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Quality, availability and suitability of antimicrobial stewardship guidance: a multinational qualitative study

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Background: Antimicrobial stewardship (AMS) programmes are established across the world to treat infections efficiently, prioritize patient safety, and reduce the emergence of antimicrobial resistance. One of the core elements of AMS programmes is guidance to support and direct physicians in making efficient, safe and optimal decisions when prescribing antibiotics. To optimize and tailor AMS, we need a better understanding of prescribing physicians' experience with AMS guidance.

Objectives: To explore the prescribing physicians' user experience, needs and targeted improvements of AMS guidance in hospital settings.

Methods: Semi-structured interviews were conducted with 36 prescribing physicians/AMS guidance users from hospital settings in Canada, Germany, Israel, Latvia, Norway and Sweden as a part of the international PILGRIM trial. A socioecological model was applied as an overarching conceptual framework for the study.

Results: Research participants were seeking more AMS guidance than is currently available to them. The most important aspects and targets for improvement of AMS guidance were: (i) quality of guidelines; (ii) availability of infectious diseases specialists; and (iii) suitability of AMS guidance to department context.

Conclusions: Achieving prudent antibiotic use not only depends on individual and collective levels of commitment to follow AMS guidance but also on the quality, availability and suitability of the guidance itself. More substantial commitment from stakeholders is needed to allocate the required resources for delivering high-quality, available and relevant AMS guidance to make sure that the prescribers' AMS needs are met.

Introduction

Antimicrobial resistance (AMR) has been declared as one of the global health and development threats.[1] It is estimated that in 2019 almost 5 million deaths were associated with bacterial AMR.[2] Factors driving AMR are highly complex and multisectoral; however, antibiotic overuse and misuse are identified as some of the key drivers of the global threat.[3,4] In response, hospitals have implemented antimicrobial stewardship (AMS) programmes as an essential strategy to effectively treat infections, prioritize patient safety, and mitigate the emergence of AMR.[5]

To encourage the appropriate and effective use of antibiotics, one of the fundamental requirements of AMS programmes is AMS guidance to support, direct and help the prescribing physicians to make prudent antibiotic decisions. AMS guidance can be provided in different forms, such as locally adapted guidelines for infection management or AMS expert consultations.[6,7] A significant number of research and practical efforts have been directed towards improving prescribing physicians' compliance with AMS guidance, particularly antibiotic guidelines.[8–10] However, little research has addressed how quality of guidance, content and contextual factors influence uptake.[11]

The lack of analysis of AMS guidance could result in a conceptual 'blind spot' and a misleading portrayal of AMS guidance as an obvious, unproblematic policy instrument that simply needs implementation and compliance. AMR policies may carry embedded inequalities and uncertainties, for example neocolonial frameworks may underpin AMR interventions.[12] Most impact assessments of AMS programmes focus on structural, procedural and outcome metrics, with the assumption that these will lead to gradual policy improvements. However, these often lack detailed insights, especially from programme users.[13,14] For AMS guidance to be usable and useful and have sustainable uptake, it is imperative to prioritize the understanding and optimization of the user experience as a foundational component.[15] Insights and evidence rooted in understanding of real-life experience are also crucial when developing and implementing AMS activities, such as different forms of guidance, in a context-specific manner.[16–19]

Based on qualitative interview data from six countries, this study provides insights into prescribing physicians' AMS user experience, particularly what the most important aspects of AMS guidance are. Undertaking the study across various countries presented a unique opportunity to identify key aspects and needs of AMS guidance that should be incorporated in its further advancement. We argue that achieving prudent antibiotic use not only depends on individual and collective levels of commitment to follow AMS guidance but also on the quality, availability and suitability of guidance itself.

Methods

Conceptual framework

We applied a socioecological model as an overarching conceptual framework for the study. The socioecological model has been broadly utilized in public health research to study such complex phenomena as violence prevention,[20] HIV prevention[21] and AMR prevention,[22,23] including a One Health perspective.[24] The social ecological framework offers to conceptualize antibiotic use as a multilayered, dynamic process where interplay between individual-, interpersonal-, institutional- and system-level factors shape antimicrobial decision practices.[25]

Study design

This study used a qualitative interview design utilizing semi-structured interviews with physicians involved in antimicrobial decision-making in hospitals in Canada, Germany, Israel, Latvia, Norway and Sweden. The study was a part of the international PILGRIM trial (Impact of Prescription Quality, Infection Control and Antimicrobial Stewardship on Gut Microbiota Domination by Healthcare-Associated Pathogens, NCT03765528). The development of the interview plan was guided by the conceptual framework. The interview plan therefore focused on questions that explored: the context of the research participant's work experience; the departmental and institutional context in which antimicrobial decisions are made; and the interpersonal context of antibiotic decision-making practices.

Recruitment and data collection

Research participants were recruited by local research teams from hospital departments with an active AMS profile: collaborative research; and/or work relations regarding various AMS activities.

Data collection took place between July 2019 and March 2022. The COVID-19 pandemic played a major role during the data collection process as local research teams, consisting of infectious disease (ID) specialists, were heavily involved in managing and organizing measures to tackle the pandemic in their hospitals. In multiple study sites, all research activities were halted during the first peaks of the pandemic.

Semi-structured interviews were carried out by one researcher using either an online (Zoom, San José, USA) or face-to-face interview format. Each interview lasted 30–35 min and was audio-recorded. An Interview plan (available as Supplementary data at *JAC-AMR* Online)) was used to guide the interview process. Interview questions were piloted with four research participants and further used with minor adjustments.

Settings

All study sites were publicly funded, city-based university hospitals with established AMS programmes, resources and personnel. AMS programmes consisted of such elements as guidelines, various specialists' consultations and reviews (e.g. ID specialist, pharmacist, laboratory doctor), restricted antibiotic access policy, monitoring of AMR and antibiotic use and other activities.

Participants

Study participants included prescribing physicians from six countries, recruited from clinical departments with an active AMS profile and experience of engaging with AMS guidance when making antibiotic decisions. Most of the research participants were physicians from internal medicine departments (e.g. oncology, haematology); participants from surgical departments were less well represented.

Data analysis

The interview recordings were transcribed, and all identifiable details were anonymized and removed. All transcribed data were uploaded onto the qualitative data software Atlas.ti (ATLAS.ti Scientific Software Development GmbH, Germany) for coding, management and analysis. Analysis was organized as a four-step process. Firstly, a deductive coding process was performed by identifying individual-, interpersonal-, departmental- and system-level factors shaping the practices of antibiotic use. Secondly, drawing on this coded data, we focused on codes specifically pertaining to AMS guidance. Thirdly, we compared this theme of codes among (i) study sites and (ii) across various levels of influence according to the conceptual framework. Fourthly, we identified the three most important aspects of AMS guidance that were shared across all study sites.

Ethics

The study was conducted in accordance with the Declaration of Helsinki. Prior to data collection, ethics approval was obtained by the research team at each study site: Research Institute-McGill University Health Centre, reference number 2019–4813 (Canada); Ethics Commission of the Faculty of Medicine of the University of Cologne, approval number 18-316; Ethics Committee at the Medical Faculty of the Eberhard Karls University and the University Hospital of Tübingen, reference number 966/2020BO2; and Ethics Committee of the Faculty of Medicine at the Goethe-University, reference number 108/19 (Germany); Rabin Medical Center Helsinki Committee, reference number 0822-18-RMC (Israel); Ethics committee for clinical research at Pauls Stradins Clinical University Hospital Development Society, approval number 300818-15L (Latvia); Regional Committees for Medical and Health Research Ethics, reference number ID 15719 (Norway); and Swedish Ethical Review Authority, reference number 2019-00653 (Sweden). Local research teams obtained written consent from each study participant.

Results

Participants

Thirty-six research participants took part in the study. In total, 3 physicians from Canada, 10 from Germany, 6 from Israel, 6 from Latvia, 8 from Norway and 3 from Sweden were included (Table 1). Although geographical location, contextual factors, hospital settings and AMS programmes varied between countries and hospitals, we found strong consensus across the study sites in terms of the most significant aspects and targets for improvement of AMS guidance.

Quality of guidelines

All research participants acknowledged the broad variety of antimicrobial treatment guidelines they employ when managing infection cases: international (e.g. IDSA), national, regional, hospital and departmental guidelines. However, quality issues were most often discussed in relation to antimicrobial guidelines. Two types of quality issues were distinguished. One aspect of quality pertained to the content of guidelines. Issues such as outdated, missing or unclear information were mentioned as quality problems that research participants encountered when using antibiotic guidelines. For instance, guidelines sometimes contained outdated treatment recommendations or did not align with the local epidemiology. Additionally, guidelines lacked clarity on specific aspects such as drug choice, drug combinations, administration routes, appropriate dosing and duration of treatment, i.e. when it was recommended to switch from IV to oral use of antibiotics. The most common challenge faced by research participants was the absence of clear criteria to follow when deciding to discontinue antibiotic treatment. Thus, there is a clear need to update available guidelines with criteria for the shortest effective duration of antimicrobial therapy. Research participants were seeking such guidelines that are as specific as possible.

> *[..] our hospital's standard [is] outdated at the moment and we lack capacity to keep it up to date and so in that case, people are looking at things that we would no more recommend. Y20, Germany*

Another aspect of quality distinguished by research participants was the format of guidelines. The guidelines that research participants used the most were in a user-friendly format, such as: a phone app [e.g. Strama Nationell (Sweden); Sanford Guide Mobile App (international)]; a Wikipedia-type online platform for infectious diseases management; or printable flowcharts for pocketbooks. However, research participants shared their experience that they did not use guidelines that were available in formats that were impractical, such as documents without a search function.

> *The quality system that is local in hospitals, where you can sort of access and see how you should do this, how you should do that. But it is a bit... Bit of a mess, basically. So, it's quite difficult to find the information that you're looking for in it. Y29, Norway*

Lack of financial and human resources of AMS programmes was often mentioned by research participants on what the underlying cause for such quality issues is.

Availability of ID specialists

Regular access to ID specialists regarding the investigation of possible infection, optimal antimicrobial therapy, and monitoring of treatment was perceived as the most valuable form of AMS guidance. In addition, ID specialists' consultations were also perceived as most flexible in the form of assistance, such as sharing decision-making with treating physicians, giving advice, and providing social support (e.g. providing a sense of safety or validation). Availability of ID specialists across study sites varied: (i) being part of clinical department staff; (ii) attached to specific departments/patient groups (e.g. immunocompromised, transplant units, intensive care); or (iii) ward round/bedside/phone consultations based on formal request, laboratory results (e.g. in case of MRSA), when authorizing the restricted antimicrobials or other standardized occasions. ID specialists' availability also varied from being accessible during working hours only to being available around the clock.

Table 1. Characteristics of research participants ($n = 36$)

Characteristic	*n*
Gender	
Female	19
Male	17
Working in hospital (years)	
<5	9
5–10	13
11–20	13
>20	1
Speciality	
Internal medicine	8
Oncology/haematology	12
ID	4
Geriatrics	1
Emergency medicine	1
Pulmonology	1
Cardiology	1
General surgery	3
Cardiac surgery	5

We have very, very good service from the infectious disease division at our hospital. They're excellent. They really provide very close follow-up. They're very available to our patients. […] It's a dedicated staff physician who covers our units where we have very complex patients and sometimes need to make decisions relatively quickly. Y11, Canada

Research participants acknowledged that having daily access to ID specialists' guidance had a significant impact on how they made decisions regarding antibiotic use.

But over the years, they've gotten more involved. So, now we discuss all infection patients with an infection specialist every day, so the infection specialists are more involved, we are more careful with what antibiotics we use. That's the big difference. Y9, Sweden

Other research participants with daily access to ID specialists highlighted the impact on a broader department culture. It resulted in the internalization of the values associated with preventing AMR and promoting prudent antibiotic use as a collective value, thus identifying with the cause as their own.

In my department, we usually, every day, tell each other about, 'How many patients are getting antibiotics?' 'How many patients have catheters?' 'How many patients have blood lines or something?' and, 'Which are necessary?' 'Which can be removed?' 'Which patients can we stop antibiotics for?' 'Which patients need this antibiotic?' So, we discuss it every day, for all patients, and these are the main ways. But about choosing an antibiotic, when we think about infection, we do have our infectious disease specialist, who helps us a lot. […] We all discuss it together, and we all think about it every day together. Y6, Israel

Most of the research participants also believed that ID consultations were not available enough. Study participants who had an ID specialist as part of the department staff, or dedicated to specific departments, acknowledged that their situation was exceptional and not the norm. Conversely, study participants who did not have regular in-presence encounters with ID specialists expressed a strong desire for increased accessibility to ID specialist guidance.

Apps, new online platforms are good things, but the greatest impact would be if the infectiologist would be attached to specific departments. Y34, Latvia

Suitability of guidance

Tailoring AMS guidance to the specific profile of each department was another key characteristic highly valued and perceived as a much-needed adjustment of AMS guidance. For example, all study participants from one study site praised AMS guidance on managing neutropenic fever that was specifically developed for their department as a highly helpful source of support.

And this guideline guides you with, 'Your patient has fever, is he in neutropenia? Yes or no.' Then you go in direction for 'yes'. And then, 'Has he also coughed, diarrhea, whatever?' And so you can go down all the way from the guideline and this helps a lot. I like having those guidelines. Y16, Germany

Research participants were able to quickly identify complications and syndromes specific to their department and patient profile that would benefit from tailored AMS guidance (e.g. as infection management for patients with a non-working immune system or infection management for patients with a major chest injury) but are not currently offered.

Lack of AMS guidance suitable to the departmental context creates friction between prescribers and AMS efforts. For example, some study participants encountered speciality-sensitive conflicts of priorities.

I think that we as haematologists, we tend to use more broad-spectrum antibiotics than the infectologists. I think that they tend more to reduce antibiotics after having antibiotics testings. Often, we don't do this. […] We can never be sure that there isn't another infectious focus in the patient. I think this is because we have different point of view in treating the patients. I think infectologists, sometimes at least, and of course not all of them, sometimes, they see more the current suspected infection. We have more the immunosuppression in mind. Y18, Germany

Other study participants in the absence of tailored AMS guidance faced a moral dilemma embedded in their efforts to optimize antibiotic use. They grappled with the challenge of striking a balance between the short-term goal of providing the best treatment for the patient and the long-term goal of preserving antibiotics for future use.[26]

But it's that balance of being as eco-friendly as possible, but also not missing out and mistreating and being wrong. And treating, missing out like resistance or something, you don't want to lose the patient or make the patient get worse. So balance. And that's challenging sometimes. Y23, Norway

AMS guidance that is heterogeneous and responds to different departmental contexts seems to serve as a common ground where different priorities, dilemmas and interests invested in antibiotic use are mended.

Discussion

The study focused on prescribing physicians' user experience of AMS guidance. Study findings demonstrate that prescribers from all countries were seeking more guidance than is currently available in both a quantitative and qualitative sense. The most important aspects and targets for improvement of AMS guidance were quality of guidelines, availability of ID specialists, and suitability of AMS guidance to department context.

Up-to-date, as specific as possible, and user-friendly guidelines were a significant form of AMS guidance. Study findings indicated that participants have encountered antibiotic guidelines that suffer from quality issues, such as outdated, missing or unclear information. Study participants also voiced expectations for more comprehensive guidance on different aspects of optimization of antibiotic use. Already available resources on optimizing antibiotic use should be utilized at local levels.[27,28] Addressing quality concerns is crucial because it can erode trust in the reliability of the guidance. Seeking feedback from guideline users or incorporating a quality improvement plan when developing, designing and implementing guidelines could help in continuously improving antibiotic guidelines,[29] for example, the possibility of

continuously optimizing guidelines in response to new evidence (also called 'living guidelines').[30] Study findings also identified issues with the format of antibiotic guidelines, such as not being available in user-friendly formats. Significant time pressure under which physicians make antibiotic decisions is documented in other studies.[31,32] If support instruments, such as guidelines, are not in a format that is easy and quick to use, then it is not realistic to expect that physicians will spend time that is already in deficit to engage with guidelines that are not user-friendly. When designing guidelines it is crucial to offer them in diverse formats, such as smartphone/tablet apps, desktop-based programmes, posters, printable flowcharts or visual prompts to improve guideline usability.[29]

Daily access to ID specialists to provide help and support when managing infection cases was perceived as the most valuable form of AMS guidance. Other studies have reported that having daily, direct encounters between ID and clinical specialists have a positive and long-lasting effect on optimal antibiotic use and quality of care.[33–35] Despite the demand and evidence of benefits, access to ID specialists' support is limited. The lack of financial and human resources is often reported as a significant barrier to implementing AMS programmes.[36] In another study, ID specialists have reported that due to heavy workload and time pressure, the quality of consultations becomes suboptimal.[31]

Adapting AMS guidance suitable to the profile of the department (specific patient population) and offering AMS guidance specifically developed for the needs of the department (how to manage department-specific clinical complications and conditions) was identified as another key aspect of AMS guidance. The underlying need for such an approach is rooted in the moral and professional dilemmas embedded in the antibiotic decision-making process.[17,26,37] However, our study findings indicate that these challenges are not perceived as static and that one way out of this professional and moral conundrum is finding a common ground in heterogeneous and tailored approaches to AMS guidance. Other studies have also concluded that a tailored approach is a significant facilitator when implementing AMS activities.[5,38,39] Moreover, it is recommended to include department clinicians in the development of tailored guidance to enhance their sense of ownership and promote the uptake of such guidance.[40]

Our study has implications for AMS teams. Firstly, our research findings have made visible an underserved target audience—prescribers who actively use AMS guidance and work in settings with established stewardship programmes. For this target audience, commonly employed interventions like awareness campaigns or basic educational activities may prove to be ineffective. This target audience is already engaged with the AMR prevention and is seeking more AMS guidance than is currently available to them. The study results also highlight that prescribers are not passive subjects of antibiotic policy but active participants in AMR prevention. Thus, it is crucial to respond to the realities and needs of these prescribers; otherwise, it is a missed opportunity to further strengthen collaboration with prescribers and improve antibiotic use. Secondly, the research findings identify tangible tasks for AMS teams where to focus their efforts regarding the AMS guidance. Physicians are interdependent on quality, availability and suitability of AMS guidance and these mediating factors are prime targets for optimizing the guidance.

Our study also has implications for policymakers, hospital leaders and administrators responsible for resource allocation to AMS programmes. An important finding emerging from the study is that all identified issues with AMS guidance can be explained by resource constraints. Hence, it is crucial to allocate more financial resources and organizational support for the optimization of AMS guidance demonstrating policymakers' and hospitals' commitment to improving antibiotic use. Optimization of AMS guidance requires prioritization of: increasing availability of ID specialists; resource support for developing, designing, implementing and continuously reviewing and improving local AMS guidance; and resource support to develop and implement an AMS guidance quality framework that includes seeking feedback and input from AMS guidance users.

The study has some limitations. We included participants exclusively from high-income countries, thus the translational value of our findings to other countries could be limited. Further research is needed to explore the applicability of these findings in different healthcare contexts. The recruitment of participants from departments with an active AMS profile may have been a potential selection bias. However, this was a deliberate recruitment strategy to explore experience with AMS programmes. Another limitation of this study was the potential language barrier. Participants needed to undergo the interview in English, which may have been a selection bias in some study sites. The sample size, while appropriate for a qualitative study, was limited to a small number of participants in each study site. However, we believe that our study findings are a strong indication to strengthen the quality, availability and suitability of AMS guidance.

Conclusions

More research is needed that seeks input and evidence from prescribers to inform development and improvement of AMS programmes. The optimization of AMS guidance is interdependent on decision-makers in high-impact positions to influence resource allocation to AMS programmes. Identifying and influencing such decision-makers is a key to further advancements in AMS programmes.

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Transparency declarations

None to declare.

Supplementary data

The interview plan is available as Supplementary data at *JAC-AMR* Online.

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