Key points and recommendations

1 Implementing an antimicrobial stewardship program

1.1 Key points

- Effective antimicrobial stewardship programs have been shown to improve the appropriateness of antimicrobial use, reduce patient morbidity and mortality, and reduce institutional bacterial resistance rates and healthcare costs.

- The overall accountability for antimicrobial management control lies with the hospital administration. They should be responsible for ensuring an antimicrobial stewardship program is developed and implemented, and outcomes are evaluated.

- International literature strongly suggests that the most effective approach to antimicrobial stewardship involves multidisciplinary antimicrobial stewardship teams with the responsibility and resources for implementing a program to improve antimicrobial prescribing.

- The support and collaboration of the hospital executive is essential to the success of antimicrobial stewardship teams, and clear lines of accountability to the hospital executive should be defined.

- Successful stewardship programs include a range of interventions. Two of the most effective strategies are restrictive methods, such as requiring approval to prescribe an antimicrobial, and the proactive strategy of prospective review with direct intervention and feedback to the provider.

- Teams are more likely to be effective in leading and sustaining changes in clinical practice if they have access to, and training in, effective quality improvement methods and knowledge.
1.2 Recommendations

1.2.1 **Hospitals have an antimicrobial stewardship program that includes an antimicrobial prescribing and management policy, plan and implementation strategy that are regularly reviewed.**

1.2.2 **Hospitals have an antimicrobial formulary and guidelines for antimicrobial treatment and prophylaxis that align with *Therapeutic Guidelines: Antibiotic* and are regularly reviewed.**

1.2.3 **Hospitals establish a multidisciplinary antimicrobial stewardship team that is responsible for implementing the antimicrobial stewardship program. At a minimum, the team should include either an infectious diseases physician, clinical microbiologist or nominated clinician (lead doctor), and a pharmacist.**

1.2.4 **The antimicrobial stewardship program resides within the hospital's quality improvement and patient safety governance structure and is included within the hospital's quality and safety strategic plan.**

1.2.5 **Antimicrobial stewardship teams have clearly defined links with the drug and therapeutics committee, infection prevention and control committee, and clinical governance or patient safety and quality units.**

1.2.6 **Team members have clearly defined roles and responsibilities. Team members should be sufficiently supported and trained to enable them to effectively and measurably optimise antimicrobial use by using interventions appropriate to local needs, resources and infrastructure.**

1.2.7 **Antimicrobial stewardship process and outcome indicators are measured and reported to the hospital executive.**

2 **Formularies and antimicrobial approval systems**

2.1 **Key points**

- Formularies can be used to influence patterns of antimicrobial use in hospitals. Each hospital should have a formulary for antimicrobial drugs, and the drug and therapeutics committee of the hospital should define rules that restrict access to particular antimicrobial agents.

- Restrictions on the use of antimicrobials have played an important role in aborting outbreaks of resistant bacteria.

- Antimicrobial approval systems have been shown to be effective in optimising antimicrobial use in a hospital setting — their use has been associated with...
• Approval systems may be used for preprescription or postprescription approval.
• Experts providing the approval should be members of the antimicrobial stewardship teams, or their nominees.
• Computerised systems have been found to be acceptable to clinicians as a means of facilitating antimicrobial approvals in hospitals.

2.2 Recommendations

2.2.1 Hospitals have a list of restricted antimicrobial agents and criteria for their use that is consistent with *Therapeutic Guidelines: Antibiotic*.

2.2.2 Hospitals implement an antimicrobial approval system.

2.2.3 Compliance with the approval process is audited on a regular basis.

2.2.4 Expert advice is available 24 hours a day to guide clinicians in prescribing antimicrobials.

3 Antimicrobial review and prescriber feedback

3.1 Key points

• Practice review (audit) and feedback is a proven and effective strategy to influence prescribing behaviour.
• The review of antimicrobial prescribing practice and the provision of feedback to clinicians is an essential strategy for an antimicrobial stewardship program.
• The review of antimicrobial prescribing can be prospective or retrospective.
• Prospective review can involve strategies such as pre-authorisation and antimicrobial restrictions, with feedback being provided to the prescriber before the antimicrobial is administered.
• Retrospective review occurs after antimicrobial therapy has been initiated, and facilitates the provision of feedback based on results that may not have been available at the time of initiation.
• Although evidence suggests that an antimicrobial prescribing review undertaken by a single health professional can be effective, a multidisciplinary team (e.g. including an infectious disease clinician, clinical pharmacist and microbiologist) is more likely to have a positive effect.
• Feedback should be tailored to the target audience and can be provided on a case-by-case basis or at a ward unit level.

• Provision of feedback should be structured to assist with the transfer of information.

3.2 Recommendations

3.2.1 Antimicrobial review and prescriber feedback is a routine part of clinical care.

3.2.2 The antimicrobial stewardship team is responsible for the provision of review and feedback at patient and unit level in wards with high antimicrobial usage (e.g. intensive care, oncology and haematology units).

4 Point-of-care interventions

4.1 Key points

• Point-of-care interventions are a valuable component of antimicrobial stewardship.

• Point-of-care interventions provide direct feedback to the prescriber at the time of prescription or laboratory diagnosis, and provide an opportunity to educate clinical staff on appropriate prescribing.

• Examples of point-of-care interventions include:
  » reviewing appropriateness of choice of antimicrobial
  » directed therapy based on microscopy and other rapid tests
  » directed therapy based on culture and susceptibility test results
  » dose optimisation
  » parenteral-to-oral conversion
  » therapeutic drug monitoring
  » automatic stop orders.

• What interventions are selected, how they are delivered and by whom, will be determined by local resources and the expertise available.

4.2 Recommendations

4.2.1 Point-of-care interventions are included in all antimicrobial stewardship programs.
5 Measuring the performance of antimicrobial stewardship programs

5.1 Key points

- Monitoring and analysis of antimicrobial usage is critical to understanding antimicrobial resistance and measuring the effects of stewardship interventions.
- Continuous surveillance of the appropriateness of antimicrobial prescribing should be the ultimate aim of any stewardship program.
- Reporting and analysis of ward and hospital antimicrobial usage data is useful in monitoring trends and identifying areas for evaluating appropriateness of prescribing.
- Process and outcome measures are an integral part of any quality improvement program and should be incorporated into the hospital’s antimicrobial stewardship plan.
- Process indicators can be used to target and evaluate initiatives to improve prescribing. Providing timely feedback in a format that can be interpreted and used by clinicians is important.
- The introduction of an individual patient electronic medical record linked with electronic prescribing and medication management systems will improve surveillance of antimicrobial usage and appropriateness of prescribing, and enable more efficient targeting of interventions.

5.2 Recommendations

5.2.1 Antimicrobial usage data is collected and regularly reviewed to identify areas for improvement.

5.2.2 Quality indicators are monitored to assess appropriate prescribing practice and compliance with policy.

5.2.3 Information technology resources are available for:

- monitoring antimicrobial usage
- auditing process indicators
- measuring outcomes of the antimicrobial stewardship program.

5.2.4 Antimicrobial usage data is interpreted together with infection control and antimicrobial resistance data.
6 Education and competency of prescribers

6.1 Key points

• Education in safe and judicious antimicrobial prescribing is an important element of any antimicrobial stewardship program.

• Education of all health professionals involved in antimicrobial prescribing should begin at undergraduate level and be consolidated with further training throughout the postgraduate years.

• Active education techniques, such as academic detailing, consensus-building sessions and educational workshops have been shown to be more effective in changing prescribing behaviour than passive dissemination of information.

• Pharmaceutical industry-sponsored activities negatively influence prescribing behaviour.

6.2 Recommendations

6.2.1 Prescribers are taught to prescribe according to the Therapeutic Guidelines: Antibiotic in undergraduate, postgraduate and professional development programs.

6.2.2 Hospitals are responsible for educating clinical staff about their local antimicrobial stewardship programs.

6.2.3 Hospitals enact policies on the interaction between prescribers and the pharmaceutical industry, based on national guidance. Prescribers are educated about the influence of pharmaceutical industry activities on prescribing behaviour.

6.2.4 Education on antimicrobial stewardship is part of postgraduate training of infectious diseases physicians, microbiologists, pharmacologists, nurses and pharmacists.

7 The role of the clinical microbiology service

7.1 Key points

• The clinical microbiology service is an essential and integral part of organisational initiatives that underpin antimicrobial stewardship efforts.

• The establishment of best practice procedures for rapid microbiological evaluation is critical to delivering timely and accurate information.

• Intensive care units are an area of particular importance, as the control of resistance in these units can affect other areas of the hospital. The clinical microbiology service should therefore pay particular attention to services provided to these areas.
• Reports to the clinician from the clinical microbiology service can provide comments that interpret isolate significance, provide antimicrobial susceptibility interpretation and provide antimicrobial management advice.

• The clinical microbiology service also has a critical role to play in improving overall antimicrobial use through providing information, establishing guidelines and educating other hospital staff. One key strategy is the production of annual cumulative antibiograms to indicate susceptibility patterns for key pathogens.

• The clinical microbiology service provides surveillance data on resistant organisms for infection control purposes.

### 7.2 Recommendations

#### 7.2.1 Hospitals have access to a clinical microbiology service that provides:

» best practice diagnostic testing for infection, including relevant rapid tests for common viral, fungal or bacterial pathogens that are reported to clinicians

» consultation on choice, nature, handling and testing of specimens for detection of infection, especially when there is a broad infectious differential diagnosis under consideration

» direct advice from a specialist consultant or supervised registrar to clinicians at the time when bloodstream, meningeal or other critical infection is detected (this should occur seven days per week)

» regular patient-specific liaison with clinicians (including infectious diseases physicians if they are not integrated with the clinical microbiology service) who care for patients at a high risk of infection (e.g. patients in intensive care, haematology and oncology units).

#### 7.2.2 Regular analyses of antimicrobial resistance are provided to groups with responsibility for local antimicrobial guidelines (e.g. antimicrobial stewardship committee, drug and therapeutics committee) to inform local empirical therapy recommendations and formulary management.

#### 7.2.3 Cascade reporting of antimicrobial susceptibility is consistent with the *Therapeutic Guidelines: Antibiotic*.

#### 7.2.4 A national standard approach to antimicrobial susceptibility testing and cumulative analysis and reporting of antibiograms is developed, agreed and implemented by clinical microbiology services.
8 The role of the infectious diseases service

8.1 Key points

- Infectious diseases physicians give legitimacy to antimicrobial stewardship programs and play an important role by collaborating with local specialists to ensure that the team’s goals are understood and met.
- The infectious diseases service makes an important contribution to formulary decision making, antimicrobial restriction policies, and the establishment and operation of antimicrobial approval systems.
- The infectious diseases service has a critical role in improving overall antimicrobial use through providing expert advice on the appropriate use of antimicrobials, education of prescribers, and developing and implementing evidence-based guidelines for antimicrobial treatment and prophylaxis as part of the antimicrobial stewardship team.

8.2 Recommendations

8.2.1 The antimicrobial stewardship team includes an infectious diseases physician or clinical microbiologist (if available).

8.2.2 Hospitals have access to an infectious diseases service that provides expert advice, educates prescribers, and plays a major role in the development and implementation of antimicrobial policy and prescribing guidelines.

8.2.3 Hospitals without an on-site clinical microbiologist or infectious diseases physician negotiate external support for antimicrobial stewardship activities.

9 The role of the pharmacy service

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.

9.2.5 Mechanisms are in place to allow pharmacists to seek expert advice from, and refer to, a clinical microbiologist or infectious diseases physician.
10 Use of computer technology to support antimicrobial stewardship

10.1 Key points

- Electronic clinical decision-support systems are potentially useful tools in antimicrobial stewardship programs.
- Organisational, social and cultural issues relating to prescribing behaviour are key factors that determine the effectiveness of these systems, and resources should be directed towards addressing these issues during implementation.
- Electronic decision support must be integrated into the clinical workflow to be effective in a complex clinical domain such as antimicrobial prescribing.
- Electronic stewardship systems are most likely to be successful as part of a multidisciplinary antimicrobial stewardship program.

10.2 Recommendations

10.2.1 Hospitals work towards implementing electronic decision-support systems to guide antimicrobial prescribing and integrating these systems with electronic health records, and electronic prescribing and medication management systems.

10.2.2 An antimicrobial stewardship pharmacist and antimicrobial stewardship team are available to support and maintain electronic stewardship systems.

10.2.3 Antimicrobial stewardship teams have access to patient administrative data, microbiology data (including antimicrobial resistance) and drug use data for monitoring and reporting purposes.