Practical solutions to the antibiotic resistance crisis

Since 2012, when a rallying cry was sounded in *SAMJ*[1] to take the increasing threat of antibiotic resistance (ABR) seriously, a growing movement of healthcare and animal care practitioners partnered with Government to develop a national strategy framework to preserve antimicrobials for future generations and enact programmes to bring about change in prescribing. While taking into account the diverse burden of infection in South Africa (SA) (HIV, fungal infections, malaria, tuberculosis, and bacteria other than *Mycobacterium tuberculosis*), our national framework aligns itself squarely with the World Health Organization-led Global Action Plan (GAP) for antimicrobial resistance[2,3] in focusing on the greatest threat – ABR in bacterial infections.

Annually, approximately 700 000 people die from antibiotic-resistant infections worldwide; this number will rise to 10 million per year by 2050 if our current overuse and misuse of antibiotics is not curtailed.[4] Moreover, if antibiotics are no longer effective, every medical procedure that relies on antibiotics to prevent or treat infection will be affected, changing the face of modern medicine. This is not a futuristic fantasy; it is already happening in SA hospitals, leading to closure of wards, cancellation of operating lists, and patients being sent home without having been operated on because of colonisation with multidrug- or pandrug-resistant bacteria. Welcome to the post-antibiotic era!

How this unfolds depends on how you, the reader, in conjunction with the international community, change your prescribing behaviour. Far from being a call to restrict antibiotics from being used, the strategy must be one of access to assured-quality antibiotics and the tools to prescribe them appropriately, rationally and prudently. The key is to ensure that antibiotics are only used for bacterial infections. One can no longer turn a blind eye to the horrific scale of antibiotic abuse with regards to viral upper respiratory tract infections in community practice, or to antibiotic abuse in non-infectious conditions or non-bacterial infections in hospitalised patients.

This edition of CME focuses on the practical measures for appropriate antibiotic prescribing and what needs to be done to prevent infection in the first place, thereby negating their need. These interventions, along with heightened surveillance and reporting of resistance patterns and antibiotic use, form the battle strategy to defend the efficacy of antibiotics. The antibiotic pipeline for new classes of antibiotic has been dry for the past 28 years and with regard to antibiotics against Gram-negative infections it is not projected to yield a new antibiotic for the next 10 - 15 years. It therefore cannot be relied on to save the day. Furthermore, no antibiotic has lasted >16 years without resistance developing to it.[5]

Hence, the emphasis is on preserving what we have through antibiotic stewardship (an intervention that ensures appropriate optimal antibiotic prescribing, without harming the patient). Stewardship lends itself to a multidisciplinary team approach, although it applies equally to individuals. Interventions that work at a community[6] and hospital[7] level are evidence based, but defining the right combination(s) depends in part on resources and national strategies. In a review by Mendelson,[8] there is a simple checklist that can be employed for stewardship at the prescriber level, and programmatic interventions to enable stewardship at the country level.

Research and development to improve diagnostics for bacterial infection is a crucial arm of the intervention. Rollout of existing or development of new, point-of-care (POC) or near-POC rapid diagnostic tests is required to reduce diagnostic uncertainty, which often fuels poor prescribing practice. Tests that link bacterial identification to the resistance profile of the organism would provide the most useful information. Boyles and Wasserman[9] outline a logical approach to the use of diagnostics for bacterial infection, and highlight new advances that are set to provide crucial, timeous information to reduce inappropriate antibiotic use.

Unless antibiotics are prescribed optimally, the chance of killing the bacteria or ensuring a stasis effect to enhance immunological clearance is lost. Optimising the antibiotic dose is fundamental to success, and the critically ill patient in an intensive care unit poses the greatest challenge in this regard. Richards *et al.*[10] explore the different facets of critical illness that effect antibiotic dosing and propose a strategy for increased dosing in this high-risk population.

How many prescribers will know about or have access to this guest editorial or CME series? How do we disseminate information around antibiotic stewardship more effectively and make use of social media in particular? Goff and Van den Bergh[11] write about the power of Twitter in accessing, educating and communicating with regard to ABR. One is never too old to learn!

Infection prevention and antibiotic stewardship go hand in hand as strategies to reduce resistance. Preventing infection negates the need for antibiotics, and hence diminishes use. Antibiotics have long been used to plug our deficiencies in tackling the primary drivers of infection, i.e. social determinants, such as lack of access to clean water and sanitation. Brink and Richards[12] remind us of the power of vaccination in preventing bacterial infection, emphasising the evidence-based reduction in *Streptococcus pneumoniae* resistance after the introduction of pneumococcal conjugate vaccine, and the potential benefit of increasing influenza vaccine coverage to reduce prescribing for secondary bacterial infection and misdiagnosed viral-induced fevers. Infection prevention to reduce transmission of bacteria in the workplace is equally important, as Whitelaw[13] exemplifies in his evidence-based article. The lack of ability to perform hand hygiene by a large contingent of the SA healthcare workforce is negligent and confers a direct threat to patient safety.

Despite the enormous threat we face, the solutions to ensuring that antibiotics are prescribed appropriately, infections are prevented and antibiotic abuse is curtailed are simple and can be easily and rapidly applied. This CME edition is intended to give you the tools to become antibiotic stewardship and infection prevention champions. Will you take up the challenge?

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