AUSTRALIAN COMMISSION
ON SAFETY AND QUALITY IN HEALTH CARE

10 Role of prescribers in antimicrobial stewardship

Antimicrobial Stewardship in Australian Health Care

2018

Please note that revised antimicrobial stewardship actions are included in the Preventing and Controlling Infections Standard, which was released in May 2021. This version of the Standard supersedes the 2017 Preventing and Controlling Healthcare-Associated Infection Standard. The AMS Book will be updated to incorporate reference to the 2021 Standard.

Chapter contents

Acronyms and abbreviations

Abbreviation	Definition
ADR	adverse drug reaction
AMR	antimicrobial resistance
AMS	antimicrobial stewardship

Key points

- Understanding the process and culture of prescribing, and pressures on prescribers, is an important factor in devising antimicrobial stewardship (AMS) programs and strategies.
- Prescribers are aware of and concerned about antimicrobial resistance; however, they often do not perceive this as a problem or a priority for individual prescribing in their own practice.
- AMS prescribing principles should be incorporated into programs of study and continuing education for all prescribers.
- Processes that help to address diagnostic uncertainty and the risk of complications can reduce unnecessary and inappropriate antimicrobial prescribing.
- The Antimicrobial Stewardship Clinical Care Standard, *Therapeutic Guidelines: Antibiotic*, the National Prescribing Curriculum and the Prescribing Competencies Framework are essential resources to inform the education of antimicrobial prescribers.
- A clear understanding of AMS prescribing principles underpins optimal prescribing, which can be strengthened by ready access to information and resources to support good decision-making, including formulary information, prescribing guidelines, local resistance patterns and specialist advice.
- Systems should be established to enable prescribers to receive feedback about their prescribing and how their practice compares with guidelines, indicators and their peers.
- The early diagnosis and management of sepsis is a priority for good patient outcomes
  - In hospital settings, the use of protocols for sepsis has the potential to influence prescribing of early broad-spectrum antimicrobial therapy
  - Prescribers must ensure that treatment for suspected sepsis is commenced without delay and, although treatment may start broad, it should be reassessed when the patient's condition is better understood
  - As sepsis is increasingly being diagnosed, the importance of judicious use of antimicrobials and the involvement of multidisciplinary teams in the development of protocols needs to be highlighted and acted on.

10.1 Introduction

Prescribers, including doctors, dentists and non-medical prescribers, work across different settings where they need to diagnose and treat infections, and prescribe antimicrobials.[1] It is the responsibility of all prescribers to follow good prescribing and antimicrobial stewardship (AMS) principles, and to use guidelines and resources in their practice to ensure that they are contributing to AMS. The prescriber takes into account multiple factors when prescribing an antimicrobial, and understanding those factors is important when devising AMS programs and strategies.

Understanding differences in prescribing environments across primary, secondary and tertiary care is important to achieving effective AMS. Hospital prescribers are more likely to be team based, with the opportunity to work collaboratively with other clinicians in the workplace, and their prescribing decisions are more likely to be subject to review by infectious diseases physicians, pharmacists or other members of the healthcare team. Prescribers in general practice tend to work more independently and have greater autonomy in making diagnostic and management decisions.[2]

Non-medical prescribers in Australia include nurse practitioners, midwives, podiatrists and optometrists; in other countries, they also include pharmacists and physiotherapists. Non-medical prescribers have varied levels of pharmacological training, and their prescribing is restricted, depending on their practice and state or territory legislation.

This chapter describes the influences on prescriber decision-making with regard to antimicrobial prescribing, appropriate prescriber strategies, and guidance and support that are available to prescribers.

Issues that are especially relevant for certain settings – rural and remote hospitals, private hospitals and aged care – are tagged as R, P and AC, respectively, throughout the text.

10.2 Prescriber concerns and influences

Access to information and knowledge alone is insufficient to achieve good antimicrobial prescribing practice. Consideration needs to be given to the factors that affect prescribing practices, such as time, motivation or skills to apply information, and knowledge to change practice.[3] Understanding the cultural, contextual and behavioural aspects of antimicrobial use is necessary to identify, develop and implement directed interventions to optimise antimicrobial prescribing (see Section 2.5.1 in Chapter 2: 'Establishing and sustaining an antimicrobial stewardship program').[3,4]

Numerous studies have investigated factors that influence prescribers in their antimicrobial decision-making (see Chapter 2: 'Establishing and sustaining an antimicrobial stewardship program').[3,5-10] They have identified both pharmacological (medical or clinical) factors and non-pharmacological factors that influence behaviour. Multiple factors are considered when deciding to prescribe antimicrobials for individual patients.[7,11]

10.2.1 Prescriber perspectives on antimicrobial resistance

Prescribers are aware of and concerned about antimicrobial resistance (AMR); however, they often do not perceive it as a problem or a priority in everyday practice (see Chapter 2: 'Establishing and sustaining an antimicrobial stewardship program').[7,11-18] In some studies, participants have considered AMR more as a public health issue[12,13,19] caused by 'other doctors' and the responsibility of 'other people'.[10]

Clinicians widely agree that AMR is an important healthcare issue in hospitals, but they are much less likely to perceive it as a problem in their own institution or practice.[16-18] For example, junior doctors in France and Scotland perceive that resistance occurs in the community setting and is transported into hospitals by patients.[16,17] Prescribers identify causes of AMR as the prescription of too many antimicrobials, too many broad-spectrum antimicrobials or subtherapeutic doses of an antimicrobial, and poor infection control practices.[17,18]

Similar findings have been indicated among hospital prescribers in Australia.[14] Perspectives on the importance of AMR and its relevance to everyday clinical decisions are mixed. Some prescribers believe that AMR issues, especially methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci, should be discussed and have a direct effect on clinical decisions. However, other prescribers believe that communication about AMR is not necessarily practical and that other day-to-day clinical matters are more important.[14]

10.2.2 Policies and guidelines

Policies and guidelines are standard tools that support AMS programs and drive the achievement of their goals (see Section 3.2 in Chapter 3: 'Strategies and tools for antimicrobial stewardship'). Prescribers report that evidence-based antimicrobial prescribing guidelines are necessary[9] and enable appropriate prescribing.[20] However, adherence is variable and influenced by several factors, including acceptance of the guidelines (which is highest among junior prescribers[20-22]), awareness of and familiarity with the guidelines, and the availability of the guidelines or policy.[9,23,24] Organisational culture, and an understanding of the roles of hierarchy and prescriber autonomy need to be considered when developing and implementing policies and guidelines, as they can influence compliance.[14,21,23]

In Australia, reasons for noncompliance with hospital AMS policy include lack of familiarity or agreement with the policy, prescriber autonomy, and structural issues. The involvement of infectious diseases and microbiology departments can facilitate compliance with policy.[23]

10.2.3 Diagnostic uncertainty

Clinical signs and symptoms often leave prescribers with diagnostic uncertainty, and this influences prescribing in all settings. In the face of uncertainty, general practitioners could be inclined to prescribe an antimicrobial, depending on their experience and patient-related factors such as patient expectations.[2] This is despite most viral and bacterial infections in primary care being self-limiting and not needing antimicrobial therapy.[25]

Diagnostic uncertainty is a predictor for antimicrobial prescribing that is inconsistent with best-practice recommendations.[26] A United States hospital study demonstrated that an accurate diagnosis was linked to optimal antimicrobial therapy, whereas an inaccurate diagnosis was linked to inappropriate antimicrobial therapy. The most common diagnoses for which diagnostic accuracy was relatively poor were pneumonia, cystitis, pyelonephritis and urosepsis.[26]

Processes to help reduce uncertainty (such as point-of-care testing for group A *Streptococcus* or C-reactive protein) as part of a multifaceted intervention can reduce inappropriate antimicrobial prescribing.[27-30] However, point-of-care testing is not widely used in Australia.

The 2015 National Antimicrobial Prescribing Survey showed that only about 12% of antimicrobial therapy is given on a directed basis in hospitals.[31] This indicates that many patients receive empirical treatment, implying either high levels of diagnostic uncertainty or a delay in appropriate diagnostic testing, post-empirical intervention or de-escalation. It is important to ensure appropriate diagnostic work-ups, including the correct use of microbiology (see Chapter 9: 'Role of the clinical microbiology service in antimicrobial stewardship').

General practitioners may prescribe antimicrobials for respiratory tract infections because of concern about overlooking something more serious or fear of the disease progressing.[10,11] The consequences of not prescribing antimicrobials, especially in situations in which patients might develop more serious problems, appear to worry some prescribers more than the possible downstream complication of AMR[12,32], and have been reported by general practitioners in several studies.[11,13,33,34] This concern also exists for hospital prescribers.

One study describes prescriber tendencies to use broader therapies to ensure that everything is covered and nothing has been missed.[14] Other areas of uncertainty include when to initiate antimicrobials, what type to use and how long to prescribe them for.

The early diagnosis and management of sepsis is a priority for good patient outcomes. In hospital settings, the use of protocols for sepsis has been widely promoted and may influence prescribing of early broad-spectrum antimicrobial therapy (see Section 8.3 in Chapter 8: 'Role of the infectious diseases service in antimicrobial stewardship'). Given the significance of sepsis as a leading cause of death, there have been widespread efforts to inform clinicians of the importance of these events and, as a result, there has been increasing recognition of, and intervention for, sepsis. One example of these programs is the NSW Clinical Excellence Commission's Sepsis Kills program. In May 2017, the World Health Assembly and the World Health Organization made sepsis a global health priority by adopting a resolution to improve, prevent, diagnose and manage sepsis. As sepsis is increasingly being diagnosed, the importance of judicious antimicrobial use and the involvement of multidisciplinary teams in developing protocols need to be highlighted and acted on.[35] In one study, diagnosis of sepsis increased almost three-fold over nine years.[35] Although prescribing for sepsis may start broad, it should narrow when the patient's condition is better understood.

10.2.4 Influence of others

Prescribing practice in hospitals is influenced not only by the expertise and experience of the practitioner but also by the medical hierarchy and professional relationships.[1] Junior clinicians are influenced by senior clinicians, such that junior medical staff may be reluctant to alter or challenge prescriptions written or suggested by senior medical staff. This influence, described as 'prescribing etiquette'[36], involves:

- Decision-making autonomy, in which senior doctors rely on their own professional judgement rather than guidelines or policies in antimicrobial decision-making, especially if the guidelines are not endorsed by peers[36]; this is accompanied by a lack of questioning by peers
- A culture of hierarchy, which is especially relevant to junior clinicians[36]; although junior doctors write the prescription, their decision is either under the direction of a senior doctor or influenced by the previous choices of that senior doctor.

Senior doctors have a dominant influence on hospital trainees, who learn their prescribing behaviours from the senior doctors.[37] This influence is more profound among less experienced doctors. Senior clinicians therefore have an opportunity to provide leadership in AMS for junior medical staff; they should ensure that support is provided for an environment that uses evidence-based interventions, and that they maintain currency in their own prescribing practice (see Section 2.3.4 in Chapter 2: 'Establishing and sustaining an antimicrobial stewardship program').[38]

Consumer expectations also influence the behaviour of prescribers, and communication with consumers about AMS is an important management tool (see Chapter 7: 'Involving consumers in antimicrobial stewardship').

10.2.5 Prescribers in aged care

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In aged care homes, factors that influence antimicrobial prescribing can be direct – for example, the influence of others, such as colleagues, the resident, the resident's family and nurses (that is, a lack of direct clinician involvement with client assessment). Factors can also be indirect – for example, the influence of the environment, such as covering for another clinician on a weekend and being unfamiliar with the resident.[39]

Other factors may include:

- The environment and communication, such as impaired communication with residents, or a lack of typical clinical signs and symptoms
- Advance care plans that may or may not include the use of antimicrobials
- The use of diagnostic resources that may be limited or too burdensome for frail or older residents, contributing to diagnostic uncertainty
- Perceived risks of prescribing, or not prescribing, an antimicrobial.

10.2.6 Non-medical prescribers

The knowledge, attitudes and behaviours of non-medical prescribers with respect to AMR and AMS have mainly been studied overseas among nurse practitioners. There is little information about other non-medical prescribers, such as midwives, podiatrists, optometrists, pharmacists and physiotherapists.

Australian nurse practitioners can prescribe certain medicines under the Pharmaceutical Benefits Scheme (PBS). However, their prescribing is limited by the nurse practitioner's scope of practice, and state and territory prescribing rights, and accounts for less than 1% of the antimicrobial prescriptions dispensed through the PBS. Although the level of prescribing of antimicrobials by nurse practitioners in Australia is low relative to the total volume, antimicrobial agents account for a significant component (29%) of their prescribing.[40] (Also see Chapter 12: 'Role of nurses, midwives and infection control practitioners in antimicrobial stewardship'.)

Little is known about Australian nurse practitioners' current attitudes to, perceptions of, and knowledge about, antimicrobial prescribing. The nurse practitioner role in Australia varies from the role in other countries, including the United States and the United Kingdom, where there are more nurse practitioners and the role is more established.[41] It is therefore difficult to draw direct comparisons about attitudes and experiences. Aspects highlighted in international studies have been related to nurse practitioners' perceptions about AMS, and nurse prescribing generally, and prescribing confidence, diagnostic uncertainty and patient expectations are often cited as factors that influence nurse practitioners' prescribing behaviour.[42-44] For example, results of a 2009 study suggested that nurse practitioners in the United States see AMR as a national or global problem, rather than a local problem.[43] In that study, nurses agreed that antimicrobials were overused nationally, but agreed less strongly that antimicrobials were overused locally.[43] The study indicated that knowledge of antimicrobials is important, and surveyed nurses indicated that they would like more education and feedback about their antimicrobial selections.

Non-medical prescribers also need to deal with prescribing confidence, patient expectations and diagnostic uncertainty. Non-medical prescribers in the United Kingdom stated that patients with self-limiting respiratory tract infections needed reassurance and wanted their symptoms 'fixed', and that previous prescriptions often drove the consultation (see Chapter 7: 'Involving consumers in antimicrobial stewardship').[42] Non-medical prescribers were aware that they did not have the same experience as general practitioners and were concerned about the possibility of making mistakes. As a result, they needed to justify their prescribing decisions.

10.3 Prescriber strategies

Prescribers should follow AMS prescribing principles when prescribing antimicrobials.

10.3.1 Antimicrobial stewardship prescribing principles

The following prescribing principles underpin AMS. They have been adapted from *Therapeutic Guidelines: Antibiotic*[25], the Antimicrobial Stewardship Clinical Care Standard[45] and the United Kingdom National Institute for Health and Care Excellence AMS guidelines.[46]

Before prescribing:

- Assess the patient, and document the symptoms and indication for use of the antimicrobial
- Consider the clinical need for microbiology testing
  - For patients in hospital with a suspected bacterial infection, take microbiological samples, if possible, before starting antimicrobial therapy; review and, if necessary, modify the prescription when the results are available
  - For patients in primary care, consider microbiology testing, and review the prescription when the results are available, modifying treatment if necessary
- For patients with non-severe infections, consider waiting for the results of microbiology testing before deciding to prescribe an antimicrobial, provided it is safe to do so
- Consider the risk of AMR for the individual patient and the population as a whole
- Assess the allergy status of the patient – elicit the nature and seriousness of any allergy to an antimicrobial, and document it in the patient's healthcare record
- Where appropriate, discuss with the patient, and their family or carers
  - the likely cause and progression of the condition
  - any self-management strategies
  - their concerns and expectations of management, including whether they want an antimicrobial
  - the benefits and harms of providing an antimicrobial
  - any symptoms that require a return visit (advise to re-consult if symptoms persist or worsen, or if they are worried)
  - whether they need information about their medicines and illness in another format.

If prescribing:

- Select an antimicrobial for the specified indication that is consistent with national (*Therapeutic Guidelines: Antibiotic*[25]) or local endorsed clinical guideline recommendations, taking into account
  - the required spectrum of activity
  - potential adverse effects, drug interactions and cost
  - patient factors such as recent antimicrobial use, allergy status, and other diseases and conditions (such as renal impairment, pregnancy and breastfeeding)
- Select an appropriate dose, frequency and route for the antimicrobial, taking into account the severity of infection, the site of infection and any factors that may alter the patient's pharmacokinetics
- Prescribe the antimicrobial for an appropriate duration according to guidelines and indicate a review or stop date; give a repeat antimicrobial prescription only if that is indicated for a particular clinical condition to ensure an appropriate duration of treatment
- Clearly document all antimicrobial therapy – including the indication and the duration of therapy before the stop or review date – in the patient's healthcare record or medication chart
- Provide information to the patient about the antimicrobial, including when and how to take it, how long to take it for, and potential adverse effects.

The MIND ME antimicrobial creed[25] is a useful reminder for prescribers about issues to consider when prescribing antimicrobials (Box 10.1).

Box 10.1: MIND ME

Microbiology guides therapy, wherever possible

Indications should be evidence based

Narrowest spectrum required

Dosage individualised to the patient, and appropriate to the site and type of infection

Minimise duration of therapy

Ensure oral therapy is used, where clinically appropriate

After prescribing:

- Review the clinical evolution and microbiological results at 48–72 hours to determine whether antimicrobial treatment should continue; if continuing, consider the possibility of switching to oral therapy (if receiving parenteral therapy) or the need for modifying the prescription to a narrower-spectrum parenteral antimicrobial
- Participate in quality improvement audits for antimicrobials (see Section 6.8.3 in Chapter 6: 'Measuring performance and evaluating antimicrobial stewardship programs')
- Provide information (including on the duration of the intended therapy) to patients, families and carers, and to the next clinician or team at transitions of care
- Follow local policies when interacting with representatives from pharmaceutical companies.

10.3.2 Prescribing in specific situations

Prescribers should also be aware of particular patient needs in specific situations, such as for patients with suspected sepsis or antimicrobial allergies, during transitions of care, and at the end of life.

Patients with antimicrobial allergies

Up to 20% of patients report allergies to one or more antimicrobials.[47-49] Most of the allergies were reported to be to β-lactam agents (83% in a recent Australian study)[48], and most of those were to penicillin. However, only 10–20% of patients labelled penicillin allergic may have a true allergy (see Section 8.3.1 in Chapter 8: 'Role of the infectious diseases service in antimicrobial stewardship').[50] Allergies and adverse drug reactions (ADRs) are often poorly assessed and documented in patient healthcare records or medication charts, without due consideration of whether the allergy or ADR should preclude the administration of one or more antimicrobials recommended as first-line treatments. These patients are more often prescribed suboptimal reserve agents with less favourable safety profiles, increasing their risk of treatment failure or adverse events.[51,52] The presence of an antimicrobial allergy label in the healthcare record has been associated with poorer clinical outcomes, such as increased length of hospital stays, higher intensive care admission rates, the development of resistance and *Clostridium difficile* infection, and higher mortality rates.[53-55]

Thorough allergy assessments that include penicillin skin testing and oral challenge have been shown to reduce the use of alternative antimicrobials, the length of hospital stay, costs and adverse events from the use of antimicrobials (see Section 8.3.1 in Chapter 8: 'Role of the infectious diseases service in antimicrobial stewardship').[56] Researchers suggest that almost 90% of β-lactam allergy labels can be safely removed.[50,55] Optimal allergy management relies on detailed ADR reporting to differentiate immunological from non-immunological ADRs. Those patients with plausible allergy histories (especially to β-lactams) should be referred to an infectious diseases physician for management advice, especially for more serious infections when β-lactams are being considered as the best treatment choice. This may include further assessment by a drug allergy specialist to confirm true allergies and remove invalid labels.[48] For patients with confirmed allergies, the true nature of the ADR needs to be clearly documented in the patient's healthcare record, and the information needs to be readily available to other clinicians at the point of prescribing, dispensing and administration.

Antimicrobial prescribing at transitions of care

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Antimicrobials have been cited as a common cause of medication error when care is transferred, such as when people are transferred between hospitals and aged care homes, or between hospitals and the community.[52] Patients admitted to a health service organisation or aged care home who are taking an antimicrobial and patients who need to continue antimicrobials on discharge should have their prescriptions reviewed and reconciled.[52] At the time of discharge from hospital, the appropriateness of ongoing prophylactic antimicrobials, in particular, should be questioned and decisions documented. Similarly, when patients are transferred from intensive care units to other wards, antimicrobial therapy should be reviewed, and treatment decisions documented and communicated to the next clinician or team.

Antimicrobial prescribing at the end of life

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Overseas studies report that up to 90% of hospitalised patients with advanced cancer receive antimicrobials during the week before death[57], and as many as 42% of aged care home residents with advanced dementia are prescribed antimicrobials during the last two weeks of life.[58] In the hospice setting, around one-quarter of recipients, for whom the intended goal of care is comfort, receive antimicrobials during the final weeks of life.[59] Research suggests that antimicrobials are often

prescribed to dying patients in the absence of clinical symptoms of a bacterial infection.[58,59]

The decision on whether to prescribe antimicrobials to patients at the end of life can be challenging. The possible benefits versus harms of antimicrobial therapy, as well as the beliefs and expectations of the patient and their family, may be unclear. Ideally, decision-making about antimicrobial use should be done as part of advance care planning, and treatment preferences should be documented in advance care directives.

Similarly to other end-of-life treatment choices, the decision to prescribe an antimicrobial should be approached using shared decision making (see Section 7.4.2 in Chapter 7: 'Involving consumers in antimicrobial stewardship').[60] Patients and families should be told that infections are expected near the end of life, and are commonly a terminal event. Individuals should understand that, even if the infection were cured, the underlying illness (for example, metastatic cancer or advanced dementia) would remain. The risks and burdens of evaluating and treating an infection should be presented, as well as the possible benefits. Sometimes antimicrobials given in the last days of life prolong dying, rather than restore good health. If antimicrobial therapy is indicated, a time-limited trial of therapy may be appropriate (for example, 48 hours), and patients and families should be informed of the signs and symptoms that show that the antimicrobials are or are not effective, in what circumstances antimicrobial treatment would be ceased, and in what circumstances it would be appropriate for it to continue.

If the preference is only for treatments that optimise comfort, it is reasonable to recommend that no investigations be initiated for a suspected bacterial infection and that palliative care be provided. If the evidence to support a bacterial infection is suitable and the use of antimicrobials is thought to be of some benefit, they should be administered by the least invasive route and should not increase patient discomfort.

10.4 Prescriber resources and tools

Several guidelines, standards and principles are available to support prescribers in antimicrobial prescribing.

10.4.1 Guidelines and antimicrobial information

All prescribers should have access to relevant evidence-based prescribing guidelines. In hospitals, local guidelines may be implemented to take into account local resistance patterns and local environments (for example, there may be separate prescribing guidelines for the emergency department). In primary care, it is critical for general practitioners to have access to, and follow, the latest version of *Therapeutic Guidelines: Antibiotic*.[25]

Other sources of information about antimicrobials and prescribing include the *Australian Medicines Handbook*[61], and the Centre for Remote Health's *CARPA Standard Treatment Manual*.[62]

10.4.2 Antimicrobial Stewardship Clinical Care Standard

The Antimicrobial Stewardship Clinical Care Standard[45] provides guidance to clinicians, health service managers and consumers on the delivery of appropriate care when prescribing antimicrobials. The standard aims to ensure that a patient with a bacterial infection receives optimal treatment with antimicrobials, which includes avoiding antimicrobial use when it is not indicated. A set of suggested indicators is available as part of the standard to assist local implementation of AMS programs. Prescribers can use the indicators to monitor AMS implementation and support improvement (see Chapter 6: 'Measuring performance and evaluating antimicrobial stewardship programs').

10.4.3 Education and professional development

AMS needs to be supported by competent prescribers practising good prescribing principles. All prescribers have a responsibility to participate in continuing education activities throughout their careers to ensure that their prescribing is based on current evidence and guidelines. See Chapter 5: 'Antimicrobial stewardship education for clinicians' for resources to support professional development.

Resources

- *Therapeutic Guidelines: Antibiotic*
- Antimicrobial Stewardship Clinical Care Standard
- United Kingdom National Institute for Health and Care Excellence: AMS guidelines

Other sources of information about antimicrobials and prescribing:

- *Australian Medicines Handbook*
- *CARPA Standard Treatment Manual*
- NPS MedicineWise and Australian Commission on Safety and Quality in Health Care: National Prescribing Curriculum and online modules on antimicrobial prescribing.

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