injections (1-2 times). The situation arises: what can we do with him?" (rural HCF, RS-20)

- **Humanitarian aid can have unintended consequences:** In small hospitals outside regional centres, the provision of antibiotics as part of international humanitarian aid had a significant impact on antibiotic prescription, which was not always assessed by respondents as a positive impact.
"Since the beginning of the war, we have experienced humanitarian aid. Without proper certificates: just the way it is! It is scary." (rural HCF, RA-34)

x. COVID-19 pandemic

- **Increased AMR due to inappropriate antibiotic use:**
Respondents claimed that the COVID-19 pandemic had a very negative impact on antibiotic resistance, due to the fact that antibiotics were used massively and uncontrollably, including reserve group drugs. According to respondents, this led to a significant increase of the sensitivity of microorganisms to many popular antibiotics.
- **Positive impact on IPC:** Some specialists noted the positive impact of the pandemic on the practices of using personal protective equipment, hand hygiene, and preventing the spread of infections within departments.

Motivation for learning about antimicrobial stewardship

- y. **Professional drive:** Physicians are motivated by the desire to be professional, to achieve better treatment results, to be updates, and to meet the standards of care of other countries.
- z. **Reduce the spread of AMR:** All respondents believe that antibiotic resistance is a critical and contemporary issue in Ukraine and worldwide. They are concerned about the possible ineffectiveness of antibiotic treatment among patients due to AMR. Most specialists noted an increased number of cases of AMR in recent years, some respondents were concerned about cases of multiple-antibiotic resistance in patients under the age of 25.

Opportunities for improvement antimicrobial stewardship in Ukraine

- aa. Physicians gave the following answers:
 - update the Orders on a regular basis
 - develop up-to-date treatment protocols for each ICD code in accordance with the new Orders
 - limit the population's access to antibiotics by stopping self-prescription of antibiotics and free access to them in pharmacies.
 - improve the access of antibiotics in HCFs
 - provide bacteriological laboratories with modern equipment and consumables
 - ensure high-quality training according to modern international standards.

Main conclusions and preliminary recommendations

The results of the study can be summarized as follows:

- The availability of antibiotics in hospitals varies between HCFs, but the overall impression from interviews is that it has improved over the past few years. However, there is a shortage of certain reserve drugs and oral forms of antibiotics, and sometimes excess of certain antibiotics that need to be disposed of.
- Effective management in HCF plays a critical role in ensuring adherence to guidelines and improving antibiotic prescribing practices, but there is a varying degree of support from HCF management.
- While many physicians are confident in their own knowledge of antibiotic prescribing, they report significant gaps in knowledge among colleagues.



- In-place training is often irregular and not systematically incorporated into professional development. Access to in-place training and training educational event organized by PHC, universities is varies.
- Laboratory capacity is limited, especially in rural areas, with delays in test results as the main problem. Other challenges include lack of testing equipment, inadequate antimicrobial susceptibility testing quality and long transportation time to the laboratories. This affects the ability to use microbiological results effectively in guiding antibiotic prescriptions.
- National guidelines on antibiotic prescribing are widely regarded as beneficial, but compliance is hindered by insufficient resources (e.g., lack of clinical pharmacists, infection control departments, adequate antimicrobials procurements, and microbiological laboratory capacity).
- The Russian invasion of Ukraine has increased the use of antibiotics due to war injuries, with concerns about inappropriate antibiotic use during casualty and medical evacuation.
- The COVID-19 pandemic exacerbated antimicrobial resistance (AMR) due to inappropriate use of antibiotics⁶, but reportedly positively impacted on the awareness and implementation some infection prevention control practices.

Based on the study findings described above, some tentative recommendations are provided below. These, however, need to be further discussed with stakeholders within the country and further examined, using evidence from other similar contexts.

Increase audit and feedback:

- Implement programs for internal and external monitoring of healthcare facilities on infection prevention and control, as well as an antimicrobial stewardship.
- Provide all hospitals with skilled clinical pharmacists authorized to audit and control the use of antibiotics in the HCF, in accordance with national guidelines.

Enhance training

- Implement ongoing in-place training for healthcare professionals on controlling antibiotic resistance. Such training must be standardized for all healthcare facilities, emphasizing the importance of adhering to the principles of effective antibiotic prescription. Also conduct such educational events

⁵ WHO Regional Office for Europe Antimicrobial Medicines Consumption (AMC) Network. AMC data 2020–2021. Copenhagen: WHO Regional Office for Europe; 2023. Licence: CC BY-NC-SA 3.0 IGO

(courses, seminars, webinars, congresses, etc) conducted by experts (MOH, PHC, partners, medical universities) including both online and in-person.

Improve antibiotic availability:

- Ensure a adequate procurement in HCF of sufficient range of antibacterials, including different groups and pharmaceutical forms in any hospitals, which will ensure compliance with industry standards and improve the quality of treatment.

Strengthen laboratory capacity:

- Ensure adhere to bacteriological laboratories meet the requirements of ISO 15189:2022 standard, provide equipment, consumables and personnel in accordance with the needs of the health care facility. This is a key element that affects the effective antibiotic prescription in Ukrainian hospitals. Improving this component may increase the level of compliance with the standard of care, approved by Order of the MoH of Ukraine No. 1513.
- Optimize the processes related to the logistics and transfer of biological samples for bacteriological testing for health care facilities that do not have their own bacteriological laboratory.

Increase compliance with national guidelines:

- Ensure further improvement of national guidelines by creating working groups to review and prepare national guidelines of care of communicable diseases.
- Introduce the practice of creating and using cumulative antibiotic susceptibility patterns, which can positively affect the understanding of antibiotic resistance by healthcare professionals and improve the practice of effective antibiotic prescription.
- Implement a system of local epidemiological surveillance on AMR in order to assess their prevalence at all levels of health care delivery.
- Conduct following-up research on the impact of the implemented changes in infection control on the practice of prescribing antibiotics among healthcare providers and the level of antibiotic resistance in Ukraine.

Increase the motivation of healthcare professionals

- Management of HCF should prioritize AMR and create effective operational schedules with an equal distribution of workload and rewarding for overtime, both for physicians, nurses, and laboratory assistants, which will increase the motivation of healthcare professionals.