9 The role of the pharmacy service

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9.1 Key points

- Pharmacists are essential to the success of antimicrobial stewardship programs and have a positive effect on improving appropriate antimicrobial use, patient care and safety.
- Hospital pharmacists are well placed to prospectively or retrospectively review antimicrobial orders, provide feedback to prescribers, and identify cases requiring review and referral to the nominated antimicrobial stewardship health professional or team.
- A pharmacist with experience and training in antimicrobial stewardship is a key member of the antimicrobial stewardship team. Their prime role is to champion and coordinate the activities of the hospital's antimicrobial stewardship program in collaboration with the antimicrobial stewardship program leader.
- The responsibilities of pharmacists in antimicrobial stewardship include:
  - » providing expert advice and education to relevant hospital staff
  - » contributing to ward rounds, consultations and relevant hospital committees (e.g. antimicrobial stewardship committee or drug and therapeutics committee)
  - » participating in policy development and the application and maintenance of antimicrobial formulary and prescribing guidelines

- implementing and auditing activities that promote safe and appropriate use of antimicrobials
- being involved in research activities related to antimicrobial stewardship.

9.2 Recommendations

9.2.1 The antimicrobial stewardship team includes a pharmacist who has experience or is trained in antimicrobial stewardship, and who is allocated time and resources for antimicrobial stewardship activities.

9.2.2 Pharmacists review antimicrobial orders for adherence to local guidelines and provide timely feedback (where applicable) to the prescriber.

9.2.3 Pharmacists are supported by the hospital in enforcing antimicrobial prescribing policies, including formulary restrictions and encouraging adherence to local prescribing guidelines.

9.2.4 Hospitals support training for pharmacists to equip them with the knowledge and skills required to effectively participate in antimicrobial stewardship activities.

9.4.5 Mechanisms are in place to allow pharmacists to seek expert advice from, and refer to, a clinical microbiologist or infectious diseases physician.

9.3 Pharmacy services and antimicrobial stewardship

Pharmacists are key to the success of antimicrobial stewardship (AMS) programs in hospitals and play a number of roles in assisting with strategy implementation that encourages responsible use of antimicrobials.[1, 12, 85, 133] A Cochrane review of interventions to improve antimicrobial prescribing identified 66 studies with interpretable data. In 22 of these studies, pharmacists delivered persuasive (64%), restrictive (23%) and mixed (14%) interventions aimed at reducing prescribing of antimicrobials.[34]

Although the main focus of this section is the role of the infectious diseases (ID) pharmacist in AMS, it is important to acknowledge that pharmacy administrators, clinical pharmacists and those involved with the supply of antimicrobials all make an important contribution to developing and maintaining AMS programs in hospitals.

9.4 Pharmacy administration

The AMS team requires the support of hospital administrators.[1] The director of pharmacy has an important role in establishing communication and collaboration between the staff from pharmacy, microbiology or IDs, and infection prevention and control. The director of pharmacy is also responsible for maintaining the formulary management system, and supporting the activities of the drug and therapeutics committee in evaluating antimicrobials for listing on the hospital's formulary and in monitoring antimicrobial use.

9.5 Pharmacists providing clinical and dispensary services

The review of antimicrobial prescribing with prescriber feedback has been identified as a key strategy in achieving prudent use of antimicrobials (see Chapter 3). Hospital pharmacists are well placed to identify antimicrobial use requiring review and can refer cases to the nominated AMS health professional or team.[12]

Dispensary and clinical pharmacists play an important part in supporting AMS strategies by ensuring formulary restrictions and practice guidelines are followed, and by participating in activities that promote safe and prudent use of antimicrobials. Studies have shown that pharmacists' interventions have a positive impact on the effective and appropriate use of antimicrobials.[134] Clinical pharmacists, with the support of the AMS team, need to be empowered to provide prescribing information and feedback to prescribers.[17]

9.6 Specialist infectious diseases pharmacists

A clinical pharmacist with ID training is considered a core member of the multidisciplinary AMS team.[1] The ID pharmacist's role may include a clinical service to a ward or medical unit with high antimicrobial consumption, such as intensive care or surgical units.[102] Alternatively, the ID functions may be included within the role of the pharmacist responsible for drug usage evaluation (DUE) or quality use of medicines. Whatever the position, the pharmacist should be allocated the time and resources to undertake AMS activities.[1] In the United Kingdom, the employment of specialist antimicrobial pharmacists facilitated greater interaction between the pharmacy and microbiology or ID departments, and demonstrated significant reductions in antimicrobial acquisition costs.[135]

At this time in Australia there are few pharmacists with specialist ID training. For the purposes of this chapter the term ID pharmacist encompasses those pharmacists with experience or training in antimicrobial stewardship who have responsibility for AMS activities.

9.7 Roles and responsibilities of infectious diseases pharmacists

The skills and responsibilities of an ID pharmacist is supported by current literature and are discussed in the following sections. They serve as a basis for deriving a job description for an ID pharmacist.

9.7.1 Prime role

The prime role of an ID pharmacist is to coordinate the activities of the hospital's AMS program in collaboration with the AMS program leader. Their aims are to achieve cost-effective, quality use of antimicrobials and reduce the emergence of antimicrobial resistance.

9.7.2 Responsibilities

The responsibilities of an ID pharmacist may include:

- providing expert advice
- attending ward rounds
- liaising with other departments
- antimicrobial formulary management
- developing and maintaining antimicrobial guidelines
- point-of-care interventions
- monitoring antimicrobial use
- educating medical and nursing staff, students and others
- demonstrating leadership in AMS
- carrying out research.

The infectious diseases physician and head of pharmacy should negotiate with hospital administration to obtain adequate authority, compensation, and expected outcomes of the program.[1]

9.7.3 Expert advice

ID pharmacists can advise other pharmacists and prescribers on the management of antimicrobial therapy in individual patients. They can act as a triage for cases requiring input by microbiology and ID clinicians.[135] This may include the choice, dose and duration of antimicrobial therapy.[1, 34] The optimisation of dosage — based on individual patient characteristics, causative organisms, the site of infection, and pharmacokinetic and pharmacodynamic characteristics of the drug — has been cited as an important part of AMS (see Chapter 4 for further details).[1] Prospective review of antimicrobial orders and timely follow up with the prescriber by an ID pharmacist reduces inappropriate use of antimicrobials and leads to improved clinical outcomes.[1, 12]

Providing expert advice includes informing senior hospital management and relevant medical units on the AMS program and activities within the hospital.

9.7.4 Antimicrobial stewardship ward rounds

ID pharmacists should attend joint ward rounds with microbiology and ID clinicians to review patients with complex antimicrobial management problems and those who have been referred to the AMS team. These rounds may include regular rounds in units with complex antimicrobial management issues such as intensive care or haematology units.[135]

9.7.5 Liaison

Liaising (on behalf of the pharmacy department) with other departments and committees is an important role for ID pharmacists (Table 9.1).

Table 9.1 Pharmacy liaison with departments and committees

Department or committee	Liaison activity
Microbiology, ID and other departments	• antimicrobial formulary • introduction of new antimicrobials • unexpected changes in antimicrobial use patterns • the development of policies related to AMS activities within the hospital[102]
Microbiology and ID staff	• changes in antimicrobial sensitivities • updating the hospital formulary information and guidelines accordingly
Hospital committees and management	• matters related to AMS • active participation in relevant hospital committees such as: » the AMS committee or antimicrobial subcommittee of the drug and therapeutics committee;[102] the ID pharmacist may provide the secretarial support to this committee » the infection prevention and control committee[102]
Professional organisations, for example: • Society of Hospital Pharmacists of Australia Infectious Diseases Committee of Specialty Practice* • Healthcare Infection Control Special Interest Group+	• matters related to AMS

AMS = antimicrobial stewardship; ID = infectious diseases
* www.shpa.org.au/scripts/cgiip.exe/WService=SHPA/ccms.r?PageId=7
+ www.asid.net.au/hicsigwiki

9.7.6 Antimicrobial formularies and approval systems

Restricted formularies and antimicrobial approval systems are effective in improving antimicrobial use in the hospital setting (see Chapter 2). ID pharmacists have an important role in supporting and maintaining hospital prescribing control systems by:

- participating in the antimicrobial formulary management process, including reviewing the evidence for inclusion of new antimicrobials or deletion of existing agents from the formulary for consideration by the drug and therapeutics committee
- updating the hospital's formulary and antimicrobial prescribing guidelines in accordance with the drug and therapeutics committee decisions — including updating information and alerts within clinical decision-support systems for electronic prescribing, dispensing and antimicrobial approval systems (see Chapters 2 and 10)

- educating and supporting other pharmacists in the clinical and dispensary areas to enforce antimicrobial prescribing programs and policies, and encourage compliance with prescribing guidelines[34] — this may include providing advice (with support from the AMS team) in those situations where there is debate with clinicians who wish to prescribe outside the hospital's policy[102]
- monitoring compliance with the hospital's antimicrobial prescribing policies, and liaising with microbiology and ID clinicians regarding issues of noncompliance.

9.7.7 Antimicrobial guidelines

ID pharmacists should work with microbiology, ID and other relevant clinicians to develop and maintain:

- antimicrobial prescribing guidelines, including specific unit protocols; for example, guidelines for antimicrobials in the management of febrile neutropenia
- policies for antimicrobial serum-level monitoring, such as aminoglycosides and glycopeptides, and for training clinicians and pharmacists about safe and effective dosing practices.[135]

This responsibility includes ensuring that the latest versions of prescribing guidelines are available in hard or soft copy from the hospital (such as printed pocked-sized versions and electronic versions on the intranet). The electronic version can be incorporated into the appropriate clinical decision-support systems within electronic prescribing, dispensing and administration systems.

9.7.8 Point-of-care interventions

ID pharmacists can play a leading role in implementing policies and interventions that promote safe and appropriate use of antimicrobials. These activities are discussed in more detail in Chapters 1 and 4 and include:

- intravenous-to-oral switch programs[1, 135]
- antimicrobial stop orders[102]
- therapeutic substitution of antimicrobials[102]
- systems for obtaining and recording approvals for restricted antimicrobials, such as mandatory order forms, telephone or online approval systems[1, 136]
- streamlining therapy to narrow-spectrum agents when culture and sensitivity results are available[1, 102]
- developing and disseminating clinical decision tools such as antimicrobial dosing cards for common infections.

9.7.9 Audit and evaluation of antimicrobial use

ID pharmacists should generate and collate reports on antimicrobial use for the AMS team, the drug and therapeutics committee, infection control committee and heads of clinical units. The reports may include:

- regular (monthly) reports from pharmacy records of antimicrobial use and expenditure at hospital or clinical unit level (i.e. total antimicrobial use, restricted antimicrobials or specific antimicrobial groups)
- national comparative data in terms of defined daily doses per 1000 occupied bed-days for those hospitals submitting to the National Antimicrobial Utilisation Surveillance Program.

ID pharmacists may also conduct DUE activities. These may be:

- point prevalence studies to identify the percentage of patients prescribed antimicrobials, the number of anti-infectives per patient, the indication for use and the duration of therapy
- clinical audits of a specific antimicrobial or group of antimicrobials against local guidelines (e.g. indications for prescribing, sensitivity to the antimicrobial, empirical versus treatment, doses prescribed and duration of therapy)
- local or collaborative DUE projects such as those organised by the National Prescribing Service, including implementation and evaluation of interventions to influence prescribing behaviour.[137]

Process and outcome measures have been shown to be useful in determining the impact of AMS on antimicrobial use and resistance patterns.[1] ID pharmacists are well placed to coordinate feedback from stakeholders with respect to the success of AMS activities and the collection of data for monitoring indicators to measure performance in safe and effective antimicrobial use. This includes indicators for antimicrobial therapy in the *Indicators for Quality Use of Medicines in Australian Hospitals*.[95] See Chapter 5 for further discussion on quality improvement activities and monitoring antimicrobial use.

9.7.10 Education

Chapter 6 discusses the importance of prescriber education and the content of training programs.

ID pharmacists can play an important role in educating staff about AMS. This may involve:

- educating pharmacy, medical, and nursing staff and students on principles of judicious, safe and effective antimicrobial prescribing, and the concept of resistance[135]
- informing prescribers on antimicrobial prescribing guidelines and policies, including educating junior doctors during their initial orientation and reinforcing information

at roster changes, and presenting results of clinical audits and DUE studies in forums such as medical teaching rounds[135]

- employing active educational techniques such as academic detailing, using one-on-one education sessions with clinicians — this has been shown to improve prescribing behaviour more than passive dissemination of information (such as supplying posters or printed handouts).[12, 34]

9.7.11 Leadership in antimicrobial stewardship

ID pharmacists should play a leadership role within the AMS program, advocating the implementation of activities within the hospital that aim to improve prescribing and the quality use of antimicrobials. They should also support pharmacy staff and others (especially junior staff) on issues related to the AMS program within the hospital (e.g. resolve disagreements about antimicrobial prescribing practices).[17, 135]

9.7.12 Research and development

ID pharmacists should (where possible) be actively involved in coordinating and participating in research and practice development activities related to AMS.[135] This is especially important for pharmacy-led interventions in AMS. Pharmacists should publish results in peer-reviewed publications and present data at conferences.[135]

9.8 Skills and training

ID pharmacists should be experienced clinical pharmacists with expertise in antimicrobials and the pharmaceutical management of infectious diseases.[102, 135] Postgraduate training in ID and the ability to interact with senior clinicians on a credible level are considered highly desirable attributes.[3, 102]

There is a shortage of pharmacists with ID training and this has been identified as one of the barriers to implementing hospital AMS programs.[23] Currently, there are no training courses in Australia for pharmacists to attain the skills and knowledge required to coordinate an AMS program. In the United States, professional pharmacy organisations have been asked to consider developing a pharmacist-focused AMS curriculum.[23] Such a curriculum would encompass important concepts in antimicrobial therapy, the use of guidelines and other literature supporting AMS, and the practicalities of establishing and maintaining an AMS program.[23] Developing a similar curriculum for Australia, or including pharmacists' education in training resources developed for prescribers, would assist in building the capacity of pharmacists with the skills required to effectively participate in AMS programs (see Chapter 6).

Properly trained clinical pharmacists acting in concert with physician colleagues have been shown to make a substantial impact on patient care in a variety of practice settings including infectious diseases.[12]