3 Antimicrobial review and prescriber feedback

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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 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).

3.3 Practice review

Practice review and feedback can be an effective method to influence prescribing behaviour that results in small to moderate changes in practice. This strategy has been used across a wide range of therapeutic areas in the healthcare setting. With respect to optimising drug use, the process of review commonly involves comparing current prescribing practice to an accepted standard or best practice, and feeding back variations in practice to the target audience. In the context of improving use of antimicrobials in the hospital setting, practice review often includes the use of a set of antimicrobial guidelines or an antimicrobial formulary as the standard to compare prescribing practice. Practice review and feedback has been incorporated into various strategies to influence prescribing behaviour, including the review of individual episodes of care and as part of broader quality improvement programs. In quality improvement programs, the process of practice review is often referred to as ‘audit’.

In efforts to promote the prudent use of antimicrobials, a number of international peak bodies and organisations have included practice review/audit and feedback as a key strategy (or standard of practice) in the healthcare setting. The Infectious Diseases Society of America has identified practice review as one of two core strategies — the second being formulary restriction and preauthorisation — that provide the foundation for an antimicrobial stewardship (AMS) program. The Healthcare Commission (now the Care Quality Commission) in the United Kingdom recommended that ‘... the checking and provision of advice on antimicrobial prescribing is routinely undertaken’ to ensure appropriate and effective use of medicines. Similar recommendations have been made in other countries, including Australia.
3.4 **Reviewing practice**

This section outlines methods for reviewing prescribing practice: individual episodes of care and quality improvement programs.

3.4.1 **Individual episodes of care**

Review of antimicrobial prescribing may occur prospectively, before dispensing (front-end approach) or retrospectively, after therapy has been initiated (back-end approach). The front-end approach involves strategies such as pre-authorisation and antimicrobial restrictions, with direct feedback provided to the clinician before the drug is dispensed. Possible problems associated with this approach include a perceived loss of autonomy by prescribers and the need for 24-hour staffing, seven days a week. However, the front-end approach does provide an opportunity for additional education, as well as the provision of feedback regarding the particular episode of care. This approach, although more restrictive than the back-end approach, may be more effective in the overall appropriateness of antimicrobial prescribing.  

The back-end approach, or retrospective review of prescribing behaviour, ‘permits empirical use of broad-spectrum antimicrobials, followed by postprescription review and then streamlining or discontinuing therapy’.

A number of benefits of postprescription review have been identified in the literature. These include:

- that recommendations will be informed by additional information not available at the time that the antimicrobials are prescribed, including results of radiologic and microbiologic tests
- preservation of the autonomy of prescribers
- the opportunity for additional education when providing feedback
- the likelihood that this approach is less resource-intensive than the front-end approach.

Studies have reported that the retrospective review of antimicrobial therapy can occur 24–72 hours postprescription. A small nonteaching hospital reported significant improvements after the implementation of a postprescription review service provided on specific days of the week (three per week), rather than at a specific time interval after an antimicrobial had been prescribed.

3.4.2 **Quality improvement programs**

The process of audit and feedback form part of established evidence-based quality improvement methodologies (e.g. Plan-Do-Study-Act [PDSA] or Drug Usage Evaluation [DUE] cycles) for the purpose of gathering data to be used as part of educational activities to influence prescribing behaviour (see Chapter 6 for more information on the education of prescribers). Typically, prescribing practice from multiple episodes of care (e.g. patients identified over a given time period) is evaluated against an accepted standard. Concordance with the standard is provided
Prospective audit of antimicrobial use with direct interaction and feedback to prescriber, performed either by an infectious diseases physician or clinical pharmacist with infectious diseases training, can result in reduced inappropriate use of antimicrobials.

Further information on monitoring usage and quality improvement programs is provided in Chapter 5.

3.5 Who should undertake the review and feedback process?

Models of the process of review and feedback in the literature include review by single health professionals (e.g. an infectious diseases [ID] physician or a clinical pharmacist) or by a multidisciplinary team (two or more members) representing specialties such as infectious diseases, pharmacy and microbiology. Both the individual approach and the team approach have been found to improve antimicrobial use. International peak bodies recommend that a multidisciplinary team or expert group be involved. It is widely acknowledged that a multidisciplinary team working together to change practice is more likely to have a positive effect.

Hospital pharmacists are well placed to identify antimicrobial use that requires review and can refer cases to the nominated AMS health professional or team. In addition, routine rounds by an AMS team in clinical areas (e.g. intensive care) can facilitate the process of practice review and feedback. For further information regarding the roles of the microbiology and ID services see Chapters 7 and 8, respectively.

3.6 What should the feedback include and how should it be provided?

This section outlines the kinds of feedback that should be included to facilitate improvements in prescribing practice for individual episodes of care and quality improvement programs.

3.6.1 Individual episodes of care

The ‘appropriateness’ of prescribing is an important concept in interventions for the improvement of prescribing practice, and papers have been published addressing this concept. One or more of the following might be used in an assessment of appropriateness:

• the decision to prescribe an antimicrobial
• the prescribing of an antimicrobial in accordance with local policy

as feedback to hospital staff as part of intervention and education. The process of audit and feedback is often repeated so that changes in prescribing practice can be monitored over time. Many quality improvement initiatives aimed to improve antimicrobial use have taken place within institutions and across multiple sites (e.g. Community Acquired Pneumonia: Towards Improving Outcomes Nationally — see Appendix 1 for further details).
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- dosage
- duration of therapy.

Feedback, when required, should be directed to the prescriber immediately after a review of an individual episode of prescribing has been completed. Ideally, the provision of feedback to clinicians should be structured to assist in the transfer of information (e.g. ISBAR: a communication technique trialled in the Australian Commission on Safety and Quality in Health Care Clinical Handover Initiative Pilot Program. www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/PriorityProgram-05_ISBAR) to the prescriber. This approach should be applied to both verbal and written methods of providing feedback.

Different methods of feedback after postprescription review were compared by Cosgrove et al. The study looked at feedback provided by either a direct telephone call, a note in the medical record or a text message sent to the clinician’s pager. The text messages and notes left in the medical record included detailed information on the recommended change, including the dose of the new agent and a rationale for the change. Recommendations were taken up by the attending clinician:

- 57.1% of the time with telephone call feedback
- 67.5% of the time with feedback via the paging system
- 73.7% of the time with feedback via a note in the medical record.

However, there was no statistical difference between the groups and the authors commented that this suggests that clinicians may be willing to implement changes regardless of how feedback is provided. They also suggested that hospitals with limited resources may be able to coordinate postprescription review and feedback of antimicrobial therapy effectively by conveying results by text or notes in the medical record. These methods are less resource-intensive than calling the clinician directly and they provide a clearer record than a telephone conversation, which relies on the clinician to write down the advice. However, direct telephone contact with the clinician allows further discussion and queries about the advice.

Interestingly, Cosgrove et al. found overall that medical teams were more likely than surgical teams to accept recommendations (68.1% versus 60.5%, \( P = 0.004 \)). The authors noted that the surgical unit interns were more likely to seek consultant advice before making changes, compared with medical interns who were more likely to act independently. The surgical unit with the highest uptake of recommendations was staffed primarily by nurse practitioners who were able to modify patients’ treatment regimens.

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a ISBAR is a communication technique trialled in the Australian Commission on Safety and Quality in Health Care Clinical Handover Initiative Pilot Program. www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/PriorityProgram-05_ISBAR
3.6.2 Quality improvement programs

Quality improvement programs typically incorporate an agreed set of measures describing the quality of current practice. These are provided as feedback to hospital staff. Adherence of prescribing practice to accepted standards or guidelines is a common measure used in quality improvement initiatives aimed at influencing prescribing behaviour. Other measures include length of stay, readmission rates, clinical outcomes, mortality rates and drug use costs or consumption data.

As quality improvement programs involve the audit of multiple episodes of care, the data can be used to identify ‘gaps’ in practice at the level of a team or ward (compared with the review of individual episodes of care that focus on the practice of an individual). Feedback sessions can be tailored for the target audience and include the results of the audit and discussion around relevant guidelines and evidence, to educate hospital staff on best or accepted practice.

CAPTION, a multicentre quality improvement initiative supported by the National Prescribing Service, aimed to improve antimicrobial use in the management of community acquired pneumonia in Australian emergency departments. As part of the initiative, two key measures were provided as feedback to hospital staff:

- documented use of a disease severity assessment tool
- concordance of antimicrobial prescribing with accepted national guidelines.

A set of tailored interventions were rolled out in participating hospitals, including one-on-one education visits, group education sessions that included the feedback of audit results and point-of-prescribing prompts. An overall 1.5-fold improvement in concordant antimicrobial prescribing was reported.

Cooke and Holmes propose the use of multifaceted interventions (care bundles) to improve appropriate antimicrobial prescribing in acute care and surgical prophylaxis. They describe care bundles as a group of key evidence-based or logical actions, instituted over a specified timeframe, which if delivered together have a greater clinical effect than if each element was instituted individually. They suggest that hospitals using the care bundle approach to antimicrobial prescribing could improve local prescribing of antimicrobials and have ready access to performance measures of processes of care to serve as indicators for quality improvement programs. Further information on the use of care bundles to improve AMS prescribing is provided in Chapter 1.

Feedback may also be provided via weekly reports to prescribers, including aggregated data on compliance with guidelines and uptake of recommendations by clinicians. Other forms of feedback include department-specific reports regarding compliance with local guidelines and newsletters highlighting therapeutic matters related to specific issues identified in the audit process.
3.7 Published benefits

A Cochrane review published in 2005 reported on interventions to improve antimicrobial prescribing practices for hospital inpatients.\textsuperscript{34} Interventions were classified as either persuasive — including audit and feedback — or restrictive (e.g. formularies, prior approval). The review looked at 10 published studies that used interrupted time series analysis to investigate the impact of persuasive interventions aimed to decrease inappropriate antimicrobial use. Five of the studies included the review and feedback of clinician prescribing. Four out of five of these demonstrated a significant improvement in measures of drug use data (grams or cost).

The Cochrane review identified only one paper that reported on the impact of persuasive interventions on microbiological outcomes. An antimicrobial program, including immediate practice review and feedback to clinicians, was initiated in a university teaching hospital in the United States after a sharp increase in the use of broad-spectrum cephalosporins and aztreonam was reported.\textsuperscript{42} Data were collected for seven years after the implementation of the program. The authors reported a 22% reduction in the use of specific broad-spectrum antimicrobials and a significant decrease in nosocomial infections caused by \textit{Clostridium difficile} and resistant Enterobacteriaceae (see Figure 3.1).

A randomised controlled trial that was not included in the Cochrane review investigated the effect of audit and feedback by an ID fellow and a clinical pharmacist on a group of prescribers, compared with a control group that received no feedback.\textsuperscript{79} The review occurred 72 hours after the antimicrobial was prescribed. The impact of the intervention was assessed through cost savings, and clinical and microbiological outcomes. There was a significant cost saving of approximately US$400 per patient in the intervention group compared with the control group. There was no difference between the two groups in clinical or microbiological response.

A more recent study investigated the effect of prescriber feedback on antimicrobial prescribing behaviour and \textit{C. difficile} infection (CDI) rates.\textsuperscript{80} A narrow-spectrum antimicrobial policy was introduced across three aged care wards, with the aim of improving antimicrobial prescribing and reducing CDI. Feedback was provided to prescribers every 8–12 weeks, reporting antimicrobial usage (the number of notional 7-day courses per 100 admissions per month) and CDI rates. A copy of the policy was also provided to prescribers in the form of a laminated pocket-sized card.

Using interrupted time series methodology, Fowler et al. demonstrated a significant reduction in the use of broad-spectrum antimicrobials and an increased use of narrow-spectrum agents. CDI rates also fell, with incidence rate ratios of 0.35 (0.17–0.73, $P = 0.009$). It is interesting to note that the measure of antimicrobial use was used as part of the feedback to prescribers. The authors note that antimicrobial use was selected as a measure, rather than as defined daily doses per 1000 bed-days, to help doctors visualise the percentage of patients treated with individual antimicrobials.
Figure 3.1 Rates of nosocomial *Clostridium difficile* and resistant Enterobacteriaceae infections, expressed per 1000 patient days, before (1989–91) and after (1992–98) implementation of the antimicrobial management program; top, *C. difficile*; bottom, resistant Enterobacteriaceae

The options of de-escalation, streamlining, switching from intravenous to oral delivery or ceasing antimicrobial therapy may not demonstrate an improvement in immediate patient outcomes compared with continuation of broad-spectrum therapy. Demonstrating no additional harm or adverse events when optimising antimicrobial therapy is therefore an important consideration, in addition to any cost savings that may be realised. Where available, data demonstrating patient safety outcomes should be included as part of the feedback or education process when rationalising antimicrobial therapy.

Source: Carling et al. (2003)