

ANTIMICROBIAL STEWARDSHIP

Why all the fuss?

Over many decades, health researchers around the world have identified an increasing need to change the way society uses antimicrobial therapy.¹⁻⁴ There is strong clinical evidence that more prudent use of antimicrobials is necessary to improve patient care outcomes and mitigate the spread of antimicrobial resistance. Antimicrobial stewardship (AMS) is a term used to describe a systematic approach to optimising antimicrobial use,⁵ and health organisations around the world have urged that stronger frameworks for AMS be established.⁶⁻⁸

In 2013, AMS became a standalone criterion within Australia's National Safety and Quality Health Service Standards.⁹ The development, implementation and evaluation of a structured and sustainable AMS program is now a requirement for all Australian hospitals.



Antimicrobial Therapy: Life-saving medicines that have changed healthcare

Throughout the mid-1900s, the world experienced a 'golden age' of antibiotic discovery¹⁰. An increasing number of antibiotic therapies were being developed, and as a result many life-threatening and disabling infections became highly treatable conditions. Combined with mass vaccination programs, modern antibiotics have dramatically reduced mortality associated with infectious diseases¹¹. Antimicrobial therapies are now essential not only for the treatment of active infections, but also in preventing infectious complications associated with surgery, cancer chemotherapy, organ transplantation and other important medical interventions⁷.

*"Effective antibiotics have been one of the pillars allowing us to live longer, live healthier, and benefit from modern medicine... Unless we take significant actions to improve efforts to prevent infections and also change how we produce, prescribe and use antibiotics, the world will lose more and more of these global public health goods and the implications will be devastating."*¹

- **Dr Keiji Fukuda**

(WHO Assistant Director General for Health Security)

Despite the widespread availability of antibiotics, infections are still a major cause of morbidity and mortality around the world.^{7, 11} In developing countries, tuberculosis causes 1.3 million deaths annually and an estimated 450 000 people develop multidrug-resistant tuberculosis each year¹². Malaria causes 627 000 deaths annually, and last line treatments are becoming less effective over time, making this disease even harder to treat¹³. In developed countries like Australia, severe sepsis continues to be the main cause of mortality in critically ill patients.¹⁴

Antimicrobial Resistance

Antimicrobial resistance describes a phenomenon whereby a microorganism becomes less susceptible to the antibiotic effect of drug therapy.¹⁵ Resistance is a natural process of microbial evolution, however widespread use (and particularly overuse or misuse) of antibiotics greatly accelerates this process by exerting 'selective pressure' on the microbial population. In the presence of an antibiotic drug, naturally resistant organisms multiply more easily than susceptible organisms, which are killed or inhibited^{16, 17}. Genetic resistance factors are then passed on to the next generations, and in some cases can even be passed 'horizontally', through the transfer of DNA to other microorganisms. As a result, cross-resistance of microbes to different types of antibiotics is increasingly common,¹⁷ creating 'multidrug-resistant', 'extensively drug-resistant' and in some cases 'pandrug-resistant' organisms.

Infections caused by antibiotic resistant organisms are associated with higher morbidity and mortality, longer lengths of stay, and increased overall burden on the health system¹⁸.

The cost of antimicrobial resistance is almost incalculable, particularly as it has a number of indirect effects on the feasibility and success of many basic healthcare interventions involving surgery and immunosuppression.¹⁹

Risks of Antibiotic Misuse

The majority of antimicrobial therapies are, when used correctly, safe and well-tolerated medications. Like any medicine however, antimicrobials may have serious side effects and unintended consequences, and may interact with other medicines and medical conditions.²⁰

In patients with severe prior reactions to particular antibiotics, or with known severe allergies to an antibiotic, re-exposure to the antibiotic can cause serious harm.²¹ As antibiotic resistance becomes more of a problem, prescribers may need to resort to last-line treatments, including antimicrobials with more serious side effects⁸. Antibiotics can also change the body's natural microbial flora, increase the risk of 'superinfections' (such as yeast infections or *C. difficile* infection) or otherwise select for more resistant organisms²²⁻²⁵. Studies show that patients who take a course of antibiotics have a greater chance of harbouring antibiotic-resistant organisms, and these organisms can remain in the body for up to 12 months²⁶. Additionally, antibiotic resistant genes pervade the hospital and the community, which jeopardises the ability to treat future patients with antibiotics^{17, 26}. When analysed by region, higher rates of antibiotic use in a particular area are associated with a higher rates of resistance to the same antibiotics²⁷.

Inappropriate antimicrobial use increases the risk of patient harm and the cost of healthcare.²⁸ The true extent of inappropriate use in NSW public hospitals is unknown, but each year, an increasing number of NSW facilities are participating in a national survey which examines the appropriateness of hospital antimicrobial use.²⁹ The 2013 results of this survey demonstrated that only 60-76% of the five most commonly prescribed antimicrobials were deemed 'appropriate', and the most common reason for 'inappropriateness' was the choice of antimicrobial having too broad a spectrum.³⁰

The role of Antimicrobial Stewardship (AMS) Programs

AMS programs are considered key strategies in the prevention and management of healthcare-associated infections, and in the prevention of antimicrobial resistance.^{31,32} Comprehensive programs use a wide range of strategies and interventions to optimise antimicrobial use with core aims to improve patient outcomes and reduce adverse consequences of antimicrobial use.^{33,32}

Strategies selected by a hospital to improve antimicrobial use may include:

- ▶ Development and endorsement of antimicrobial prescribing guidelines; either the *Therapeutic Guidelines: Antibiotic* or locally-developed and endorsed guidelines
- ▶ Restriction of selected antimicrobials based on their spectrum of activity, risk of harm, cost and other concerns, in order to better regulate and monitor use of these agents
- ▶ Post-prescription review of antimicrobial therapy by an antimicrobial stewardship team, with intervention (if needed) and feedback to prescribers about antimicrobial therapy
- ▶ Analysis of antimicrobial usage and resistance to detect trends, identify areas for further investigation, and evaluate the impact of targeted interventions
- ▶ Selective reporting of antimicrobial susceptibilities on microbiology reports to encourage prescription of first-line antimicrobials where possible, and promotion of timely review of broad-spectrum antimicrobial therapy once microbiology results are available
- ▶ Referral and liaison with 'Hospital in the Home' services for patients that may require parenteral antimicrobial therapy but do not need to remain in hospital as an inpatient

- ▶ Promotion of timely intravenous to oral switch of antimicrobial therapy where safe and appropriate
- ▶ Provision of education for prescribers, nursing staff and pharmacists about their role and responsibilities regarding quality use of antimicrobials
- ▶ Support for partnering with patients, carers and local healthcare providers to ensure appropriate and optimal antimicrobial use both during the patient's hospital stay and after transfer to their home³¹⁻³³.

The most effective strategies will be those that are developed in liaison with a multidisciplinary representative group (which may be the local AMS committee or another committee performing a similar function) and the hospital executive³¹. Strategies should be selected after consideration of risks, resources, impact and sustainability. Getting started can be a major hurdle for many hospitals, and the task of implementing antimicrobial stewardship can seem overwhelming. Starting with simple interventions that are supported by local prescribers and which have measurable and obtainable targets, can be the most effective way of introducing AMS in the hospital environment³⁴.

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