



17 Antimicrobial stewardship in rural and remote hospitals and health services

**Antimicrobial Stewardship
in Australian Health Care**

2021

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.

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Acronyms and abbreviations

Abbreviation	Definition
AMR	antimicrobial resistance
AMS	antimicrobial stewardship
APAS	Australian Passive AMR Surveillance
ASGS	Australian Statistical Geography Standard
AURA	Antimicrobial Use and Resistance in Australia
CDI	Clostridioides difficile (previously referred to as Clostridium difficile) infection
COPD	chronic obstructive pulmonary disease
eMR	electronic medical record
GP	general practitioner
ID	infectious diseases
ICP	Infection control practitioner
MRSA	methicillin-resistant Staphylococcus aureus
LHD	local health district
LHN	local health network
MPS	multi-purpose service
NAPS	National Antimicrobial Prescribing Survey
NAUSP	National Antimicrobial Utilisation Surveillance Program
NSQHS	National Safety and Quality Health Service
QUM	Quality Use of Medicines
NP	nurse practitioner
RIPERN	rural and isolated practice endorsed registered nurses
VCPS	virtual clinical pharmacy service
VMO	visiting medical officer

Key Points

- Implementation of an antimicrobial stewardship (AMS) program in rural and remote hospitals may involve unique challenges, including less onsite AMS specialist expertise and staff recruitment and retention challenges.
- Advantages of implementing AMS in rural and remote hospitals include closer inter-professional relationships within the hospital, and with local community providers.
- A multidisciplinary AMS team reduces dependency on an individual member of the healthcare team.
- A nominated committee, either a quality and safety committee, Infection Prevention and Control committee or an AMS committee, should be responsible for governance and oversight of AMS.
- Participating in national antimicrobial surveillance programs may assist in targeting AMS interventions to optimise antimicrobial use.
- It is important to understand the local hospital AMS situation first, by meeting with all stakeholders, and examining and auditing existing practices.
- Rather than seeking to address all aspects of AMS at once, focus efforts on areas with the most potential for success. Use local information and input from stakeholders to guide decision making.
- Clear pathways to obtain expert infectious disease/microbiologist advice are essential, whether from another hospital in the network, via the hospital's pathology laboratory provider or externally.
- Prescribing guidelines and structured care bundles are valuable tools to support appropriate prescribing of empiric antimicrobial therapy and contribute to the success of AMS programs in rural and remote hospitals.
- Formulary restrictions and antimicrobial approval systems are useful but need to be workable and safe within the constraints of the health service.
- Adapting existing resources to the local situation and collaborating with other hospitals, pathology laboratory providers and the jurisdictional Department of Health are likely to make the best use of time and resources for AMS in rural and remote hospitals.

17.1 Introduction

Antimicrobial Stewardship (AMS) is an important part of the Preventing and Controlling Infections standard in the National Safety and Quality Health Service (NSQHS) Standards.^{1,2} This standard was updated in 2021³ to include a requirement for continuous quality improvement in antibiotic use in response to audit.³ In addition, Australia's National Antimicrobial Resistance Strategy describes priority actions to address the growing public health threat of antimicrobial resistance (AMR).⁴ AMS is a key component of the national strategy.

Antimicrobial Stewardship in Australian Health Care (the Antimicrobial Stewardship Book) was published in 2018 by the Australian Commission on Safety and Quality in Health Care (the Commission) to provide an overarching resource for AMS programs in Australia. The Antimicrobial Stewardship Book is available at: <https://www.safetyandquality.gov.au/our-work/antimicrobial-stewardship/antimicrobial-stewardship-australian-health-care-ams-book>.

Additional chapters of the Antimicrobial Stewardship Book are being developed on specific topics to further support and advance AMS in Australia. As these are completed, they are published to continue to expand the content of the Antimicrobial Stewardship Book.

Antimicrobial Stewardship in Rural and Remote Hospitals is the latest addition to the Antimicrobial Stewardship Book. This chapter:

- Describes factors affecting AMS in rural and remote hospitals
- Identifies resources to support appropriate prescribing of antimicrobials
- Provides practical strategies that can be implemented within rural and remote hospitals to improve AMS.

Data collected by the Australian Institute of Health and Welfare is reported using the Australian Statistical Geography Standard (ASGS) Remoteness Structure.^{5,6} Hospitals in regional and remote areas range in size from single bed multi-purpose services (MPSs) to facilities with more than 600 beds in large regional areas.⁷ Using the ASGS definitions of “regional” and “remote,”⁸ 76% of Australian public hospitals are located in these areas.⁷ This represents approximately 32% percent of average available beds in Australia.⁵

This chapter will use the term “rural and remote” to refer to areas outside Australia’s major cities. These terms are predominantly used by these health service organisations and encompass inner regional, outer regional, remote and very remote in the ASGS.⁹

17.1.1 Factors impacting AMS in rural and remote hospitals

Until recently, published research on AMS programs has largely focused on acute care hospitals in major cities. Whilst some of this research may be translatable to larger rural referral hospitals with a similar range of services and resources, it may be less relevant to the smaller hospitals and MPSs that make up most of the services in rural and remote areas.

This chapter explores the challenges and opportunities that hospitals in rural and remote areas face in implementing AMS programs and provides guidance on mechanisms for establishing and sustaining successful AMS programs in these settings. Rural and remote health care delivery is not homogenous; several large services may be available within an hour, or two hours’ drive, or the facility may be much further away.

The proportion of the population in rural areas that are Aboriginal and/or Torres Strait Islander peoples is generally greater, influencing infectious disease patterns and antimicrobial needs. AMS for Aboriginal and Torres Strait Islander populations is discussed in detail in Chapter 15.

Some of the larger rural hospitals provide complex services such as specialist surgical, haematology/oncology, and high-dependency or intensive care units,⁵ and have on-site specialists, or specialists who visit regularly. Some rural hospitals have an emergency department or urgent care service, acute inpatient services and residential aged care services. Rural and remote hospitals with fewer than 50 beds are often serviced by visiting medical officers (VMOs), many of whom are general practitioners (GPs).

Some of these smaller facilities have no on-site doctors, nurse practitioners (NPs) or rural and isolated practice endorsed registered nurses (RIPERNS), and no on-site pharmacy service or pathology provider. The range of services provided by these hospitals aligns with the relevant capability frameworks in accordance

with the resourcing and expertise available. For the purposes of this chapter, the scope of services in rural and remote areas also includes MPSs.

With so many different service models in rural and remote Australia, AMS programs need to be tailored to local needs and resourcing. Published Australian data on AMS often focuses on tertiary referral hospitals. There is overseas data from rural and remote settings,²⁴ but international studies describing AMS programs within community hospitals in geographically smaller countries may not be directly relevant to the Australian context.

Australia is unusual in its wide geographical spread of the population, with low population density and often limited infrastructure in remote areas. Studies in Australia, undertaken prior to the introduction of the NSQHS Standards, identified large differences in AMS activities and resources available to support AMS in rural and remote hospitals.¹⁰⁻¹² This early work reported a lack of capacity and infrastructure for core AMS elements including development of local prescribing policies, antimicrobial approval systems, individual prescription review, and auditing.¹¹

Key barriers to the development of AMS programs in rural and remote hospitals were identified as a lack of formalised access to specialist support, lack of on-site pharmacists

with AMS skills and poor access to education (see Table 17.1).¹³ High staff turnover may make it difficult to monitor long term outcomes of AMS interventions and access to timely, reliable AMS data may be reduced. Enablers of AMS were identified as a flatter governance structure, better 'buy-in' from prescribers and the hospital executive, access to telehealth services, and a greater sense of community amongst staff, with pride in their facility and a desire to see the AMS program succeed.¹³

It is these types of factors that have enabled many health services to develop innovative service models to meet their community's needs, in diverse geographical and cultural settings. These models are often characterised by multidisciplinary team approaches to provide good health outcomes with limited resources.

AMS interventions have great potential to improve prescribing practice and reduce AMR rates.^{14,15} An opportunity that exists in rural and remote communities is the potential for a cross-sectoral approach to AMS because GPs and other health care workers tend to work across acute, residential and primary care. It is especially important to engage rural and remote prescribers in AMS as they are more likely to prescribe antimicrobials and more likely to prescribe antimicrobials inappropriately compared to metropolitan clinicians.^{15,16}

Table 17.1 Major barriers and enablers for implementing antimicrobial stewardship programs in regional and rural hospitals¹³

Major enablers	Major barriers
Flatter structure of governance within small hospitals	Lack of formalised access to infectious diseases (ID) or clinical microbiology support
Pride in local healthcare facilities & healthcare provision	Lack of access to education and training
Access to <i>Therapeutic Guidelines: Antibiotic</i> for all public healthcare facilities throughout Australia	Lack of internal expertise within healthcare facilities, especially pharmacists with antimicrobial stewardship skills
Low use of broad-spectrum antimicrobials	Difficulty attracting and retaining qualified clinicians in rural and remote areas
Good telehealth and internet access, and willingness to embrace technology	Differing governance structures among the states and territories, and among individual facilities
Lower prevalence of multi-drug resistant organisms	Primarily generalist workforce with multiple responsibilities in addition to AMS

17.2 Establishing AMS in rural and remote hospitals

As most of the published information on AMS comes from experiences in major city hospitals, there may be a misconception that successful programs require the same type of resources as available in larger healthcare organisations, such as on-site physicians and pharmacists with specialised infectious diseases (ID) training and AMS information systems (see Chapter 1). However, successful AMS programs can be developed and implemented in settings with a different workforce.^{17,18,19}

Essential requirements are indicated in the NSQHS Standards¹ and the Safety and Quality Improvement Guide for the Preventing and Controlling Infections standard.² The requirements included in the second edition of the NSQHS Standards¹ and the 2021 Preventing and Controlling Infections standard³ provide further guidance. Since the release of the first edition of the NSQHS Standards in 2013,²⁰ which required all hospitals establish an AMS program, important lessons have been learned about what makes these programs successful in rural and remote settings.

The extent and type of AMS activities that can be undertaken by rural and remote hospitals will vary dependent on the nature of the service being provided and the patients and residents being cared for. No single AMS program design will fit all settings. Chapters 2 to 6 describe a range of AMS interventions that facilities can consider. It is important that interventions are customised for application to different settings.²¹ Using multiple approaches is likely to be more successful.²² Intermountain Healthcare evaluated various AMS programs in small hospitals in the United States.²² A multi-pronged approach including elements such as education, access to infectious diseases expertise and antibiotic utilization data, audit and feedback resulted in reduced use of antibiotics.²²

Developing an AMS program in a setting with lower caseloads and fewer resources requires good planning and collaboration with local and network clinicians and stakeholders. It is often not practical to tackle all AMS problems at once. Priorities need to be agreed between stakeholders and be informed by available data.²³ AMS

implementation timelines, schedules and objectives also need to be agreed with stakeholders.

The following information should be read in conjunction with Chapter 2, which provides guidance on establishing and sustaining an AMS program, using quality improvement methodology. Options are included for governance, committee structures, and AMS team membership in rural and remote facilities (Table 2.1, p43 and Table 2.3, p46-47).

17.2.1 Governance

Clinical and corporate governance structures for public and private hospitals in rural and remote locations vary widely. These facilities may be standalone hospitals or part of regional networks. A private hospital may be part of an Australia-wide network. Regardless of what type of governance arrangements exist, building on existing structures initially is ideal when there are fewer resources.²⁴

Most state and territory health departments have established AMS advisory committees or networks; many Local Hospital Networks (LHNs) or Local Health Districts (LHDs) have well developed AMS programs. LHNs/LHDs with staff dedicated to AMS in larger facilities may be required, or be willing to, share resources, work collaboratively and provide oversight to rural and remote facilities within the network.

Where the LHN/LHD has a network AMS committee responsible for the development and ongoing evaluation of the AMS program, public hospitals and multi-purpose services in the network should be represented on the committee overseeing AMS. In rural and remote areas, as in metropolitan practice, private hospitals may have staff in common with local public hospitals. Improving local AMS expertise has the potential to enhance both public and private systems within local communities due to this overlap.

At the local hospital level, AMS should sit within the hospital's clinical governance structure. Lines of accountability and the reporting structure should be confirmed early in the development of the program (see Chapter 2). Links need to be established with an executive member (or members) responsible for ensuring that the strategic goals for AMS are outlined and met.

Role of the Hospital Executive

Engaging with the hospital executive on an ongoing basis during implementation or improvement of the AMS program will assist in acceptance by clinicians.

Obtaining and maintaining executive engagement may be easier in smaller rural and remote hospitals, which often have a flatter governance structure, and strong commitment from local clinicians who are willing to lead and become involved in quality improvement activities.

Identifying where accreditation requirements would support the case for resource allocation is likely to enhance support for AMS in rural and remote hospitals.²⁵ The hospital executive can also provide the appropriate oversight of, and support for, AMS, which increases AMS sustainability.²⁵ An executive sponsor can potentially facilitate appropriate resource allocation, for both service provision and the ongoing education components. See Chapter 2, pp44–45 for examples of ways in which the hospital executive can demonstrate support for AMS in the organisation.

17.2.2 Local AMS Committee and team

AMS Committee

Larger rural and remote hospitals may have a dedicated AMS committee separate from the LHN/LHD AMS Committee. For smaller hospitals, the make-up of the committee will depend on available staff and may involve members who have regional roles (e.g. an LHN/LHD AMS pharmacist) or members from a larger facility in the LHN/LHD. Off-site AMS specialists may attend meetings by teleconference or videoconference to provide expert advice to the committee.

A standalone AMS Committee may not be feasible for all smaller rural and remote hospitals. Where this is the case, AMS committee functions may be incorporated into an existing related committee, such as the:

- Drug and Therapeutics Committee
- Infection Prevention and Control Committee
- Medication Safety Committee
- Safety and Quality Committee.

The relevant committee might be formally expanded to include AMS, acknowledging this with an expanded title. At a minimum, the terms of reference should be revised to specifically include AMS and relevant membership. AMS should be a standing item on the committee's agenda. Members with expertise from outside the hospital may be invited to join the committee, and expert advice, such as infectious disease (ID) physician or AMS pharmacist, should be co-opted by the committee when needed.

AMS team

All facilities should have a local AMS team. The size and make-up of the team will vary with facility size and available resources. The types of consumers using the service must also be considered when determining the make-up of the AMS team.

A survey of all Australian public hospitals with paediatric beds, of which 49 were regional or rural, revealed the perceived barriers to AMS were lack of specialist ID and microbiology services, lack of dedicated pharmacy resources and a lack of clinician education.²⁶ Despite having paediatric beds, only 9% had paediatric representation on the AMS team, compared with 35% for tertiary and metropolitan hospitals.²⁶ Rural hospitals were also less likely to have dedicated AMS resources and staff.²⁶

Therefore, in rural and remote hospitals, innovative approaches are often required to develop an AMS team. When developing an AMS team at a small hospital, the engagement and interest of staff is often more relevant than their roles.²³ Nurses or midwives, NPs or RIPERNS, along with doctors including trainees, GPs, VMOs, physicians, surgeons, anaesthetists, and pharmacists with an interest in appropriate use of antimicrobials, quality and safety, or medication management may be key team members.

Ideally, the team should include at least one medical practitioner (a potential medical champion), one pharmacist (where possible), plus at least one nurse or infection prevention and control practitioner (ICP). These staff should be provided with AMS training. Clinical champions play a crucial role in AMS programs in rural and remote hospitals.²⁵

Engaging local prescribers by including them as AMS team members is a useful way to obtain prescriber buy-in to the AMS program.

Prescribers can then be involved in the development of the AMS policy and plan.²⁵ Key person dependency should be avoided wherever possible and is a particular risk in rural settings, together with practitioner burnout.²⁵

Rapid turnover of staff can also be an issue in rural hospitals, which can be a barrier to implementation of evidence-based care.²⁷ Turnover of pharmacy staff has been identified as a challenge for AMS programs in rural and remote settings.²⁸ Engaging long-term clinical staff such as experienced local nurses may improve the sustainability of AMS program interventions.²⁵

Consumer input is also important (see Chapter 7). The implementation of the King's Fund Collaborative Pairs program in Western NSW may serve as an example for rural and remote settings.²⁹ See Chapter 2 for further information on AMS team roles and responsibilities.

17.2.3 Expert advice and support

Although AMS programs can be run successfully without on-site ID physicians or specialised pharmacists, it is important that these experts are available to provide support when it is needed, such as managing complex issues relating to the hospital antimicrobial policies or individual patient management.³⁰ For example, long term duration of therapy of antimicrobials may pose clinical, financial and logistical challenges. Delivery of specialised items to ensure continuous supply may be a logistical challenge in remote sites. Processes or a flowchart for accessing expert advice need to be clearly defined in the AMS policy.

Different avenues for obtaining expert advice and support for rural and remote AMS activities are presented in Box 17.1.

Box 17.1 Opportunities for expert advice and support in hospitals in rural and remote areas

- State and territory AMS leads.
- LHN/LHD or regional AMS network.
- Infection control practitioner networks.
- Recruiting an AMS pharmacist(s), possibly with an LHN/LHD or regional role, or a part time practitioner.
- Formalising ties with ID physicians in the LHN/LHD.
- Contracting ID services from an external ID physician or ID department.
- Clinical microbiologists who work in the laboratories that provide diagnostic support to the facility (including public, private or state-wide services).
- Telehealth services.
- Participating in national surveillance programs e.g. NAUSP, NAPS.

LHN/LHD or regional AMS networks

Establishing an LHN/LHD or regional AMS program led by a multidisciplinary AMS committee is a model that has been adopted in some Australian jurisdictions and overseas, to coordinate and support AMS activities across all facilities in the health network. In Scotland, all regional National Health System (NHS) boards have AMS teams that are responsible for implementing AMS across primary and secondary care.³¹ Many Australian public and private hospitals have regional or local hospital boards or management structures that have the potential to drive AMS in their hospitals and the smaller facilities for which they are responsible.

Rural and remote health service boards in Australia do not generally have oversight of primary care practices, but GPs are part of the usual medical workforce in many rural and remote hospitals. This means that health service boards can have an impact on both primary and secondary care in rural and remote Australia, via effective governance of AMS programs in hospitals.

Case study 17.1 from an Australian LHN provides an example of how the network can support AMS activities in a smaller hospital.

Case study 17.1 Local Hospital Network support for antimicrobial stewardship in a small remote hospital

Hospital A is a 17-bed public hospital in a remote area and is part of a Local Hospital Network (LHN) that includes:

- A principal referral hospital in a major city, which has many on-site specialist services, including an ID unit and a microbiology laboratory
- Four smaller public acute hospitals that have on-site general surgeons and general physicians
- Three very small mixed subacute and non-acute hospitals that are served by visiting GPs.

The AMS service at the principal referral hospital is provided by three ID physicians who have appointments in AMS and work in the service for a month at a time on a rotating roster, and two full-time clinical microbiologists associated with the microbiology laboratory. A full-time AMS pharmacist is employed to oversee the program for the LHN.

AMS Committee

An LHN AMS committee has been established and holds monthly meetings at the principal referral hospital. Representatives from the networked hospitals attend these meetings in person, and remote hospital representatives attend by videoconference.

Expert AMS clinician support

The network AMS pharmacist visits Hospital A at least quarterly, to familiarise themselves with the local AMS issues, understand the local environment and build rapport with the staff. ID physicians do not always attend these visits because of their busy clinical schedules, but each ID physician aims to visit Hospital A at least once a year.

Clinical Champions

GPs at the smaller hospitals have been nominated as local AMS clinical champions. They are responsible for the daily running of the AMS program. A generalist pharmacist also visits Hospital A for four hours twice a week, and assists with local issues, including setting up the hospital formulary and some post-prescription reviews. However, AMS is not their major role, and they only have minimal time for these activities. Both the GP champion and the general pharmacist at Hospital A have sought extra training in AMS by attending short courses, and they are supported through a system of mentorship from the networked ID physicians and AMS pharmacist. They are encouraged to phone the AMS team at the principal referral hospital to discuss any issues and to seek antimicrobial prescribing advice.

Antimicrobial policy and guidelines

The guidelines, policies and procedures are developed by the LHN AMS committee. They are available to all hospitals in the LHN and are customised to suit the local context of the Hospitals.

Education

The AMS team at the principal referral hospital is responsible for delivering education on antimicrobial use to the staff across the entire network, using online conferencing.

Information technology

Hospitals in the LHN have a common information technology system, which allows access to any results or investigations for patients from all sites. The hospitals also have an electronic approval system for pre-prescription approval of restricted medicines, which functions on a multisite platform. The AMS team can view the approvals at each of the sites within the LHN and phone to discuss cases with prescribers, if necessary. They can also recommend formal consultation with the ID service, if appropriate; this is usually a telephone consult, but is sometimes part of a weekly formal ID ward round, conducted using telehealth. Within the LHN, the uptake of the electronic approval system was fastest for Hospital A, even though it was one of the least resourced services. This was because Hospital A had a highly enthusiastic and respected local champion, and staff who were keen to have a successful program, as well as some friendly rivalry among the smaller hospitals within the LHN.

ID Services

The benefits of consultation with an ID specialist in improving outcomes for clinical infections (including reducing morbidity, mortality and healthcare costs) are described in Chapter 8.^{32,33} For facilities that are not part of a network, formal arrangements for specialist support sometimes exist, but there are sites where such arrangements are not in place.¹¹ Solutions must be tailored according to the jurisdiction or service.

Accessing ID advice is reported as a significant challenge for AMS programs in rural and remote hospitals.²⁸ Formalising a model of care and service delivery approach, which supports arrangements to access help via outreach visits or use telehealth, is vital.²⁸ For example, Intermountain Healthcare implemented AMS in 16 small community hospitals in the United States, including infectious diseases telehealth services as a critical part of their integrated approach.³⁴

Rural and remote hospitals that are not able to employ ID physicians should consider using consultant services to provide:

- Clinical advice for management of individual patients with complex conditions, unresolved infections or as needed
- Assistance in developing local guidelines for selected indications
- Ongoing education and training to local staff
- Assistance in guiding AMS program activity
- Assistance in interpreting audit data and planning appropriate responses
- Assistance with managing the antimicrobial approval system.

Further examples are provided in Table 17.2.

In determining the most appropriate service delivery model for the population the hospital serves, consider the contractual and network arrangements for off-site expert ID and clinical microbiological advice. A formal support arrangement helps AMS clinicians build trust and rapport with the ID service, provides consistency in advice, and accountability for appropriate follow-up. Any off-site input needs to be provided within the context of local factors, such as local epidemiology of microorganisms, longer timeframes for microbiological test results to be received and the impracticality of therapeutic monitoring at some sites due to laboratory service constraints.³⁵ These challenges must be

considered, rather than attempting to adopt a process from a large hospital without adapting it for local conditions.

It is essential that whatever arrangements are put in place to provide the consultant service, there are clear lines of responsibility and accountability for advice provided by the ID service. This will need to include provision for the consideration and acceptance or rejection of that advice by the local clinician responsible for the patient's care.

17.3 Antimicrobial stewardship strategies in rural and remote hospitals

Strategies for AMS in rural and remote hospitals need to account for the local environment and available resources.

17.3.1 Antimicrobial prescribing policy

All rural and remote healthcare facilities in Australia should have an antimicrobial prescribing policy in place that:

- Is consistent with *Therapeutic Guidelines: Antibiotic*³⁶
- Is tailored to the local environment, resources and staff but aligned with other hospitals which share staff
- Describes situations that require escalation or discussion with an ID physician or clinical microbiologist
- Outlines referral processes that fit into the clinical workflow and are workable for clinicians. (See Table 17.2 for examples of the types of situations that may require expert advice. These will vary by hospital, depending on the local expertise available).

The policy may be developed by the AMS committee. Examples of AMS policies are:

- NSW CEC sample antimicrobial stewardship policy for a Local Health District or network³⁷
- Antimicrobial stewardship policy of the Western Australian Department of Health³⁸

Table 17.2 Scenarios that may trigger a request for advice from an ID physician or clinical microbiologist

Antimicrobial factors	Patient factors	Microbiology results indicate
<ul style="list-style-type: none"> Broad-spectrum and high cost antimicrobials (e.g. linezolid, daptomycin) Vancomycin, azithromycin, ceftriaxone, piperacillin–tazobactam, or meropenem for longer than three days* Aminoglycosides e.g. gentamicin for >48 hours Systemic antifungal agents (e.g. amphotericin or echinocandins) Intravenous antimicrobial therapy for longer than 7 days. 	<ul style="list-style-type: none"> <i>Staphylococcus aureus</i> bacteraemia Candidaemia Infected prosthesis Infective endocarditis Epidural or brain abscess Bacterial meningitis or encephalitis Osteomyelitis Diabetic foot infection Infective spinal discitis Severe sepsis/septic shock Fever of unknown origin Febrile neutropenia in immunocompromised patients Serious infection in morbidly obese or very underweight Impaired renal or hepatic function Water-borne infection (e.g. coral cuts) Necrotising fasciitis Fever of unknown origin 	<ul style="list-style-type: none"> Invasive methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) infections Multidrug-resistant gram-negative infections <i>Clostridioides difficile</i> infections (CDI) Vancomycin-resistant enterococci Tuberculosis Malaria Fungaemia

*At facilities where meropenem is highly restricted, any use would require review.

17.3.2 Prescribing guidelines and structured care bundles

Prescribing guidelines should be available for the common infections treated in the facility.

Guidance should:

- Endorse *Therapeutic Guidelines: Antibiotic*,³⁶ taking into account local bacterial susceptibilities.=
- Utilise existing prescribing guidelines such as the Central Australian Rural Practitioners Association (CARPA) *Standard treatment manual*.³⁹ These can be customised to suit the common conditions seen in remote practice and are particularly useful for nurse-run facilities
- Be developed in collaboration with local physicians, with input from an ID expert
- Be endorsed by the hospital executive.
- Be readily available to clinicians, including when they are off-site. This is especially important if prescribers are in private consulting rooms but are responsible for patients admitted to the hospital

- Electronic prescribing support tools may assist.

Regardless of the source of the prescribing advice, it is imperative that there is a process to update the information when changes occur. A useful example is the South Australian antimicrobial prescribing clinical guideline.⁴⁰

Clinical care pathways and structured care bundles are a useful way to promote consistent, evidence-based, high-quality prescribing. A number of Australian studies have shown that antimicrobial prescribing was more likely to be inappropriate in rural and remote hospitals compared with large city hospitals for sepsis and cellulitis, and that broad-spectrum antimicrobials may be overused in the treatment of infective exacerbations of COPD.^{41,42} There may be justifiable reasons for this. As a minimum, hospitals should have pathways or guidance on:

- Sepsis management⁴³
- Community-acquired pneumonia management⁴⁴
- S. aureus* bacteraemia management⁴⁵
- Intravenous-to-oral switch⁴⁶

Even when collaboration with other hospitals is undertaken to develop clinical guidelines and structured care bundles, implementation must always be adapted as necessary to ensure local applicability.²⁴

Tailoring the AMS intervention to the local context is likely to increase its uptake by clinicians.⁴⁷ This involves identifying local barriers and enablers to ensure an appropriate intervention.^{24,47} Undertaking a small project with a quick win is especially important in rural and remote settings with fewer resources.²³

With an understanding of the local context, a review of the available evidence and the assistance of expert advisors, further structured care bundles can be added over time, for other conditions that would benefit from such an approach to management.⁴⁸

17.3.3 Formulary restrictions and approval systems

Introducing restrictions on antimicrobial use is an effective strategy for improving the appropriateness of antimicrobial prescribing. Models of restriction will vary depending on available resources.³⁶

Points to consider when designing a system to restrict antimicrobial prescribing include:

- Developing formularies at an LHN/LHD or jurisdictional level
- Restricting access to broad-spectrum antimicrobials.⁴ This may be the most efficient and direct method of monitoring and limiting antimicrobial use in hospitals with limited resources. Such a restriction should be accompanied by appropriate advice and escalation pathways for clinicians so that they know what they can prescribe instead of the restricted antimicrobial, if appropriate⁴¹
- Designing a model of restriction according to specific needs and resources of the facility e.g. the NSW CEC fact sheet on antimicrobial restrictions in small to medium-sized hospitals⁴⁹
- Engaging interested local physicians, surgeons, GPs or pharmacists as stewards of the approval system. These stewards require access to an ID physician or clinical microbiologist to refer difficult or unusual cases for expert advice. Smaller hospitals

without onsite physicians or pharmacists may use other models⁴⁹

- Having arrangements in place to quickly access broad-spectrum or infrequently used (including high cost, restricted access) antimicrobials (e.g. through aeromedical service imprest, special arrangements with larger facilities that commence the patient on infrequently prescribed antimicrobials). Antimicrobials that are not routinely stocked in the hospital may require special access arrangements or transfer of the patient to another site for treatment. These arrangements must include consideration of the logistics of obtaining antibiotics outside the local formulary, to minimise risks to patients from transport or supply delays.

In the private sector, there are a number of barriers to restricting antimicrobials.⁵⁰ Developing a clinical AMS service to work directly with the private specialist and decision support tools may be solutions for some rural private hospitals.⁵⁰ It is important to involve the hospital doctors in the discussion about how to implement AMS.⁵⁰

17.3.4 Prescription review and feedback

A mechanism should be established to review the quality of antimicrobial prescribing and provide direct feedback to prescribers. Ideally, this should be done by a clinician who can assist with post-prescription review by identifying high-risk patients, or patients from a predetermined list of key indications or antimicrobials, and by:

- Scanning and forwarding copies of paper medication charts, or digitally transmitting medication orders from the digital health record, to an off-site pharmacy department or local contracted community pharmacy for review. Audit can be conducted in the context of the relevant clinical information
- Having regular teleconferences or videoconferences with off-site pharmacists, ID physicians or clinical microbiologists to review patients' prescriptions and discuss cases
- Using established clinical networks, and via telehealth, include off-site experts in ward rounds of high-risk or high-use areas, such as intensive care units, high-dependency units, and oncology and surgical patients.

Healthcare facilities with fewer resources should focus their prescription review efforts on areas where AMS interventions will likely achieve the most significant return. This will include conditions that account for the majority of the antimicrobial prescriptions, and those with most of the inappropriate antimicrobial prescriptions. Audits such as the National Antimicrobial Prescribing Survey (NAPS)⁵¹ can help in identifying the units, services, groups of providers and even individual providers that contribute significantly to inappropriate antimicrobial use.

Several studies have shown that targeted AMS interventions can be effective in hospitals with limited ID resources. For example, Yam et al¹⁸ describe an AMS program at a rural hospital, with no ID physician or trained ID pharmacist, in which six antimicrobials with high potential for misuse were targeted for specific interventions. These interventions were pharmacy directed and included prospective review of prescriptions with streamlining of therapy (ensuring narrow spectrum and avoiding combinations if possible), appropriate discontinuation, antimicrobial change and dose optimisation.¹⁸

Similarly Brink et al¹⁹ in a study of 47 hospitals with limited ID resources showed a pharmacist-led program, focusing on five targeted interventions, aimed at decreasing antimicrobial consumption (reducing instances of prolonged duration, multiple antimicrobials and redundant coverage) was able to achieve a sustained reduction of 18.1% in antimicrobial consumption in the group as a whole.¹⁹ These examples illustrate that rural and remote hospitals that invest in pharmacist-led AMS programs can achieve impressive results by carefully targeting their AMS interventions.

17.3.5 Monitoring and reporting antimicrobial use and resistance

Tracking and monitoring antimicrobial use and resistance allows AMS teams to identify target areas for improvement and to measure the effect of AMS interventions. This should include regular prescribing audits, monitoring local resistance trends, including producing or requesting antibiograms from the local pathology laboratory provider.

It is preferable to measure usage and audit prescribing using standardised and validated tools that can be used to benchmark data with

local or similar facilities, such as the National Antimicrobial Utilisation Surveillance Program (NAUSP)⁵² and the NAPS.⁵¹ Sharing resources avoids duplication of effort and permits comparison of data.

Collecting quantitative antimicrobial use data may be difficult in very small facilities, particularly if there is no access to dispensing data. Also, patient numbers may be too small to show significant changes in usage rates over time. Audits of qualitative prescribing practices using tools such as the Hospital NAPS⁵¹ or Quality Improvement NAPS⁵³ may be more useful because they can be easily collected using available resources and tailored to the hospital casemix. Simple regular audits, such as the Quality Improvement NAPS⁵³ or the NSW CEC 5x5 audit⁵⁴ are likely to suit small facilities. Participation in Australian Passive AMR Surveillance (APAS) is also possible through the local pathology laboratory software and reporting systems.

It is important to carefully choose what to audit, and concentrate on issues that are appropriate to the scope of services provided, with results that can be acted on quickly and effectively.¹⁷ Targeting a small number of key issues that can be addressed with available resources may be more productive than attempting to improve all the known problems at once. With any audit, it is important to determine how the findings will be reported, who will receive feedback, how they will be used, and education for quality improvement.

The ability to collect resistance data will depend on the microbiology laboratory's capabilities and the pathology software used. The production of antibiograms may be less helpful than at larger hospitals, due to the small number of isolates identified from smaller facilities. It may be more useful to consider combined regional antibiograms for several facilities in a given area, or to concentrate on certain resistant organisms in one facility if a problem arises there, such as high rates of colonisation with MRSA, or a local outbreak of vancomycin-resistant enterococci or carbapenemase-producing *Enterobacterales* (formerly *Enterobacteriaceae*).

APAS⁵⁵ is part of the AURA Surveillance System.⁵⁶ It is a de-identified source of information about resistance.⁵⁵ If the hospital's pathology laboratory provider contributes to APAS, local reporting and antibiograms may be available.⁵⁵ The Pharmaceutical Benefits Schedule Australia⁵⁷ and

the *Australia Atlas of Healthcare Variation*⁸ are additional possible sources of useful information about local prescribing.

Box 17.2 Monitoring AMR in northern Australia⁵⁶

The HOTspots resistance surveillance program monitors AMR in the far north of Australia. Participating regions are far north Western Australia, Northern Territory and far north Queensland. The program has shown that resistance rates of some important pathogens are higher in this region than in other parts of the country. HOTspots collects susceptibility data on 14 key pathogens.

MRSA is prevalent in northern Australia. In 2019 aggregate rates of MRSA for northern Australia were 27.7% for blood *isolates*, compared with 17.7% nationally; and rates of resistance to fluoroquinolones in *Escherichia coli* were similar to national figures (HOTspots, 14.6–14.8%; national, 11.4–13.7%).

In contrast, rates of resistance to third-generation cephalosporins (ceftriaxone or cefotaxime) were generally higher in northern Australia (8.3–18.2%) than nationally (8.0–11.9%). Reports of erythromycin-resistant *Streptococcus pyogenes* remained low (<2%) in far north Queensland between 2015 and 2017, and rose to 8.0% in 2019. Rates of resistance to erythromycin and tetracycline in *S. pneumoniae* have fallen in far north Western Australia, but remained stable in far north Queensland over the period 2015–2019. However, erythromycin resistance rates were still high in 2019: 11.0% across the three regions.

17.3.6 Evaluating program outcomes

In rural and remote hospitals, process measures may be more appropriate than outcome measures to monitor the success of AMS initiatives and identify areas for improvement.

Demonstrating a significant change in outcomes such as antimicrobial use or local bacterial resistance patterns may be difficult in smaller hospitals because of smaller patient numbers. Selecting a particular infection (e.g. *S. aureus*) and auditing quality of management may be an alternative way to evaluate program outcomes. Other examples of measures relevant to rural and remote settings and suitable data collection tools are provided in Table 17.3.

Table 17.3 Examples of process measures for rural and remote hospital AMS programs⁵⁹

Measures	Data collection tools
Regular standardised drug consumption data	National Antimicrobial Utilisation Surveillance Program ⁵²
Proportion of antimicrobial prescriptions in which the indication has been documented	Hospital NAPS ⁵¹ Quality Improvement NAPS ⁵³ NSW CEC 5x5 audit ⁵⁴
Proportion of prescriptions that are compliant with <i>Therapeutic Guidelines: Antibiotic</i>	Hospital NAPS ⁵¹ Quality Improvement NAPS ⁵³ NSW CEC 5x5 audit ⁵⁴
Proportion of prescriptions for surgical prophylaxis compliant with guidelines	Hospital NAPS ⁵¹ Surgical NAPS ⁶⁰ NSW CEC 5x5 audit ⁵⁴
Number of referrals to ID or microbiology services	Not applicable
Antimicrobial Stewardship Clinical Care Standard indicators	Hospital NAPS ⁵¹ Surgical NAPS ⁶⁰ Quality Improvement NAPS ⁵³ NSW CEC 5x5 audit ⁵⁴
National quality use of medicine (QUM) indicators: antibiotic therapy	National QUM indicators for Australian Hospitals Data collection tool for Indicator set 2: Antibiotic therapy ⁶¹

Note that many smaller sites do not contribute to NAUSP. For MPSs, the Aged Care NAPS (AC NAPS) may be suitable (see Chapter 16 on AMS in community and residential aged care). See Chapter 5 for further information on auditing and measuring antimicrobial use.

17.3.7 Education

Lack of access to ongoing education is a potential limitation to implementing an AMS program in a rural and remote hospital, but technology can readily be used to deliver AMS education, which has improved access for those practising outside metropolitan areas.⁶

Health professionals directly involved in implementing the program, including nurses, ICPs, pharmacists and physicians can access education on antimicrobial prescribing and AMS through a range of different formats. These include webinars, online training modules, video lectures and education activities organised by professional organisations and state or territory AMS networks/committees. ID physicians, AMS pharmacists or microbiology staff from a larger hospital or the LHN/LHD network can be engaged to provide outreach education to rural and remote hospitals in person or by webinar. See Chapter 5 for further information on education, and links to online resources.

17.4 Enablers for AMS in rural and remote hospitals

17.4.1 Clinical team support

Nurses

It is important to fully utilise available nursing expertise.⁶² Nurses contribute substantially to AMS activities, leading AMS programs and audit activities such as the NAPS and retaining a hospital's clinical corporate knowledge, which can influence the prescribing practices of new, rotating or visiting clinicians.^{25, 63}

Nurses work within the quality systems in the rural or remote hospital. They can help identify potential enablers when a new program or AMS intervention is initiated. Nurses should be provided with the time, resources and the training in AMS required to perform their roles.

ICP

If available, ICPs are a valuable resource in rural and remote AMS programs (see Chapter 12).

Pharmacists

A pharmacist is a major asset to an AMS program. Pharmacists may be responsible for coordinating hospital AMS activities.^{18,19} In hospitals without an on-site pharmacist, AMS may be supported by a regional pharmacist, whether as part of an LHN/LHD AMS service or within a regional network. The community pharmacist contracted to provide medicines and services to the local hospital may be best placed to assist, and should be encouraged and supported in this role

Mentorship from a specialist AMS pharmacist (e.g. from an established program at a different hospital or the LHN/LHD AMS Service) and access to additional AMS training are likely to be beneficial to a generalist pharmacist taking on this role.⁶⁴ Virtual pharmacy services are also being explored in remote NSW health facilities (see Case Study 17.2).⁶⁵

Medical practitioners

If a facility has access to a specialist with ID training, this person should be involved in the AMS program. For facilities without such support, GPs, general physicians and surgeons may be involved in local AMS programs. Indeed, it can be a significant advantage to have generalist medical practitioners championing AMS, as the program may then be seen to be relevant to all prescribers, rather than being in the domain of ID experts only. Antimicrobials are among the most common medicines prescribed by GPs, physicians and surgeons; these clinicians have a reason to be interested in AMS.⁶⁶ Whether or not they are trained in ID hospitals, which often must send specimens long distances.²⁸ These delays can impact on, these clinicians will likely benefit from some training in AMS.

Microbiology

Microbiology laboratory staff may also be able to assist with supporting AMS programs. Smaller and remote hospitals have established links to pathology services that may include the availability of clinical microbiologists. These links are often much more established than links to ID departments. Clinical microbiologists can advise on use of point of care testing, assist with interpretation of local or regional antibiograms on a regular basis (at least annually), education and training on correct collection of microbiology specimens and interpretation of results. It is important to consider local factors

that impact on the implementation of AMS. For example, blood cultures and other results often take longer in geographically isolated choice of

empiric antimicrobial therapy and can delay switching to a more appropriate drug.²⁸

Case study 17.2 Virtual clinical pharmacist-led antimicrobial stewardship in rural and remote New South Wales hospitals⁵⁶

In 2020, the Western New South Wales Local Health District introduced a virtual clinical pharmacy service (VCPS) at eight small rural and remote hospitals that did not have routine access to hospital pharmacists. The VCPS uses videoconferencing, electronic medication management and the electronic medical record (eMR) to provide proactive, accessible advice on the quality use of medicines. Before introduction of the VCPS, there were few local antimicrobial stewardship (AMS) activities in place.

As part of a comprehensive clinical pharmacy service, the VCPS provides proactive quality reviews of all prescribed antimicrobials. Non-compliance with guidelines or recommendations for optimising therapy are documented in the patient's health record and communicated to clinicians through the eMR. Urgent issues are addressed over the phone. For consistency in documenting AMS reviews and to assist with data collection, a standardised eMR note template was introduced, based on the National Antimicrobial Prescribing Survey (NAPS) audit tool. The VCPS began contributing antimicrobial usage data to the National Antimicrobial Utilisation Surveillance Program (NAUSP) in January 2020.

NAUSP data are analysed, incorporated into monthly reports, and discussed with nursing and executive staff during regular service rounds at each facility. General and targeted antimicrobial education is provided to medical and nursing staff in response to identified antimicrobial use issues. These have included targeted education on AMS to nursing staff and a presentation from an ID physician on community-acquired pneumonia and appropriate use of ceftriaxone for medical officers.

The VCPS also aims to optimise antimicrobial stock management by providing education and reviewing imprest levels, especially when this is suspected to contribute to undesirable usage trends. Patients also received education on antimicrobials during admission and on discharge.

VCPS education initiatives included:

- Provision of medication lists
- Provision of specific information on quality use of antimicrobials
- Education about use of antimicrobial infusers in the post-acute setting
- Education about clearance of methicillin-resistant *Staphylococcus aureus*
- Education about treatment options for *Clostridioides difficile*.

After nine months (April 2020 to January 2021), 885 patient admissions had been reviewed by the VCPS, resulting in 293 AMS interventions. AMS interventions accounted for 18% of all pharmacist-identified medication-related issues. The most common AMS interventions related to insufficient documentation of duration of therapy, followed by inappropriate use of broad-spectrum antimicrobials (Figure A). Most AMS interventions (74%) were either accepted or accepted in part by the treating team.

The clinical significance of the interventions was rated on a 5-point scale (minimum, minor, moderate, major and serious). Pharmacists reported 31% of interventions as minimum, 51% as minor and 18% as moderate. Pharmacists self-reported using an intervention tool and expected 69% of patients to have a positive clinical outcome based on the AMS recommendation.

The prescribing and use of some antimicrobials continue to present challenges in rural settings. However, AMS review and intervention have become standard practice in these facilities. Results from a formal evaluation of the service, with feedback collected from patients and nursing, medical and allied health clinicians, will be published by early 2022.

The six most common reasons for AMS interventions between April 2020 and January 2021 were considering intravenous (IV) to oral switch, deviation from guideline therapy, documenting the intended duration of therapy, incorrect dose, or frequency, reviewing duration of therapy or antibiotic spectrum too broad.

17.4.2 Digital support

Access to reliable high-speed internet, required for many eHealth applications, is not always available in rural and remote locations.⁶⁷ If suitable infrastructure is available, there are several digital supporting functions possible for the AMS team. Digital decision support and approval systems are useful tools in AMS, especially if digital prescribing is already supported (Chapter 4).

Electronic AMS clinical decision support systems can be particularly useful in rural and remote hospitals.²³ As well as supporting the local staff by streamlining the workflow for AMS interventions, they provide a valuable clinical resource and aid the work of the ID physician. This is particularly important where ID expertise is provided remotely. For example, an online approval system may be more feasible to implement than a telephone approval system. Telehealth is another way that an AMS program can be enhanced.

Telehealth uses technology to support a model of service delivery where not all clinical input is available on-site. The service may include 'phone, multipoint videoconferences, teleradiology and remote monitoring. Telehealth can improve access to services and specialty care for people living in rural and remote areas.

Rural and remote hospitals have demonstrated leadership in the use of telehealth and have experience using it across a range of clinical areas, including support for AMS activities. For example, low-cost videoconferencing systems can be used to conduct individual patient reviews with an ID specialist, or virtual AMS ward rounds with a remote specialist (ID physician, clinical microbiologist or pharmacist). Examples of the types of telehealth that can be used to support AMS activities include antibiotic pre-authorization, post-prescription review and the delivery of AMS education. Digitally enabled models of care can increase access to pharmacist expertise in rural and remote areas.⁶⁸

In Queensland, telehealth has been used in conjunction with site visits to set up an AMS program in a rural health service.⁶⁹ Centrally based ID physicians, AMS pharmacists and nurses work with AMS champions at the rural sites to run the program.⁶⁹

Several models for providing AMS by telehealth have been also successfully implemented

overseas.^{18, 70} They include regular weekly AMS case conferences and virtual AMS bedside rounds, with prescriptions reviewed remotely before dispensing. Australian models have included an ID physician or clinical microbiologist who has remote access to the hospital clinical information systems, conferencing with an on-site AMS pharmacist who attends the bedside and reviews the patient's paper medication chart. The pharmacist then documents the agreed recommendation about antimicrobial use in the patient's medical record, for consideration of the treating doctor or clinician responsible for the patient's care.

Telehealth has potential to improve access to expert advice and care for patients in rural and remote Australia and local hospitals and/or the LHN/LHD should plan to incorporate telehealth within their AMS program. As part of this process hospitals and LHNs/LHDs should consider the following when establishing remote AMS advice using telehealth:

- Expertise available on site and what could be enhanced via incorporation of a telehealth model
- When and how advice on prescribing is sought
- The process for obtaining advice from off-site experts and back-up arrangements if the expert is unavailable
- Any key antimicrobials, indications or microbiology results that require consultation with an off-site expert
- The process for documenting consultations and decisions
- The provision of external access to on-site information technology systems, such as electronic medical records, AMS clinical decision support, pathology, microbiology and radiology systems
- Processes and systems required to ensure confidentiality and security of patient records
- The process for involving off-site clinicians in educating and upskilling local staff
- The use of local AMS clinical decision support software and/or electronic health records to optimise remote consultations with ID physicians
- Appropriate information technology development and support for systems that streamline the workflow.

17.5 Conclusions

Since the release of the NSQHS Standards¹ in 2013, which included the requirement that all hospitals establish an AMS program, important lessons have been learned about what makes these programs successful in rural and remote settings. The second edition of the NSQHS Standards¹ and the 2021 Preventing and Controlling Infections standard³ have provided further guidance. Although the basic elements of AMS programs are consistent, implementation needs to be tailored to the rural and remote context.

With careful planning, commitment and the collaboration of staff, AMS programs can be successfully implemented and sustained in rural and remote health services.¹³ National, state and territory, and LHN/LHD AMS programs can provide the leadership and resources to support rural and remote facilities. Ongoing collaboration and sharing of resources within and between hospitals and networks will continue to improve AMS in rural and remote hospitals.²⁶

Resources

- Australian Commission on Safety and Quality in Health Care.
 - a. Clinical care standard.
<https://www.safetyandquality.gov.au/our-work/clinical-care-standards/antimicrobial-stewardship-clinical-care-standard>
 - b. Consumer brochure: Do I really need antibiotics?
<https://www.safetyandquality.gov.au/publications-and-resources/resource-library/consumer-brochure-do-i-really-need-antibiotics>
 - c. Options to support implementation of antimicrobial stewardship.
<https://www.safetyandquality.gov.au/publications-and-resources/resource-library/options-implementation-antimicrobial-stewardship-different-facilities>
 - d. Safety and Quality Improvement Guide Standard 3: Preventing and Controlling Healthcare Associated Infections. Sydney: ACSQHC, 2021. [National Safety and Quality Health Service Standards \(second edition\) | Australian Commission on Safety and Quality in Health Care](#)
- *Australian Guidelines for the Prevention and Control of Infection in Healthcare* (2019). <https://www.nhmrc.gov.au/about-us/publications/australian-guidelines-prevention-and-control-infection-healthcare-2019>
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- National Centre for Antimicrobial Stewardship (NCAS).
 - a. Website
<https://www.naps.org.au/Default.aspx>
 - b. Microbiology fact sheets. Available at: <https://www.ncas-australia.org/education>
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- South Australian Health.
 - a. Antimicrobial Guidelines <https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+programs+and+practice+guidelines/medicines+and+drugs/antimicrobial+guidelines/antimicrobial+guidelines>
 - b. South Australian expert Advisory Group on Antibiotic Resistance (SAAGAR). IV to Oral Switch Clinical Guideline for Adult Patients – can antibiotics S.T.O.P. South Australia Health: SA Health; 2017. https://www.sahealth.sa.gov.au/wps/wcm/connect/86doaf8047ca4a108ca28dfc651ee2b2/Clinical_Guideline_IV+to+Oral_Switch_v1.1_06.06.2019.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-86doaf8047ca4a108ca28dfc651ee2b2-nzoVNEf
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