

12

Role of nurses, midwives and infection control practitioners in antimicrobial stewardship

Antimicrobial Stewardship in Australian Health Care

2018

This chapter is part of *Antimicrobial Stewardship in Australian Health Care 2018*, Australian Commission on Safety and Quality in Health Care, 2018.

The publication summarises current evidence about AMS strategies and interventions, and their implementation. Chapters 1–7 provide strategies for implementing and sustaining AMS, and Chapters 8–12 examine the roles of the different clinicians in AMS.

The publication will continue to evolve with additional chapters over time that address AMS in specific settings, such as primary care.

As new resources become available, they will be added as hyperlinks to the resources section in each chapter or to the appendices.

Chapter contents

Acronyms and abbreviations	276
12.1 Introduction	277
12.2 Nursing and midwifery practice and antimicrobial stewardship	277
12.3 Facilitating nursing and midwifery involvement	280
12.3.1 Planning for nursing and midwifery involvement	280
12.3.2 Promoting a safety culture	282
12.3.3 Education	283
12.3.4 Resources and tools	284
12.4 Advanced and specialist practice roles	285
12.4.1 Nurse practitioners	285
12.4.2 Infection control practitioners	286
Resources	289
References	290

Acronyms and abbreviations

Abbreviation	Definition
AMR	antimicrobial resistance
AMS	antimicrobial stewardship
ICP	infection control practitioner
ID	infectious diseases

Key points

- Successful implementation of antimicrobial stewardship (AMS) programs requires collaboration between all members of the healthcare team.
- Nursing and midwifery practice activities that support the goals of AMS include
 - assessment, care planning and patient monitoring
 - medication management
 - collaborating with multidisciplinary team members
 - coordinating care.
- Support for nurse and midwife involvement in AMS activities should be promoted across health service organisations.
- Nurses and midwives in leadership positions have specific roles in facilitating the engagement of this important workforce.
- The involvement of nurses and midwives in AMS should be supported and enabled through
 - AMS policies that include the role of nurses and midwives in AMS
 - explicit executive, and AMS committee and team support
 - AMS educational strategies and resources specific to the nursing and midwifery role and scope of practice.

12.1 Introduction

Antimicrobial resistance (AMR) can affect patients in all healthcare settings and, as a result, antimicrobial stewardship (AMS) concerns all clinicians.¹ AMS requires the expertise and resources of all team members to ensure the safe and appropriate use of antimicrobials. It extends beyond prescribing to encompass antimicrobial administration, patient monitoring and review, patient and carer education, and infection prevention and control.

To date, AMS programs have primarily targeted the practices of doctors, microbiologists and pharmacists, and few studies have explored the role of nurses and midwives.¹⁻⁴ However, professional associations and experts, internationally and in Australia, highlight that nurses, midwives and infection control practitioners (ICPs) play key roles in preventing and controlling AMR.⁴⁻¹⁰ They can help to safeguard the effectiveness of antimicrobials through infection prevention and control, education, and involvement in AMS activities. This applies in all settings, especially those with no infectious diseases (ID), microbiology or pharmacy services on site.

This chapter explores the role of nurses, midwives and ICPs in AMS; the ways in which AMS can be integrated into routine nursing and midwifery practice; and key areas of influence. Options are provided for strengthening engagement. The specific

role of specialist and advanced practice nurses and midwives is also considered.

The chapter is a useful guide for AMS teams looking to improve the involvement of nurses and midwives in AMS programs, and for nurses and midwives who want to be more formally involved in AMS programs and better understand their potential contribution.

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.



12.2 Nursing and midwifery practice and antimicrobial stewardship

Nurses and midwives make up more than half of the Australian health workforce and are involved in all aspects of patient care.^{2,4} Nurses and midwives apply a person-centred and holistic approach to their practice.^{10,11} They are a constant in the

patient journey and advocate for patients, and their contribution to patient safety and quality of care is acknowledged.¹²

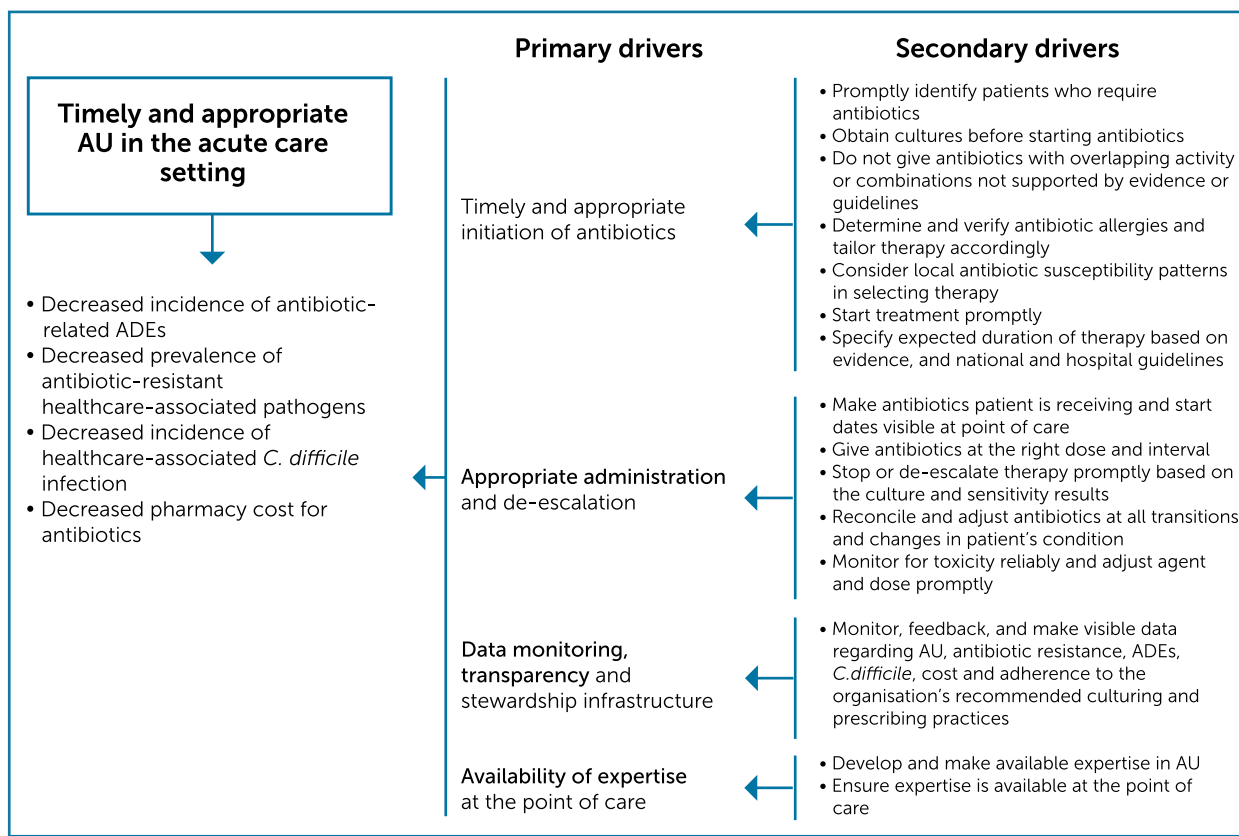
The key drivers for successful AMS in acute care settings are described in the United States Centers for Disease Control and Prevention’s AMS driver diagram (Figure 12.1) Both the primary and secondary drivers of AMS depend on nursing and midwifery participation and action, highlighting the importance of nurse and midwife involvement.⁴ See also the driver diagrams in Section 2.5.5 of Chapter 2: ‘[Establishing and sustaining an antimicrobial stewardship program](#)’).

Nursing and midwifery practice involves patient assessment, the development and implementation of patient care plans, and evaluation of outcomes.¹⁴ Many of these activities overlap with AMS functions⁶ and are consistent with the goals of AMS: to improve patient safety and outcomes, reduce AMR, and minimise healthcare costs. Examples include recognising signs of sepsis, assessing infection risk and making decisions about precautions to be put in place, implementing standard and transmission-

based precautions and practices to prevent infections associated with invasive medical devices, administering antimicrobials safely, monitoring patient responses, and educating patients and their carers about safe and appropriate medication use. Nurses and midwives can therefore play a significant role in AMS by embedding AMS principles into routine practice.⁶ Table 12.1 summarises nursing and midwifery practice activities that support AMS; many of them align with the quality statements of the [Antimicrobial Stewardship Clinical Care Standard](#).¹⁵

There are specific aspects of AMS that would benefit from formalising nursing and midwifery involvement. For example, nurses and midwives in all settings could be empowered to initiate discussion of antimicrobial indication and duration of therapy to ensure that medicines are ceased or reviewed in line with clinical need.¹⁶ In hospital settings, this could include antimicrobials for surgical prophylaxis, for which high rates of inappropriate prescribing have been reported.^{17,18} Also in hospital settings, nurses¹⁹ and midwives can be supported to promote changing from intravenous

Figure 12.1: Driver diagram for acute care



ADE = adverse drug event; AU = antibiotic use
Source: Adapted from US Centers for Disease Control and Prevention¹³

Table 12.1: Nursing and midwifery practice activities that support and influence antimicrobial stewardship

Practice area	Specific activities
Assessment, monitoring and early response	<ul style="list-style-type: none"> • Conduct nursing and midwifery assessment and care planning, incorporating history of allergies, adverse events and risk of infection • Identify and escalate patients with signs of acute deterioration or serious infection • Document and communicate assessment findings to healthcare team members • Implement nurse- and midwife-led clinical pathways and protocols for acute deterioration, including sepsis pathways
Infection prevention and control	<ul style="list-style-type: none"> • Assess the risk of acquiring and transmitting an infection • Identify patients who are likely to be colonised or infected with multidrug-resistant organisms • Instigate and promote compliance with standard and transmission-based precautions (e.g. hand hygiene) • Detail infection signs and symptoms in care plans or healthcare records
Microbiological specimen collection	<ul style="list-style-type: none"> • Correctly collect microbiological specimens when indicated • Ensure timely transfer of microbiological specimens to laboratories to maintain specimen quality
Medication management and safety	<ul style="list-style-type: none"> • Review and recognise when treatment is not in line with microbiological results, and highlight this to prescribers • Follow medication safety principles, incorporating the nine 'rights'²⁰ to prevent errors <ul style="list-style-type: none"> – five rights of medication administration: patient, drug, route, time and dose – four other rights: documentation, action, form and response • Speak up about or question antimicrobial management that is not in line with policy and guidelines • Ensure timely administration of antimicrobials, including the first dose for sepsis • Check the patient's allergy status before administration²¹ • Administer antimicrobials via the correct route, and recognise when patients are able to tolerate oral intake and could switch from intravenous to oral antimicrobials • Support appropriate documentation for prescribed antimicrobials: generic name, dose, time, route, indication, and review and stop date • Reduce the incidence of missed antimicrobial doses • Administer intravenous antimicrobials at the right rate and dilution • Monitor duration of treatment and promote timely patient review • Support timely therapeutic drug monitoring to ensure that antimicrobials that perform optimally within a specific therapeutic level are in line with recommended guidance • Monitor the patient to assess whether the antimicrobial has the intended effect, and to identify allergic responses and unwanted effects • Support the timely cessation of antimicrobial therapy • Correctly dispose of unused antimicrobials

Practice area	Specific activities
Transitions of care (including end-of-life care)	<ul style="list-style-type: none"> • Assess the patient's suitability for discharge or transfer • Include infection risks or issues in clinical handover communications when care is transferred (e.g. on admission, discharge, transfer of care to another practice or clinician) • Identify patients suitable for, and support safe transitions to, outpatient antimicrobial therapy • Ensure appropriate documentation • Arrange or coordinate a follow-up for review of antimicrobial therapy, if required • Discuss issues concerning antimicrobial therapy at the end of life with patients, carers and other members of the healthcare team as part of planning for end-of-life care
Patient education	<ul style="list-style-type: none"> • Educate patients and carers about <ul style="list-style-type: none"> – infection prevention and control, including the importance of hand hygiene – safe and appropriate antimicrobial use, including the importance of timely administration and review when concerned • Advocate for patients to be involved in decision-making about management and care
Collaboration	<ul style="list-style-type: none"> • Contribute to the development of policies and guidelines • Participate in committees and teams responsible for developing AMS resources • Participate in AMS quality improvement projects and initiatives

AMS = antimicrobial stewardship

to oral medicines, which reduces the risk of infection due to indwelling devices and enables earlier discharge (see Section 3.5 in Chapter 3: [‘Strategies and tools for antimicrobial stewardship’](#)).

The extent of nurses’ and midwives’ participation in AMS will depend on the context, and their level of practice and competence. Experienced nurses and midwives have considerable knowledge, understanding and skills acquired through practice, which are often complemented by postgraduate education. These individuals can apply their nursing and midwifery experience and knowledge to contribute to AMS in specific settings; to the development of AMS policies, quality improvement initiatives and education; or to participation in the AMS committee or team. More experienced nurses and midwives are often in clinical leadership roles, and are well placed to champion nursing and midwifery involvement in AMS.

In settings that have reduced access to pharmacy and ID services, such as private or small hospitals, nurses or midwives may also be required to coordinate local AMS activities. However, nurses and midwives complement rather than replace the specialist pharmacy and medical expertise. Nurses coordinating AMS programs require specialist support, resources and education. See Chapter 2:

[‘Establishing and sustaining an antimicrobial stewardship program’](#).^{22,23}

12.3 Facilitating nursing and midwifery involvement

The involvement of nurses and midwives in AMS can be supported and enabled through explicit engagement strategies, and by providing relevant education and resources. The focus should be on enabling and empowering them to use their specific knowledge and skills to influence AMS, and on ensuring that appropriate infrastructure, education and resources are available to support their participation.

12.3.1 Planning for nursing and midwifery involvement

An approach to planning, implementing and sustaining AMS programs has been outlined in Chapter 2: [‘Establishing and sustaining an antimicrobial stewardship program’](#).

R

P

In planning for nursing and midwifery involvement in AMS, it is essential that nurses and midwives collaborate with the local AMS team to ensure that activities are consistent with the broader AMS program goals. A suggested starting point for nurses and midwives is to meet with members of the AMS team (whether on site or as part of a network or group) to gain an understanding of the local AMS program, including program goals, priorities and strategies, and the roles of different team members.

There is literature indicating that nurses and midwives may be unsure about their role in AMS, citing competing workload priorities as a factor that limits their involvement in AMS programs.^{24,25} Planning should incorporate discussion with nurses and midwives about their perceptions of their role and contribution, and factors seen to be barriers or enablers to their participation (see Chapter 2: '[Establishing and sustaining an antimicrobial stewardship program](#)'). Understanding this viewpoint will enable a tailored approach to increasing nurse and midwife involvement that is achievable within the local context. The nursing or midwifery team can then assess the current situation in terms of their existing involvement in AMS, using the advice and information from the AMS team to identify any gaps in knowledge or skills, opportunities for involvement or improvement, and resources or support needed. It may be helpful to consider the activities listed in Table 12.1 and use them to inform a baseline assessment to identify priorities for improvement.

In hospitals, planning and priority setting may be conducted within a ward or unit; in smaller hospitals, it may involve nurses and midwives from across the hospital. In general practice settings, practice nurses and midwives could discuss issues with the practice team, or a single practice nurse or midwife could do a self-assessment or arrange to meet with others within the primary care network.

When establishing priorities, it may be helpful to consider the quality statements of the [Antimicrobial Stewardship Clinical Care Standard](#)¹⁵, which promote timely treatment, documentation, optimal collection and transportation of specimens for culture to enable targeted therapy, and patient and carer education. The standard could be used as the basis of a gap analysis to identify where nurses and midwives could maximise their contribution to AMS. Priorities could include^{3,4,6,22}:

- Prompting prescribers to
 - obtain cultures before starting therapy
 - obtain approval for prescribing restricted antimicrobials

- use [Therapeutic Guidelines: Antibiotic](#)²⁶ or local guidelines based on it
- review antibiotics after 48 hours or a documented review date
- Communicating microbiology results to prescribers in a timely way, to enable treatment to be targeted to a narrow-spectrum agent or ceased, if appropriate⁴
- Promoting documentation of indication, drug name, dose, route of administration, duration and review plan⁹
- Educating patients and their carers about taking antimicrobials as prescribed, how long to take them for, any potential side effects, and whether treatment will need to be reviewed
- Implementing nursing and midwifery clinical pathways; for example
 - switching from intravenous to oral delivery
 - sepsis pathways.

Handover communication is another important area in which nurses and midwives can implement AMS principles. Nurses and midwives are routinely responsible for handover of care within a hospital, between health services or when patients are discharged from care. Nurses and midwives can ensure that medicines are considered at each transition of care, and that clear information is provided to the patient, carer and receiving clinician (see Section 10.3.2 in Chapter 10: '[Role of prescribers in antimicrobial stewardship](#)'). This also applies to end-of-life care, in which there is some evidence that patients receive antimicrobial therapy inappropriately (see Chapter 10: '[Role of prescribers in antimicrobial stewardship](#)'). Nurses' understanding of patient needs at this time has been described.²⁷

Engaging nursing and midwifery managerial leaders, including nursing or midwifery managers and the executive, and clinical leaders, such as clinical nurse and midwife consultants, practitioners, educators and ICPs, in discussions is important. Nurse and midwife leaders are often in a position to empower other nurses and midwives to consider the 'bigger picture' of the workplace, and help to ensure that any changes are adequately supported, and are within the scope of nursing and midwifery practice and existing resources (see Box 12.1). This may be more applicable in the hospital setting, but the primary care sector could also promote such leadership opportunities for practice nurses and midwives. Another part of a nurse's or midwife's leadership role is to work with other organisational and clinical leaders to promote engagement and encourage collaborative work environments to support AMS.²⁸

Box 12.1: Nurse and midwife leadership and engagement

Nursing and midwifery leadership and engagement may involve:

- Promoting antimicrobial stewardship (AMS) as a patient safety activity²
- Working with nurses and midwives to help them appreciate and understand the significance of their role in AMS
- Facilitating nurse and midwife participation in formalised education programs²
- Ensuring that members of the multidisciplinary team and executive are clear about how nurses and midwives will be involved in AMS efforts in the local context
- Promoting nurse and midwife representation on relevant teams and committees responsible for developing antimicrobial policies and guidelines
- Advocating nurses' and midwives' involvement in AMS rounds and other care activities in which individual patient progress and antimicrobial therapy are discussed
- Supporting nurses and midwives in quality improvement activities and projects that aim to improve infection prevention and control or AMS
- Reviewing clinical pathways to include nurse- or midwife-initiated actions (e.g. prompt for intravenous-to-oral switching, flag patients for review by the AMS team)
- Identifying and supporting AMS nurse and midwife champions
- Encouraging nurses and midwives to participate or take the lead in activities for Antibiotic Awareness Week
- Ensuring that audit results are shared with nurses and midwives.

12.3.2 Promoting a safety culture

A positive safety culture is an important factor in successful AMS. Collaboration and effective teamwork are characteristics of a positive safety culture. As part of this, healthcare team members are enabled to speak up freely and question antimicrobial management if there are concerns about patient safety.

It has been argued that the capacity for nurses to discuss or question antimicrobial management choices is closely connected to the construct of power and knowledge, especially within the acute care context.³ For example, they may be uncertain about questioning antimicrobial management if they perceive that local hierarchies and working relationships do not support this.³ Also, nurses and midwives may rely on guidelines and local policy to influence prescribing, but this contribution may be undermined when junior prescribers consider the prescribing preferences of senior clinicians to be more important than evidence-based guidelines or policy.^{3,23,29-31} Acknowledging and promoting AMS as an organisation-wide patient safety program that is multidisciplinary, and including nurses and midwives as key team members and participants in AMS, will help to confirm their position. Such acknowledgement should come from both managerial and clinical leaders from all disciplines and, importantly, the AMS committee and team. Including nurses and midwives on multidisciplinary committees and teams responsible for AMS further formalises recognition of their contribution. Supporting nursing and midwifery participation in AMS or team rounds can also help to ensure that their role is acknowledged, enable a shared understanding of the nursing and midwifery role, and promote improved communication and cooperation between team members.³ Internationally, professional societies and government policies recommend having nurses and midwives on AMS committees.¹⁶

Establishing processes that formally encourage and support nurses and midwives to speak up without criticism may also help to involve nurses and midwives in AMS. This approach has been adopted in many patient safety initiatives aimed at improving teamwork, including the Comprehensive Unit-Based Safety Program (see Section 2.3.1 in Chapter 2: '[Establishing and sustaining an antimicrobial stewardship program](#)').^{32,33}

Strategies to enable nurse and midwife involvement in AMS are summarised in Table 12.2.

Table 12.2: Summary of strategies to support the involvement of nurses and midwives in antimicrobial stewardship

Role	Action
Executive, managers, and nurse and midwife leaders	<ul style="list-style-type: none"> • Promote a positive workplace culture, including promoting AMS as an organisation-wide multidisciplinary patient safety program • Formally acknowledge the role of nurses and midwives in AMS • Establish rules and procedures that empower nurses and midwives to speak up about antimicrobial management • Ensure that nurses and midwives have access to antimicrobial prescribing policies and guidelines at the point of care • Ensure that nurses and midwives know how to access <ul style="list-style-type: none"> – expert advice on antimicrobial management – pathways to escalate if there are serious concerns • Provide access to education on AMS, including face-to-face sessions and online learning modules • Support quality improvement activities and projects that focus on improved practice in infection prevention and control, and AMS
AMS committee and team (in collaboration with nursing and midwifery teams)	<ul style="list-style-type: none"> • Include nurses and midwives on AMS committees and teams (relevant to the facility) • Engage nurses and midwives in development, review and implementation of AMS strategies, tools and resources • Advocate for nurses and midwives to be included in AMS strategies, and publicly support rules and procedures to empower them in their role • Make antimicrobial prescribing policies, and formulary restrictions and guidelines accessible at the point of care • Include nurses and midwives in audit and feedback activities, and in AMS team rounds • Support nursing and midwifery education on AMS

AMS = antimicrobial stewardship

12.3.3 Education

If nurses and midwives are to be engaged in, and contribute to, AMS, they need to be included in AMS education activities (see Chapter 5: '[Antimicrobial stewardship education for clinicians](#)').

Some nurses and midwives may lack an understanding of AMR and AMS strategies, or may not view AMS as part of their scope of practice or be aware that they can influence prescribing behaviour.^{16,22,25,34} They may be unclear about antimicrobial therapy that patients in their care are receiving, patients' allergy status, the expected duration of therapy, or the importance of timely administration to ensure optimal therapy and limit adverse effects (including AMR).^{21,22,25} Increasing nurses' and midwives' knowledge of antimicrobial management may improve their capacity to influence more appropriate use.^{22,23}

Mandatory education and training in AMS for all clinicians, including nurses and midwives, has been recommended by the National Health Service (NHS) in Scotland and England.^{16,35,36} Nurses and midwives also require education specific to their role.^{3,4,37} Targeting education to focus on aspects of nursing and midwifery practice linked to AMS^{3,4,38} can help nurses and midwives to better understand the ways their practice integrates with AMS, and the significance of their role in influencing antimicrobial prescribing and antimicrobial use. Further, this may empower decision-making and enable them to take action when antimicrobial or clinical management is not in line with recommended practice outlined in local guidelines and policies. Continuing education should incorporate and consider the principles and quality statements outlined in the [Antimicrobial Stewardship Clinical Care Standard](#).¹⁵ Topics that could be considered in nursing and midwifery

education include AMR, classes of antimicrobials, aminoglycoside monitoring, allergy management and early recognition of sepsis. Several of these topics have been included in nurse education programs in Scotland.³⁵ Suggested topic areas for nurse and midwife education are listed in Box 12.2.

Education can be formal or informal, and can be comprehensive or more focused. For example, a formal AMS education program coordinated by ICPs at a large Australian tertiary health service focused on intravenous-to-oral switching and the potential to change practice. Interviews with each of the 79 participating senior nurses before and after the intervention showed that the intervention resulted in an increase in AMS knowledge and the potential to influence antimicrobial use. For example, when asked if they had previously questioned a patient's antimicrobial order, the results were significantly different ($P < 0.0001$) before (71%) and after (91%) the education.²²

Informal education can happen by including nurses and midwives as part of AMS team rounds, patient case reviews, audit and feedback, or other quality improvement initiatives. Participating in these activities in day-to-day practice can help nurses and midwives to consolidate and apply the knowledge gained through more formalised educational activities, providing opportunities to discuss antimicrobial treatment, indication and the duration of therapy with other clinicians and the AMS team.

See Chapter 5: '[Antimicrobial stewardship education for clinicians](#)' for recommendations on educating clinicians, specific education strategies and approaches to education, and links to education resources.

12.3.4 Resources and tools

Tools and resources such as standardised medication charts, clinical pathways, screening tools and checklists that are available at the point of care and specific to the local context can help to embed AMS in routine nursing and midwifery practice. Resources that support safe and effective nursing and midwifery practice have been shown to improve patient care in different areas, including for sepsis. Nurse-initiated sepsis protocols (for early assessment and recognition) have been developed to support the implementation of sepsis guidelines in emergency department and ward settings, and have significantly reduced the time to first-dose antimicrobials.^{4,39}

Box 12.2: Topic areas for nurse and midwife education about antimicrobial resistance and antimicrobial stewardship

- What antimicrobial resistance (AMR) is and how it can be contained
- Infection management and control, including differences between infection and colonisation, and their link to addressing AMR
- Role of antimicrobial stewardship (AMS) in preventing and containing AMR, including the link with patient safety
- Antimicrobial pharmacotherapy
- Medication safety – timeliness of administration, safe administration (correct dose, duration of therapy), allergies, the differences between antimicrobial adverse reactions and true antimicrobial allergies, patient response
- Microbiology, including the timing, collection and quality of microbiology specimens; prioritisation of laboratory result communication; distinction between positive test results (e.g. urine culture and chest X-ray reports) and active infection
- Role of clinical practice guidelines, local guidelines and policies
- How to access resources
- AMS strategies, such as antimicrobial de-escalation linked to patient response, switching from intravenous to oral delivery, and changing the duration of therapy
- How to educate patients and carers about antimicrobials

Source: Adapted from recommendations from Pulcini and Gyssens³⁶, Scottish Antimicrobial Group³⁵ and Public Health England¹⁶

It has been suggested that the most effective resources may be those that are tailored to practical nursing and midwifery tasks such as preparing and administering antimicrobials⁴⁰, including readily accessible information about intravenous therapy such as dilution rates, compatible fluids and rates of administration. Such information should be available at the point of care. One example of such a resource in Australia is the *Australian Injectable Drugs Handbook*.⁴¹ Checklists, clinical pathways and other point-of-care guidance can include a prompt for nurses and midwives to consider the potential for reviewing microbiology results, intravenous-to-oral switching or initiating patient education.

Information technology (IT) can support education and information sharing among nurses and midwives, and provide ready access to guidelines and pathways. Examples of IT tools are electronic clinical decision support systems, electronic healthcare records, online medication references, calculators, handheld devices and mobile device applications (see Chapter 4: '[Information technology to support antimicrobial stewardship](#)').

Nurses and midwives should be included on relevant teams and committees responsible for developing, piloting and implementing guidelines, pathways and other resources for AMS. This will help to ensure that day-to-day nursing and midwifery practices and workflow are considered in the development of these tools, and will also help to encourage their uptake and use in practice. *The OSSIE Toolkit*⁴² guides those looking to implement improvement activities in infection prevention and control practice in conjunction with their AMS program.

12.4 Advanced and specialist practice roles

Nurse practitioners and ICPs have specific roles to play in AMS.

12.4.1 Nurse practitioners

Nurse practitioners are registered nurses with the education and experience needed to work autonomously and collaboratively in an advanced clinical role. This role is grounded in a set of nursing values, knowledge, theories and practice that is qualitatively different from that of medical practitioners.⁴³

In 2016, around 1,400 nurse practitioners were registered to work across Australia in many different clinical settings, from primary to tertiary care.⁴⁴ Nurse practitioners may perform advanced physical assessments, order and interpret investigations, prescribe medicines and independently refer patients to other clinicians,⁴³ subject to regulation in individual states and territories regarding the scope of prescribing practice. These are important responsibilities in AMS.⁴⁵

Recent data show that nurse practitioners account for less than 1% of antimicrobial prescribing in the Australian community.⁴⁶ Although the overall contribution of nurse practitioner prescribing to antimicrobial use appears to be small, antimicrobials account for around a third of nurse practitioner prescriptions in Australia.⁴⁷

Because nurse practitioners prescribe antimicrobials and can initiate and plan treatments, they should participate in AMS education activities and ensure that they adopt AMS principles into their clinical practice (see Chapter 10: '[Role of prescribers in antimicrobial stewardship](#)'). Studies of nurse prescriber attitudes to antimicrobial prescribing have shown similar findings to studies of general prescriber attitudes, with prescribing confidence, diagnostic uncertainty and patient expectations often cited as factors that influence nurse practitioner prescribing behaviour.⁴⁸⁻⁵⁰

Nurse practitioners, like all prescribers, require ready access to evidence-based prescribing guidelines (*Therapeutic Guidelines: Antibiotic*)²⁶ and to standards and tools to support good prescribing practice (see Chapter 3: '[Strategies and tools for antimicrobial stewardship](#)'). Nurse practitioners should also be informed about local AMS teams and processes for obtaining expert ID, microbiology or pharmacist advice, whether on site or remotely.

Similarly, AMS principles can also be incorporated into the nurse practitioners' diagnostic role. This includes ensuring that optimal collection methods are used, and that laboratory results are immediately followed up so that therapy can be optimised. Key principles that apply to the selection of diagnostic tests, and to optimal sample collection and transport are discussed in Chapter 9: '[Role of the clinical microbiology service in antimicrobial stewardship](#)'.

The combination of advanced and extended practice skills and leadership skills means that, depending on the context, nurse practitioners are well placed to lead AMS efforts in their respective practice settings, and champion nursing and midwifery involvement in AMS. Establishing or accessing existing

professional networks may help nurse practitioners to develop a community of practice for AMS.⁴⁵

Table 12.3 summarises suggested strategies for nurse practitioners to consider as part of their role.

12.4.2 Infection control practitioners

In 2017, the Australasian College for Infection Prevention and Control published an updated [position statement](#) on the role of ICPs in AMS.⁷ Endorsed by both the Australian Society for Antimicrobials and the Australasian Society for Infectious Diseases, the statement noted that ICPs should be part of a multidisciplinary AMS team that includes ID physicians, general practitioners, pharmacists and microbiologists, and that ICPs play a role in:

- Contributing to the governance of AMS programs by participating in the AMS committee or a similar body
- Educating healthcare workers on infection prevention and control strategies to minimise the

risk and transmission of AMR, including safe and appropriate antibiotic use

- Promoting access to current endorsed therapeutic guidelines on antimicrobial prescribing
- Surveillance of resistant organisms, healthcare-associated infections, antimicrobial use, and adherence to antibiotic and treatment guidelines.

Most Australian hospitals employ ICPs, and the scope of practice for ICPs is diverse and expanding.⁵¹⁻⁵³ Many ICPs have extensive experience and expertise in infection prevention and control practices and – given that their role is often organisation-wide – a good understanding of the local organisational culture and systems, and have established links with multiple professional groups. Although there are differences between the responsibilities of AMS programs and infection control programs, it is important that there is collaboration between the two programs if they are to improve clinical outcomes, reduce AMR and prevent the spread of infection.⁵⁴

Areas in which ICPs may influence AMS are summarised in Table 12.4.

Table 12.3: Examples of antimicrobial stewardship strategies for nurse practitioners

Practice	AMS strategies
Diagnosis	<ul style="list-style-type: none"> • Adopt the key principles that apply to the selection of diagnostic tests and optimal sample collection and transport (see Chapter 9: 'Role of the clinical microbiology service in antimicrobial stewardship') • Follow up on results within 48 hours to enable review and changes to therapy
Prescribing	<ul style="list-style-type: none"> • Follow AMS prescribing principles before, during and after the consultation • Prescribe according to <i>Therapeutic Guidelines: Antibiotic</i> and the Antimicrobial Stewardship Clinical Care Standard • Consider the use of shared decision-making resources when discussing antimicrobial decisions with consumers • Be aware of local resistance patterns, local prescribing guidelines and recommended antimicrobial treatment regimens • Participate in audit and feedback activities, and evaluate antimicrobial use
Patient education	<ul style="list-style-type: none"> • Educate patients and carers during consultations, and provide written information to them • Promote infection prevention and control, including hand hygiene • Promote immunisation
Professional activities	<ul style="list-style-type: none"> • Participate in continuing professional education, including by completing online learning modules on antimicrobial prescribing • Establish or participate in an AMS interest group or a network for nurse practitioners (i.e. a community of practice) • Promote AMS through education, information resources and tools • Promote and participate in Antibiotic Awareness Week

AMS = antimicrobial stewardship

Table 12.4: Areas of influence for infection control practitioners

Participating roles	Leading roles, in collaboration with other experts (on site or remote)
<ul style="list-style-type: none"> • Promoting compliance with standard and transmission-based precautions, including hand hygiene • Educating and providing information to clinicians, students, consumers and others • Undertaking surveillance and providing information to incorporate feedback on <ul style="list-style-type: none"> – local infection patterns – local pathogen antimicrobial resistance patterns – local infection patterns – local antimicrobial prescribing patterns • Translating information about patient outcomes into educational opportunities • Facilitating the implementation of clinical care bundles to reduce infection in high-risk situations (e.g. CAUTI, CLABSI, PIVC, VAP) • Providing expert advice to clinicians, patients and carers • Promoting uptake of, and compliance with, national standards for AMS • Participating in AMS committees or AMS team rounds • Supporting nurses and midwives in resolving disagreements about adherence to antimicrobial prescribing guidelines 	<ul style="list-style-type: none"> • Triaging patients for post-prescription review at 48–72 hours • Coordinating Antibiotic Awareness Week activities • Informing senior management and relevant committees about the AMS program • Coordinating, or actively participating in, AMS ward rounds • Implementing intravenous-to-oral switching programs • Auditing, evaluating and reporting on antimicrobial use, including quality indicators • Conducting AMS research

AMS = antimicrobial stewardship; CAUTI = catheter-associated urinary tract infection; CLABSI = central line-associated bloodstream infection; PIVC = peripheral intravenous cannula; VAP = ventilator-associated pneumonia
 Source: Nagel et al.⁵⁴

A recent multi-centred cross-sectional study found that ICPs spend about 36% of their time on surveillance activities, such as surveillance of multidrug-resistant organisms and surgical site infections.⁵⁵ ICPs can use surveillance data to support early identification of resistant organisms and infections.⁵⁶ Communication about this to the AMS team and prescribers can support appropriate antimicrobial therapy for individual patients.⁵⁴ ICPs can apply their knowledge and understanding of surveillance principles to the surveillance of antimicrobial use and appropriateness. In the 2015 National Antimicrobial Prescribing Survey, close to 20% of the auditors were nurses and ICPs; in private hospitals, the percentage was higher, at close to 50%.¹⁸

ICPs can show leadership within the AMS program and champion AMS efforts by being involved in relevant committees and education¹⁶, quality improvement and research programs. ICPs are often responsible for educating the workforce on the importance of infection prevention and control to prevent the spread of infection. The ICP can work

with the AMS team to incorporate AMS into the infection control education program. Incorporating feedback on local infection patterns, local pathogen AMR patterns and local antimicrobial prescribing patterns and, if possible, information about patient outcomes into education sessions can bring an extra perspective to infection prevention and control. This will increase awareness and understanding of the importance of infection prevention and control activities to successful AMS programs.

ICPs may be required to coordinate or lead AMS programs in public and private hospitals, and aged care homes.²³ This can be achieved with support from executive leaders and input from a local pharmacist. If pharmacists, ID physicians or clinical microbiologists are not available on site, input from the Local Hospital Network, Local Health District or a community pharmacist may be possible.⁵⁷ In those circumstances, the focus should be on how best to apply the skills and knowledge of the ICP to develop a tailored program. As with nurses and midwives, ICPs cannot replace



the specialist expertise brought to AMS by other experts. For example, post-prescription review in hospitals requires that the pharmacokinetic and pharmacodynamic features of the antimicrobial be considered, which is outside the ICP scope of practice. Published examples of successful ICP-led AMS interventions have highlighted the role of support and input from specialist colleagues in supporting implementation^{22,23} (see Case study 12.1).

Case study 12.1: Infection control practitioner-led program in aged care homes

AC

An antimicrobial stewardship program led by infection control practitioners (ICPs) at two aged care homes demonstrated successful post-intervention results. ICPs were involved in the education of general practitioners, nurses and midwives; data collection; monitoring of pathology results; and discussions between general practitioners and an infectious diseases physician. Pre- and post-intervention results showed a significant reduction in total days of antimicrobials prescribed ($P < 0.0001$).²³

Resources

- Position statements
 - International Confederation of Midwives: [Midwives and prevention of antimicrobial resistance](#)
 - International Council of Nurses: [Antimicrobial resistance](#)
 - Australasian College for Infection Prevention and Control: [The role of the ICP in antimicrobial stewardship](#)
 - American Nurses Association: [white paper on the role of nurses in hospital antibiotic stewardship practices](#)
- NSW Clinical Excellence Commission: [Antibiotics in-service for nursing staff](#)
- Australian Commission on Safety and Quality in Health Care: [Antimicrobial stewardship video presentations](#)
- NPS MedicineWise: [Reducing antibiotic resistance](#) – information and continuing professional development options
- NHS Education for Scotland: [Antimicrobial Stewardship Workbook](#) for nurses and midwives
- NSW Clinical Excellence Commission: [Sepsis Kills program](#)
- Information about preparing and administering antimicrobials: [Australian Injectable Drugs Handbook](#)
- Australian Commission on Safety and Quality in Health Care: [The OSSIE Toolkit](#) – guidance on implementing improvement activities in infection prevention and control practice

References

1. Edwards R, Loveday H, Drumright LN, Holmes A. Should nurses be more involved in antimicrobial management? *J Infect Prev* 2011;12(1):4–5.
2. Manning ML, Pfeiffer J, Larson EL. Combating antibiotic resistance: the role of nursing in antibiotic stewardship. *Am J Infect Control* 2016;44(12):1454–7.
3. Edwards R, Drumright LN, Kiernan M, Holmes A. Covering more territory to fight resistance: considering nurses' role in antimicrobial stewardship. *J Infect Prev* 2011;12(1):6–10.
4. Olans RN, Olans RD, DeMaria A Jr. The critical role of the staff nurse in antimicrobial stewardship: unrecognized, but already there. *Clin Infect Dis* 2016;62(1):84–9.
5. International Council of Nurses. *Antimicrobial resistance*. Geneva: ICN; 2017.
6. American Nursing Association, Centers for Disease Control and Prevention. *Redefining the antibiotic stewardship team: recommendations from the American Nurses Association/Centers for Disease Control and Prevention Workgroup on the role of registered nurses in hospital antibiotic stewardship practices*. White paper. Silver Spring (MD): Nursing World; 2017.
7. Australasian College for Infection Prevention and Control. *Position statement: the role of the ICP in antimicrobial stewardship*. Hobart: ACIPC; 2017.
8. Australian College of Nursing. Letter re: developing a national AMR strategy for Australia discussion paper. Canberra: ACN; 2014.
9. Royal College of Nursing. *Antimicrobial resistance: RCN position on the nursing contribution*. London: RCN; 2014.
10. International Confederation of Midwives. *Position statement: midwives and prevention of antimicrobial resistance*. The Hague, The Netherlands: International Confederation of Midwives; 2017.
11. Australian College of Nursing. *Nurse leadership*. Canberra: ACN; 2015.
12. World Health Organization. *The global strategic directions for strengthening nursing and midwifery*. Geneva: WHO; 2016.
13. Centers for Disease Control and Prevention (US). *Antibiotic stewardship driver diagram*. Atlanta (GA): CDC; 2012.
14. Nursing and Midwifery Board of Australia. *Registered nurse standards for practice*. Canberra: NMBA; 2016 [updated 2017 Feb 1; cited 2017 May 14].
15. Australian Commission on Safety and Quality in Health Care. *Antimicrobial Stewardship Clinical Care Standard*. Sydney: ACSQHC; 2014.
16. Public Health England. *Antimicrobial stewardship: start smart – then focus*. London: PHE; 2011 [updated 2015 Mar 25; cited 2017 Sep 6].
17. Australian Commission on Safety and Quality in Health Care. *Antimicrobial prescribing practice in Australian hospitals: results of the 2013 National Antimicrobial Prescribing Survey*. Sydney: ACSQHC; 2014.
18. Australian Commission on Safety and Quality in Health Care. *Antimicrobial prescribing practice in Australian hospitals: results of the 2014 National Antimicrobial Prescribing Survey*. Sydney: ACSQHC; 2015.
19. Mostaghim M, Snelling T, McMullan B, Konecny P, Bond S, Adhikari S, et al. Nurses are underutilised in antimicrobial stewardship – results of a multisite survey in paediatric and adult hospitals. *Inf Dis Health* 2017;22:57–64.
20. Elliott M, Liu Y. The nine rights of medication administration: an overview. *Br J Nurs* 2010;19(5):300–5.
21. Fehily SR, Stuart RL, Horne K, Korman TM, Dendle C. Who really knows their patients' penicillin adverse drug reaction status? A cross-sectional survey. *Intern Med J* 2015;45(1):113–15.
22. Gillespie E, Rodrigues A, Wright L, Williams N, Stuart RL. Improving antibiotic stewardship by involving nurses. *Am J Infect Control* 2013;41(4):365–7.
23. Stuart RL, Orr E, Kotsanas D, Gillespie EE. A nurse-led antimicrobial stewardship intervention in two residential aged care facilities. *Healthc Infect* 2015;20(1):4–6.
24. McGregor W, Brailey A, Walker G, Bayne G, Sneddon J, McEwen J. Assessing knowledge of antimicrobial stewardship. *Nurs Times* 2015;111(21):15–17.

25. Cotta MO, Robertson MS, Tacey M, Marshall C, Thursky KA, Liew D, et al. Attitudes towards antimicrobial stewardship: results from a large private hospital in Australia. *Healthc Infect* 2014;19(3):89–94.
26. Writing group for Therapeutic Guidelines: Antibiotic. *Therapeutic guidelines: antibiotic. Version 15*. Melbourne: Therapeutic Guidelines; 2014.
27. Australian Commission on Safety and Quality in Health Care. Safety and quality of end-of-life care in acute hospitals: a background paper. Sydney: ACSQHC; 2013.
28. Manning ML, Giannuzzi D. Keeping patients safe: antibiotic resistance and the role of nurse executives in antibiotic stewardship. *J Nurs Adm* 2015;45(2):67–9.
29. Broom A, Broom J, Kirby E, Scambler G. Nurses as antibiotic brokers: institutionalized praxis in the hospital. *Qual Health Res* 2016;27(13):1924–35.
30. Charani E, Holmes AH. Antimicrobial stewardship programmes: the need for wider engagement. *BMJ Qual Saf*, 2013;22(11):885–7.
31. Charani E, Castro-Sánchez E, Holmes A. The role of behavior change in antimicrobial stewardship. *Infect Dis Clin North Am* 2014;28(2):169–75.
32. Agency for Healthcare Research and Quality (US). Comprehensive unit-based safety program. Rockville (MD): AHRQ; 2017 [updated 2016 Dec; cited 2017 Sep 26].
33. Weaver SJ, Weeks K, Pham JC, Pronovost PJ. On the CUSP: Stop BSI – evaluating the relationship between central line-associated bloodstream infection rate and patient safety climate profile. *Am J Infect Control* 2014;42(10 Suppl):S203–8.
34. Charani E, Castro-Sanchez E, Sevdalis N, Kyratsis Y, Drumright L, Shah N, et al. Understanding the determinants of antimicrobial prescribing within hospitals: the role of ‘prescribing etiquette’. *Clin Infect Dis* 2013;57(2):188–96.
35. NHS Education for Scotland. Antimicrobial stewardship workbook. Edinburgh: NHS Education for Scotland; 2015.
36. Pulcini C, Gyssens IC. How to educate prescribers in antimicrobial stewardship practices. *Virulence* 2013;4(2):192–202.
37. Olans RD, Nicholas PK, Hanley D, DeMaria A Jr. Defining a role for nursing education in staff nurse participation in antimicrobial stewardship. *J Contin Educ Nurs* 2015;46(7):318–21.
38. McNulty CAM, Boyle P, Nichols T, Clappison P, Davey P. The public’s attitudes to and compliance with antibiotics. *J Antimicrob Chemother* 2007;60(Suppl 1):63–8.
39. Kleinpell R. Promoting early identification of sepsis in hospitalized patients with nurse-led protocols. *Crit Care* 2017;21(1):10.
40. Wentzel J, van Velsen L, van Limburg M, de Jong N, Karreman J, Hendrix R, et al. Participatory eHealth development to support nurses in antimicrobial stewardship. *BMC Med Inform Decis Mak* 2014;14:45.
41. Society of Hospital Pharmacists of Australia. Australian injectable drugs handbook, 7th edition. Melbourne: SHPA; 2017.
42. Australian Commission on Safety and Quality in Health Care. The OSSIE Toolkit for the implementation of the Australian guidelines for the prevention and control of infection in healthcare. Sydney ACSQHC; 2010.
43. Masso M, Thompson C. Rapid review of the nurse practitioner literature: nurse practitioners in NSW ‘gaining momentum’. Sydney: NSW Ministry of Health; 2014.
44. Nursing and Midwifery Board of Australia. Registrant data reporting period: 1 October 2016 – 31 December 2016. Canberra: NMBA; 2016 [cited 2017 Jun 2].
45. Manning ML. The urgent need for nurse practitioners to lead antimicrobial stewardship in ambulatory health care. *J Am Assoc Nurs Pract* 2014;26(8):411–13.
46. Australian Commission on Safety and Quality in Health Care. AURA 2016: first Australian report on antimicrobial use and resistance in human health. Sydney: ACSQHC; 2016.
47. Buckley T, Cashin A, Stuart M, Browne G, Dunn SV. Nurse practitioner prescribing practices: the most frequently prescribed medications. *J Clin Nurs* 2013;22(13–14):2053–63.
48. Rowbotham S, Chisholm A, Moschogianis S, Chew-Graham C, Cordingley L, Wearden A, et al. Challenges to nurse prescribers of a no-antibiotic prescribing strategy for managing self-limiting respiratory tract infections. *J Adv Nurs* 2012;68(12):2622–32.
49. Abbo L, Smith L, Pereyra M, Wyckoff M, Hooton TM. Nurse practitioners’ attitudes, perceptions, and knowledge about antimicrobial stewardship. *J Nurs Pract* 2012;8(5):370–6.
50. Ness V, Price L, Currie K, Reilly J. Antimicrobial resistance and prescribing behaviour. *Nurse Prescribing* 2014;12(5):248–53.

51. Hall L, Halton K, Macbeth D, Gardner A, Mitchell B. Roles, responsibilities and scope of practice: describing the 'state of play' for infection control professionals in Australia and New Zealand. *Healthc Infect* 2015;20(1):29–35.
52. Tropea J, Brand C, Roberts C. A national stakeholder review of Australian infection control programs: the scope of practice of the infection control professional. Sydney: Australian Commission on Safety and Quality in Health Care; 2008.
53. Mitchell BG, Hall L, MacBeth D, Gardner A, Halton K. Hospital infection control units: staffing, costs, and priorities. *Am J Infect Control* 2015;43:612–16.
54. Nagel JL, Kaye KS, LaPlante KL, Pogue JM. Antimicrobial stewardship for the infection control practitioner. *Infect Dis Clin North Am* 2016;30(3):771–84.
55. Mitchell BG, Hall L, Halton K, MacBeth D, Gardner A. Time spent by infection control professionals undertaking healthcare associated infection surveillance: a multi-centred cross sectional study. *Infection, Disease & Health* 2016;21(1):36–40.
56. Moody J, Cosgrove S, Olmsted R, Septimus EJ, Aureden K, Oriola S, et al. Antimicrobial stewardship: a collaborative partnership between infection preventionists and healthcare epidemiologists. *Infect Control Hosp Epidemiol* 2012;33(4):328–30.
57. Australian Commission on Safety and Quality in Health Care. *National Safety and Quality Health Service Standards*. 2nd ed. Sydney: ACSQHC; 2017.