JAC Antimicrob Resist
doi:10.1093/jacamr/dlz059

JAC-Antimicrobial Resistance

The second-hand effects of antibiotics: communicating the public health risks of drug resistance

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Antimicrobial resistance (AMR) poses a threat to modern medicine, but there are challenges in communicating its urgency and scope and potential solutions to this growing problem. It is recognized that AMR has a 'language problem' and the way in which healthcare professionals communicate about AMR may not always resonate with patients. Many patients are unaware that antibiotics can have detrimental effects to those beyond the recipient, due to transmission of drug-resistant organisms. The overestimation of benefits and underestimation of risks helps to fuel demand for antibiotic use in situations where they may be of little or no benefit. To better communicate risks, clinicians may borrow the term 'second-hand' from efforts to reduce smoking cessation. We present several examples where antibiotics themselves have second-hand effects beyond the individual recipient in hospitals, long-term care homes and the community. Incorporation of the concept of the second-hand effects of antibiotics into patient counselling, mass messaging and future research may help facilitate a more balanced discussion about the benefits and risks of antibiotic use in order to use these agents more appropriately.

Antimicrobial resistance (AMR) poses a dire threat to global health, calling for cross-jurisdictional and cross-disciplinary efforts to use antibiotics more judiciously.[1] Antibiotic use in individuals and populations applies selection pressure, increasing the predominance of resistant pathogens and opportunistic organisms such as *Clostridioides difficile*. Human-to-human transmission is the most common method of dissemination, but drug-resistant organisms can be acquired from a variety of other reservoirs, including agriculture and the environment, making AMR a truly interconnected 'One Health' issue.[2] More simply, as a society the more we use antibiotics the less effective they become for everyone. Antibiotics are a non-renewable resource and all members of society, particularly healthcare professionals and patients, have a role to play in ensuring antimicrobial stewardship.

Effective clinician–patient communication about benefits and risks of antibiotics can help to improve clinical decision-making and patient satisfaction.[3] However, there are challenges in communicating the urgency and scope of AMR and potential solutions to this problem. It has been recognized that AMR has a 'language problem' in that many of the terms used by clinicians fail to convey information about this threat in a simple, easy-to-understand way.[4] For example, in a recent survey of the general public by the WHO only 44% of respondents were aware of the term 'antimicrobial resistance' compared with 68% for the term 'drug resistance', terminology used much less frequently in this context.[5] This discrepancy highlights a disconnect between clinicians and patients and reveals an opportunity to improve the way we communicate the dangers of drug resistance to patients and providers.

The challenge of effectively communicating benefits and risks is not unique to AMR and exists across a spectrum of clinical practice and public health issues. A cognitive bias seen in many situations is 'unrealistic optimism', the human tendency to overestimate perceived individual benefits and underestimate individual and societal risks.[6,7] This cognitive bias is seen with AMR as it is often perceived by patients as a distant issue for future generations or in other countries, that would not individually impact themselves or their family.[8] Unrealistic optimism results in a disproportionate expectation of benefits compared with risks and drives patient expectation or demand for antibiotics.

One reason that patients may underestimate the risks of antibiotic overuse is the prevalent misconception that antibiotic resistance occurs in the individual receiving the antibiotics, rather than the bacteria themselves. In the survey of patients led by WHO, 76% believed that 'antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well'.[5]

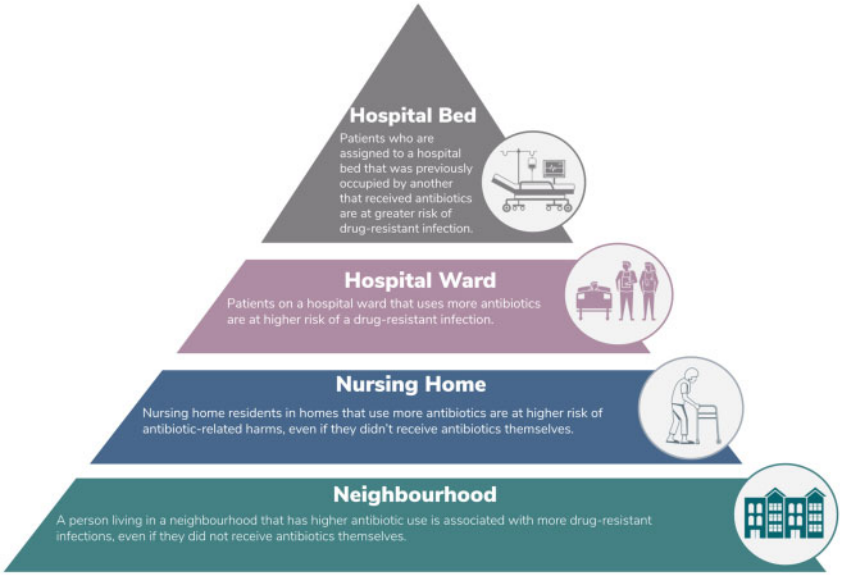

Figure 1. Examples of the second-hand harms of antibiotics.

This misconception is at odds with the key message that drug-resistant bacteria can spread from person to person, meaning overuse of antibiotics affects not only individuals themselves but also those around them.

How can we better frame the idea that these risks extend beyond the individual patient? Potential harm from antibiotic overuse impacting the individual, but also those around them, resulting in significant public health implications, is analogous to the conversation on the health effects of smoking. The term 'second-hand' and the research evaluating the impact of second-hand smoke on human health have helped to shape public discourse and encourage the implementation of tobacco-free policies.[9] Additionally, those with greater knowledge of the harms of second-hand smoke are less likely to initiate smoking, more likely to have smoke-free homes[10] and more likely to attempt cessation.[11]

Unlike tobacco smoke, antibiotics are potentially life-saving medications, but it is just as vital to understand the risks of overuse and their impact on future effectiveness in society as a whole. We propose the concept that antibiotics also have 'second-hand' harms to both individuals and populations. Several studies have demonstrated the risk of antibiotic use that spreads from antibiotic recipients to non-antibiotic recipients, presumably due to transmission of resistant and opportunistic organisms within hospital beds,[12] hospital wards,[13] nursing homes[14] and neighbourhoods.[15] In Figure 1, we have highlighted some key examples to illustrate the concept of the second-hand harms of antibiotics.

Each of the above studies demonstrates the population impact of antibiotic use and AMR. Drug-resistant organisms, or their genetic material, spread from person to person, highlighting that there are second-hand effects of antibiotic use beyond the individual recipient. We believe that public health and clinicians should communicate this vital concept to patients when discussing the risks of unnecessary antibiotic use.

Through one-on-one conversations with individual patients, shared decision making has been a successful approach to align goals between the patient and the clinician and manage expectations about antibiotic therapy. A thorough balanced discussion about both the benefits and risks of treatment can reduce patient expectations for antibiotics, improve appropriateness of antibiotic use and reduce overall antibiotic exposure for patients.[3] Incorporation of the concept of second-hand effects of antibiotics into the shared decision-making process may be one additional tool to tip the scale in favour of reduced antibiotic use in situations where antibiotics are not indicated. Patients with upper respiratory infections such as the common cold, pharyngitis and sinusitis typically do not benefit from antibiotics, but as many as 50% receive them unnecessarily.[16] In these situations where there is a lack of benefit but known risk to the patient and population, discussion of second-hand effects should be incorporated into the discussion.

At the population level, campaigns have been employed to increase awareness about appropriate antibiotic use and the harms of antibiotic misuse, ideally targeting both clinicians and lay audiences.[17] The second-hand harms of antibiotic messaging should apply to all decision makers, clinicians, patients and policy makers. This presents unique opportunities to study patient and clinician perceptions of second-hand effects and evaluate the incorporation of this messaging into future communication-based interventions.

The challenges associated with addressing smoking cessation and antibiotic overuse are certainly distinct. However, the sustained reduction in smoking prevalence (over 15% absolute reduction between 1997 and 2009)[18] may provide opportunities to learn from an effective messaging approach about the harms of active and passive smoking. This comprehensive approach includes clear and consistent evidence-based messaging informing regulatory changes, one-on-one counselling, provision of alternatives to smoking and messaging to populations through mass media campaigns.[19,20] Antimicrobial stewards may wish to take some cues from this successful multifaceted strategy.

To improve our messaging, we need to better quantify both the benefits and risks of antibiotic therapy. As antimicrobial

stewardship research matures, incorporation of comprehensive outcomes that thoroughly measure both positive and negative impacts of antibiotic therapy, addressing the concept of desirability of outcomes, has recently been established.[21] However, there are further opportunities to evaluate patient-level and population-level harms, thereby continuing to add to our knowledge of the second-hand harms of antibiotics.

Given the overestimated benefits and underestimated harms of antibiotic use, it is evident that a more balanced discussion about their benefits and harms is needed at both an individual patient and a societal level. With the increasing impact of antibiotic resistance on morbidity and mortality, there is an urgent need to mobilize public opinion to support interventions to improve antibiotic use locally, nationally and globally. Reframing the problem to emphasize and evaluate the 'second-hand' harms of antibiotics may be a vital step in recalibrating unrealistic optimism and informing attitudes to preserve antibiotic effectiveness for future generations.

Funding

This manuscript was written as part of our routine work.

Transparency declarations

None to declare.

Supplementary data

The Reviewer report is available as Supplementary data at *JAC-AMR* Online.

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