Antimicrobial Stwardship


ANTIMICROBIAL
STEWARDSHIP

- Hospital Antibiotic Stewardship Programs

Antibiotics have transformed the practice of medicine, making once lethal infections readily treatable and making other medical advances, like cancer chemotherapy and organ transplants, possible.

The prompt initiation of antibiotics to treat infections has been proven to reduce morbidity and save lives, with a recent example being the rapid administration of antibiotics in the management of sepsis. However, 20–50% of all antibiotics prescribed in acute care hospitals are either unnecessary or inappropriate.

Like all medications, antibiotics have serious side effects, including adverse drug reactions and Clostridium difficile infection (CDI).The misuse of antibiotics has also contributed to the growing problem of antibiotic resistance, which has become one of the most serious and growing threats to public .The Centers for Disease Control and Prevention (CDC) estimates more than two million people are infected with antibiotic-resistant organisms, resulting in approximately 23,000 deaths annually.

Hospital based programs dedicated to improving antibiotic use, commonly referred to as “Antibiotic Stewardship Programs (ASPs),” can both optimize the treatment of infections and reduce adverse events associated with antibiotic use. These programs help clinicians improve the quality of patient care and improve patient safety through increased infection cure rates, reduced treatment failures, and increased frequency of correct prescribing for therapy and prophylaxis.They also significantly reduce hospital rates of CDI and antibiotic resistance.Moreover these programs often achieve these benefits while saving hospitals money.

The antimicrobial stewardship program will:

- a. Review antimicrobial prescribing and use
- b. Use surveillance data on antimicrobial resistance and use to support appropriate prescribing
- c. Evaluate performance of the program, identify areas for improvement, and take action to improve the appropriateness of antimicrobial prescribing and use
- d. Report to clinicians and the governing body regarding
- • compliance with the antimicrobial stewardship policy
- • antimicrobial use and resistance
- • appropriateness of prescribing and compliance with current evidence-based therapeutic guidelines or resources on antimicrobial prescribing

1. A patient with a life-threatening condition due to a suspected bacterial infection receives prompt antibiotic treatment without waiting for the results of investigations.

2. A patient with a suspected bacterial infection has samples taken for microbiology testing as clinically indicated, preferably before starting antibiotic treatment.

3. A patient with a suspected infection, and/or their carer, receives information on their health condition and treatment options in a format and language that they can understand.

4. When a patient is prescribed antibiotics, whether empirical or directed, this is done in accordance with the current version of the Therapeutic Guidelines[42] (or local antibiotic formulary). This is also guided by the patient's clinical condition and/or the results of microbiology testing.

5. When a patient is prescribed antibiotics, information about when, how and for how long to take them, as well as potential side effects and a review plan, is discussed with the patient and/or their carer.

6. When a patient is prescribed antibiotics, the reason, drug name, dose, route of administration, intended duration and review plan is documented in the patient's health record.

7. A patient who is treated with broad-spectrum antibiotics has the treatment reviewed and, if indicated, switched to treatment with a narrow-spectrum antibiotic. This is guided by the patient's clinical condition and the results of microbiology tests.

8. If investigations are conducted for a suspected bacterial infection, the responsible clinician reviews these results in a timely manner (within 24 hours of results being available) and antibiotic therapy is adjusted taking into account the patient's clinical condition and investigation results.

9. If a patient having surgery requires prophylactic antibiotics, the prescription is made in accordance with the current Therapeutic Guidelines[42] (or local antibiotic formulary), and takes into consideration the patient's clinical condition.

Box 1.3: Essential elements and strategies for antimicrobial stewardship programs

Structure and governance

Overall accountability for antimicrobial stewardship (AMS) is defined by an organisation's corporate and clinical governance. Managers and senior clinicians are responsible for the AMS program, including:

- Ensuring that AMS resides within the organisation's quality improvement and patient safety governance structure
- Establishing a multidisciplinary AMS team that includes, at least, a lead doctor and pharmacist
- Providing the necessary human, financial and information technology* resources for AMS activities
- Ensuring ongoing education and training for prescribers, pharmacists, nurses, midwives and consumers about AMS, antimicrobial resistance and optimal antimicrobial use.

Essential strategies

The essential strategies that sit within the AMS governance structure are:

- Implementing clinical guidelines† consistent with *Therapeutic Guidelines: Antibiotic* that take into account local microbiology and antimicrobial susceptibility patterns
- Implementing formulary§ restriction and approval systems that include restricting broad-spectrum and later-generation antimicrobials to patients in whom their use is clinically justified
- Reviewing antimicrobial prescribing, with intervention and direct feedback to the prescriber
- Implementing point-of-care interventions (including directed therapy, intravenous-to-oral switching and dose optimisation)
- Ensuring that the clinical microbiology service
  - provides guidance and support for optimal specimen collection
  - targets reporting of clinically meaningful pathogens and their susceptibilities
  - uses selective reporting of susceptibility testing results
  - generates location-specific antimicrobial susceptibility reports (antibiograms) annually
- Monitoring antimicrobial use and outcomes, and reporting to clinicians and management.

* Information technology examples include electronic prescribing with clinical decision support, online approval systems for restricted agents, post-prescription alert systems and antimicrobial use surveillance systems.
† Guidelines include clinical pathways and care bundles.
§ Refers to institutional formularies; in the community, the Pharmaceutical Benefits Scheme and the Repatriation Pharmaceutical Benefits Scheme act as the formulary.

Summary of Core Elements of Hospital Antibiotic Stewardship Programs

- Leadership Commitment: Dedicating necessary human, financial and information technology resources.
- Accountability: Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.
- Drug Expertise: Appointing a single pharmacist leader responsible for working to improve antibiotic use.
- Action: Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. “antibiotic time out” after 48 hours).
- Tracking: Monitoring antibiotic prescribing and resistance patterns.
- Reporting: Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff.
- Education: Educating clinicians about resistance and optimal prescribing.

Leadership Commitment

Leadership support is critical to the success of antibiotic stewardship programs and can take a number of forms, including:

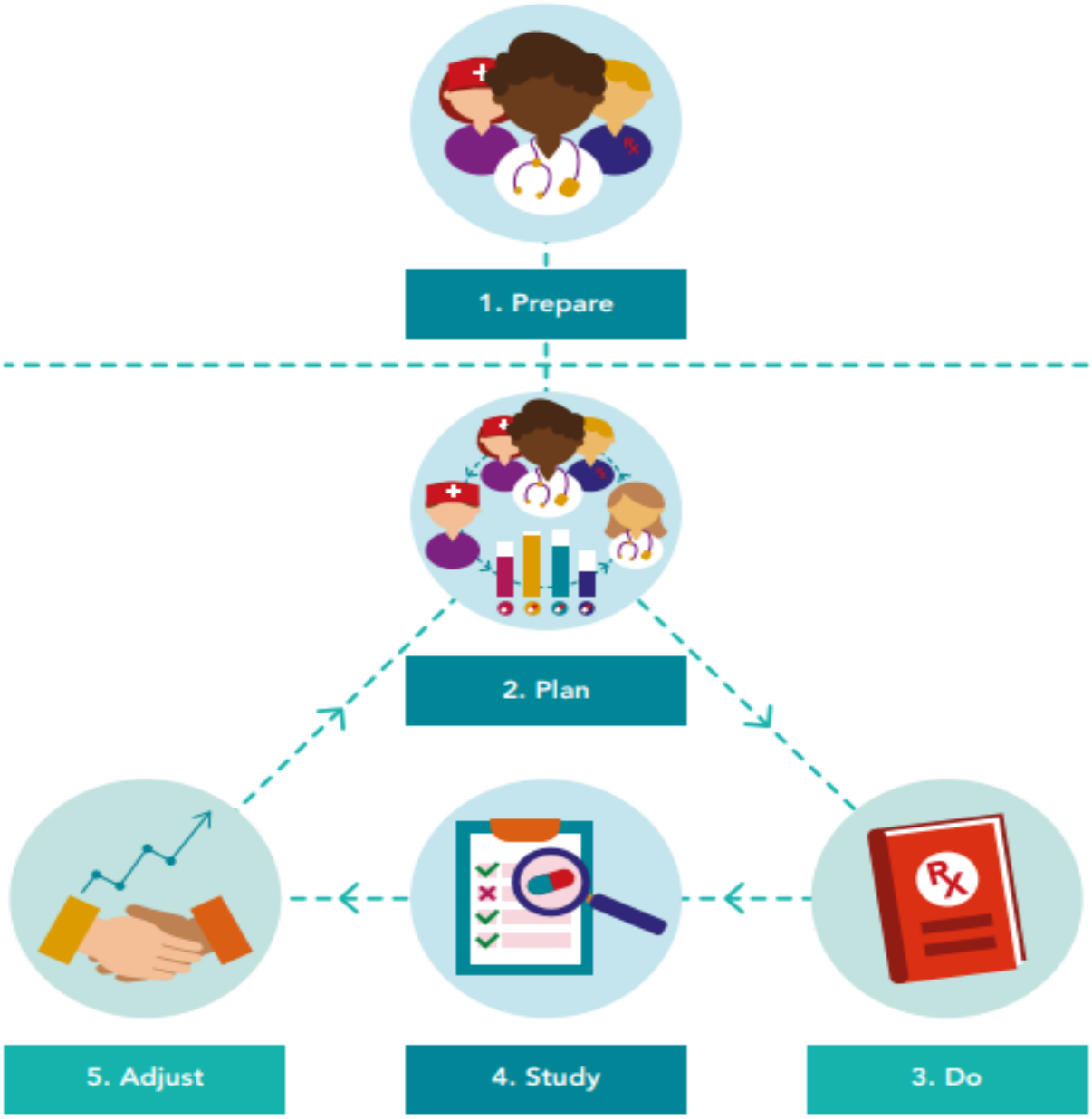
- Formal statements that the facility supports efforts to improve and monitor antibiotic use.
- Including stewardship-related duties in job descriptions and annual performance reviews.
- Ensuring staff from relevant departments are given sufficient time to contribute to stewardship activities.
- Supporting training and education.
- Ensuring participation from the many groups that can support stewardship activities.

Accountability and Drug Expertise

• Stewardship program leader: Identify a single leader who will be responsible for program outcomes. Physicians have been highly effective in this role.

• Pharmacy leader: Identify a single pharmacy leader who will co-lead the program.

- The work of stewardship program leaders is greatly enhanced by the support of other key groups in hospitals where they are available:
- Clinicians and department heads.
- Infection preventionists and hospital epidemiologists
- Quality improvement staff
- Laboratory staff
- Information technology staff
- Nurses



Implement Policies and Interventions to Improve Antibiotic Use

- Key points

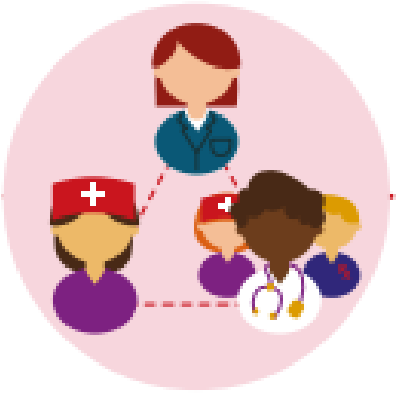
• Implement policies that support optimal antibiotic use.

• Utilize specific interventions that can be divided into three categories: broad, pharmacy driven and infection and syndrome specific.

- Tracking and Reporting Antibiotic Use and Outcomes

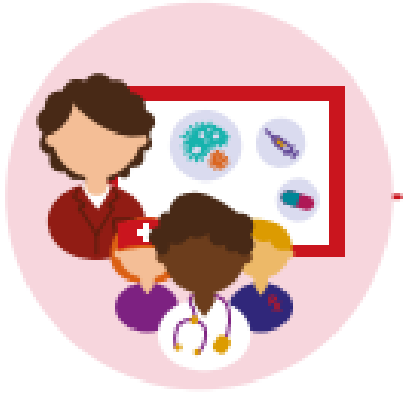
- Education

Leadership commitment



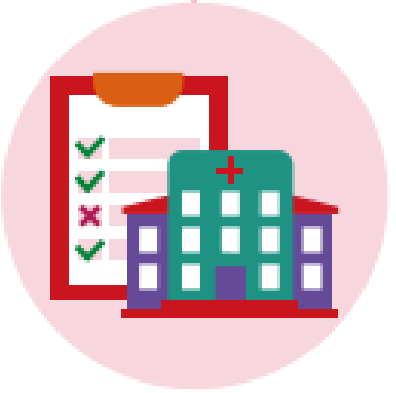
Accountability & responsibilities

AMS actions



Education & training

Monitoring & surveillance



Reporting & feedback

Role of the infectious diseases service in antimicrobial stewardship

- Infectious diseases (ID) physicians play an essential role in antimicrobial stewardship (AMS), which needs to be considered when planning the AMS program and the composition of hospital and network AMS teams.
- Depending on activity, the involvement of at least one ID physician to contribute effectively to the development, implementation and functions of the AMS program is important to the success of the program.
- The roles of ID physicians include providing advice on the appropriate use of antimicrobials; developing and implementing evidence-based guidelines for antimicrobial treatment and prophylaxis; and contributing to formulary decision-making, antimicrobial restriction policies, and the establishment and operation of antimicrobial approval systems.
- ID physicians are able to make a considerable contribution to the development and delivery of education to the workforce through formal education programs, through feedback provided at forums such as grand rounds, or as part of an AMS intervention.

The advice of an ID physician should be sought about:

- The initiation, de-escalation and cessation of antimicrobial therapy for individual patients (this can occur during AMS rounds)
- The need for therapeutic drug monitoring to maximise clinical activity and minimise adverse events caused by antimicrobial therapy
- Adjustment in the dose, frequency and route of antimicrobial administration in specific clinical situations (for example, management of sepsis and neutropenia) and specific patient groups (for example, neonates).

ID physicians can also play an important role in interpreting antibiograms and trends in AMR at local and national levels.

Table 3.2: Categories of antimicrobial restrictions

Antimicrobial category	Details and examples
Unrestricted	• Can be prescribed without an approval • Examples include benzylpenicillin and doxycycline
Restricted or 'protected'	• Require an approval within a nominated time of the medicine being prescribed (e.g. within 24 hours) • Individual prescription review is required for prolonged use (beyond 48–72 hours) • Examples include broad-spectrum antimicrobials with potential to promote resistance – such as ceftriaxone, vancomycin, ciprofloxacin and meropenem – and those that are common targets for antimicrobial stewardship programs
Highly restricted	• Require discussion with a nominated expert to obtain approval before the medicine can be initiated, to ensure that use is appropriate and to enable ongoing patient follow-up • Often, a full, formal, specialist clinical consultation for these patients is also recommended • Examples include antimicrobials viewed as last-line agents and reserved for highly resistant pathogens, or medicines with high potential toxicity or high cost, such as echinocandins, colistin and linezolid

Examples of comments that interpret results, and provide clinical and infection control advice

Blood	*Staphylococcus aureus* isolated	*Staphylococcus aureus* isolated from blood is rarely a contaminant. 30-day all-cause mortality of *S. aureus* bacteraemia is approx. 21%.[78] Formal consultation with infectious diseases physician or clinical microbiologist is strongly recommended. The Staphylococcus Bacteraemia Management Guideline can be found at [location/URL]. Relapse of *S. aureus* bacteraemia occurs in up to 5% and may present up to 3 months after the event. Patients should receive a written note to this effect [reference information sheet].
Blood	Isolate of coagulase-negative *Staphylococcus* (CoNS) from an intensive care patient – mixed or isolated after prolonged incubation (>1 day), only one set taken	For optimal sensitivity and specificity, at least two separate blood culture sets (adult, 20 mL each) should be collected from separate venepuncture sites before starting antimicrobial treatment. This patient had one set collected, which has isolated CoNS. This result could indicate either infection or contamination – clinical correlation is required.
Blood	Isolate of potential contaminant organism(s) from non–intensive care unit patient – mixed or isolated after prolonged incubation (>1 day), not present in multiple sets	This isolate most likely represents contamination. To avoid contamination during blood culture collection: • Do not collect sample through pre-existing or new intravascular lines • Perform hand hygiene before the procedure • Disinfect the skin site and blood culture bottle caps with [alcohol/other preferred agent] (applied for at least 1 minute)

Faeces	Isolate of *Campylobacter*	*Campylobacter* gastroenteritis does not normally require antimicrobial treatment. However, in severe or prolonged cases, and during pregnancy, treatment is indicated – refer to *Therapeutic Guidelines: Antibiotic*.
Isolate from non-sterile site	Antimicrobial susceptibility reported for information rather than to recommend treatment	The reporting of antimicrobial susceptibility does not imply that treatment with antimicrobials is necessary. Colonisation (as opposed to infection) does not require antimicrobial treatment.
Any specimen	Isolate of carbapenemase-producing Enterobacteriaceae (CPE)	CPE detected. Treatment options are limited – consult [insert preferred reference here]. Manage CPE-colonised inpatients with standard and contact precautions. [An alert is placed on the patient record.] (For further information, see Resources.)

Role of the clinical microbiology service in antimicrobial stewardship

- The clinical microbiology service (CMS) provides a vital function in laboratory diagnosis of infections, which supports effective patient management.
- The laboratory diagnostic process involves test ordering, specimen collection, laboratory testing, and interpretation and communication of the result. The systematic application of best practice is needed at each of these stages to optimise patient care and antimicrobial use.
- Formalised processes should be in place to ensure appropriate clinical specimen collection and testing, to ensure the accuracy and quality of diagnostic testing, and timely reporting with comments that assist in interpretation.
- The CMS also plays system-wide roles in antimicrobial stewardship, including in the surveillance of antimicrobial resistance (AMR), advice on infection control issues, therapeutic drug monitoring and workforce education.
- The CMS provides input to the reporting of AMR through surveillance programs such as Antimicrobial Use and Resistance in Australia and the National Alert System for Critical Antimicrobial Resistances.

Role of the pharmacist and pharmacy services in antimicrobial stewardship

- Pharmacists play a key role in antimicrobial stewardship (AMS) in hospitals, aged care homes and the community.
- A pharmacist with experience and training in AMS performs an important leadership role and is an important resource for the AMS team. In some health service organisations, the AMS pharmacist may lead the AMS program.
- Ideally, the AMS pharmacist should be an experienced clinical pharmacist with expertise in antimicrobials and the therapeutic management of infectious diseases.
- The AMS pharmacist is in a position to promote the uptake and implementation of the National Safety and Quality Health Service Preventing and Controlling Healthcare-Associated Infection Standard and the Antimicrobial Stewardship Clinical Care Standard as part of routine patient care.
- Studies in hospitals have shown that pharmacists' interventions, including routine reviews of antimicrobial prescriptions, can improve the appropriate use of antimicrobials and reduce costs.
- In addition to clinically reviewing and dispensing antimicrobial prescriptions, community pharmacists should educate patients and carers about the appropriate use of antimicrobials.
- Pharmacists providing home medication reviews or residential medication management reviews can also contribute to AMS activities.

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

- 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.

THANK YOU