

Preserving antibiotics for the future

Where Australian general practice sits on the global spectrum



CPD 

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Background

Antibiotics have revolutionised modern medicine; however, since their discovery a century ago, their effectiveness against common infections is waning. Antimicrobial resistance is one of the most important challenges of our time. Reversing the trend of increasing resistance is vital to ensure procedures such as surgery, neonatal care and organ transplants remain safe. Inappropriate use of antibiotics is the most important driver of resistance. As the vast majority of antibiotics are prescribed by general practitioners, primary care has an important part to play in preserving antibiotics for the future.

Objective

The aim of this article is to describe how antibiotic use in Australia compares globally and what can be learnt from countries with successful antimicrobial stewardship.

Discussion

Australia is making progress, with unnecessary use of antibiotics declining, but there is still a long way to go. The National Antimicrobial Resistance Strategy is Australia's commitment to the health of future generations. General practice is integral to its success.

ANTIBIOTIC RESISTANCE kills approximately 1600 Australians every year.¹ In less than 100 years since Fleming noticed something unexpected in one of his 'contaminated' culture plates, bacteria have adapted to survive in the presence of antibiotics. This presents itself in clinical practice as infections that are no longer responsive to treatment with antibiotics. In his speech for the 1945 Nobel Prize, Fleming warned that misuse of penicillin could lead to bacteria becoming resistant.² The first reports of *Staphylococcus aureus* resistance to penicillin had already appeared in the 1940s.^{3,4}

Australian hospital and community laboratory data show rising levels of resistance of commonly encountered pathogens for commonly used antibiotics.⁵ In 2019, for *Escherichia coli*, up to 45% resistance was reported for ampicillin/amoxicillin and 10.9% for amoxicillin/clavulanic acid.⁵ Methicillin resistance has been found in 22% of *S. aureus* infections in Australia.¹ Organisms that are multi-drug resistant and extensively drug resistant, where multiple classes of antibiotics have become ineffective, have become commonplace.

Bacterial resistance develops rapidly in an individual after they take antibiotics and can persist for up to 12 months.⁶ In that time, individuals can spread the

resistant bacteria to others, creating a problem not only for themselves but also for their families and communities.⁶

Development of resistance has been clearly linked to the consumption of antibiotics;⁷ therefore, reducing antibiotic prescribing and reserving antibiotics for infections for which they have a proven benefit can slow the development of resistance.⁸

Use of antibiotics

Most antibiotics used in the healthcare context are prescribed by general practitioners (GPs).^{5,9-11} Although in Australia in recent years the consumption of antibiotics has been declining, in 2019 more than 26 million antibiotic prescriptions were dispensed, approximately one for each Australian. In that same year, 40.3% of Australians had at least one antibiotic dispensed.⁵ Bringing Australia's antibiotic consumption down to the level of the lowest prescribing countries in Europe, such as the Netherlands and Sweden, would take approximately 40 years at the current rate of decline.¹²

Two comprehensive Australian general practice data sources show that antibiotics are frequently prescribed for indications that are not recommended by clinical practice guidelines. MedicineInsight is

a large-scale database of longitudinal de-identified electronic health records from more than 660 general practices.¹³ The Registrar Clinical Encounters in Training (ReCEnT) database captures approximately 500,000 recordings of general practice registrars' patient encounters at different times during their training.¹⁴ Analyses from both sources show that for cough/acute bronchitis, a condition for which guidelines clearly do not recommend antibiotics,¹⁵ in 2016–17 patients received an antibiotic prescription in 81.4% (MedicineInsight) and 72.2% (ReCEnT) of cases.^{10,16} McCullough et al calculated that for acute respiratory infections, antibiotics are prescribed at rates between four and nine times higher than those recommended by *Therapeutic Guidelines*.¹⁷ Although many contextual factors play a part in GPs' prescribing decisions, in these cases, antibiotics are not only ineffective but are also harmful to patients. Hospitalisations for adverse effects of antibiotics are a problem worldwide,¹⁸ and even a single dose of antibiotics can alter the individual's microbiome for up to a year, affecting the person's immune system and general health.¹⁹ All these factors add to the risk of harm related to inappropriate prescribing.²⁰

Patient outcomes of low antibiotic prescribing rates

It is important to retain a focus on appropriateness of prescribing to ensure safety and quality of patient care. Concerns have been raised that low antibiotic prescribing rates might come at a health cost to patients, with an increase in the risk of untreated serious infections and complications. However, evidence to date shows that this is not the case. Gulliford et al compared the incidence of serious complications of respiratory tract infections over a 10-year period in low antibiotic prescribers with high prescribers in the UK.²¹ They concluded that low prescribing practices might see a slight increase in treatable pneumonia and peritonsillar abscesses but no increase in serious complications such as mastoiditis, empyema, bacterial meningitis and so on. Cars et al found similar results in

their Swedish prospective study between 2006 and 2016; a reduction in antibiotic prescribing did not result in more serious infections.²² Another UK study found no difference in hospitalisations between children who received antibiotics for an acute cough when compared with those who did not.²³ Serious complications remain rare and can also occur in those treated with antibiotics.

Lessons from overseas: A global perspective

Australia has set an example of effectively containing resistance to fluoroquinolones. Restricting use in primary care as an 'authority only' medication has kept resistance for this antibiotic class low. The problem of antibiotic resistance in general is small in Australia when compared with Australia's Asia-Pacific neighbours, as many countries in the region struggle to stem the tide. For instance, in South Asia the prevalence of extended-spectrum β -lactamase-producing strains of *E. coli*, resistant to commonly used antibiotics such as penicillins and cephalosporins, may be as high as 33%.²⁴ In a world where travel is abundant, these resistant bacteria are easily spread into Australian communities.²⁵

Although fluoroquinolone resistance rates in Australia are also low when compared with some European countries, resistance in important gram-positive pathogens remains high.⁵ Volume of use is a main driver of this resistance. In terms of antibiotic consumption, Australia ranks number seven of 28 countries, at more than twice the rate of the lowest prescribing countries,¹¹ such as Sweden, Denmark and the Netherlands. Unsurprisingly, these same low-prescribing countries have the lowest antimicrobial resistance rates.²⁶

Sweden is regarded as having one of the most successful national antimicrobial stewardship programs, with a bottom-up approach with strong commitment at all levels of government. The Swedish Strategic Programme Against Antibiotic Resistance (Strama) started in 1995 in response to a rapid spread of penicillin-resistant pneumococci in children.²⁷ Over a period of 25 years, Sweden has reduced antibiotic prescriptions by nearly

50% (73% in young children) and now has one of the lowest levels of antibiotic resistance in the world, without a negative impact on patient outcomes. The power of Strama is the strong connection between local and national levels with local multidisciplinary groups comprising GPs, hospital specialists, pharmacists and public health units. They have set up a system of surveillance, ensured clear communication (to health professionals as well as the public) and developed guidelines. This enables constant monitoring, involvement, ownership and scientific rigour. Important for its success has been public engagement, and although most Swedes now agree that unnecessary use of antibiotics makes them ineffective, continued education is needed. The Swedish success story demonstrated that it may not be possible to eliminate antibiotic resistance, but it can be successfully managed.

Cultural factors have been identified as important determinants of antibiotic prescribing and use.²⁸ Prescriber training, attitudes, power structures and fear of litigation as well as patients' beliefs in medications and work ethos all have an impact on the complex environment in which antibiotics are prescribed and taken. An interesting study in Belgium and the Netherlands showed that although they share a language, Belgians and Dutch had very different views on how to manage respiratory infections. In the Netherlands (low antibiotic use), people 'ride out' the course of a cough, whereas in Belgium (high use) 'bronchitis' warrants antibiotics.²⁹ It would be interesting to see how this translates to the multicultural society in Australia.

Easy access to antibiotics in countries where they are available over the counter, or on pharmacist advice, drives use.^{30,31} However, self-medication also occurs where antibiotics are prescription only when pack sizes exceed the number of tablets required or repeats are automatically included.^{30,32}

Antimicrobial stewardship in a post-COVID-19 world

The COVID-19 pandemic has shown the importance of strategic and coordinated

efforts across governments, communities and health systems to address and mitigate the effects of infectious diseases. The Australian National Antimicrobial Resistance Strategy, first published in 2015, aligns Australia to the World Health Organization's *Global action plan on antimicrobial resistance*³³ and lays the foundations for Australia's own national antimicrobial stewardship.³⁴ The strategy sets out a vision for how best to combat antimicrobial resistance with a 'one health' approach, coordinated action across all sectors in which antimicrobials are used in the country, as well as close coordination with global action, underpinned by a comprehensive surveillance strategy.

Stewardship is where the antimicrobial resistance strategy is put to the test. Antimicrobial stewardship requires sector leadership and should comprise a suite of coordinated strategies and interventions to promote the optimal use of antimicrobials tailored to patients' needs.³⁵ Antimicrobial stewardship programs in hospitals have been shown to reduce unnecessary and inappropriate use of antimicrobials, reduce patient morbidity and mortality, and reduce bacterial resistance rates and healthcare costs.³⁶ The Swedish experience has shown that this can include primary care. The Australian Commission of Safety and Quality in Health Care has published guidance on antimicrobial stewardship in different healthcare settings including general practice. The Royal Australian College of General Practitioners' position statement and response to the national strategy pave the way for a tailored approach for primary care. However, implementation is slow.^{37,38} Research to help guide and improve the effectiveness of implementation is ongoing, but funding opportunities for targeted primary care stewardship projects has been limited. If Australia is serious about preserving antibiotics for the future, slowly chipping away at antibiotic consumption is not acceptable. The Swedish experience shows that the bottom-up commitment of prescribers and consumers needs to be enhanced with top-down regulatory measures and incentives. Recent changes to the

maximum quantity and repeats for the most prescribed antibiotics are a first step.³⁹

In a post-COVID-19 world when international travel across borders resumes, microorganisms will travel at least as easily as the people they infect. Combatting antimicrobial resistance can only work if everyone – prescribers and consumers of antibiotics, governments and the entire global community – takes part.

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