

KEY PERFORMANCE INDICATORS FOR ANTIMICROBIAL STEWARDSHIP

Fact Sheet

This fact sheet contains advice on developing key performance indicators for an antimicrobial stewardship (AMS) program. It is based on current literature, national recommendations and input from clinicians working in NSW public health facilities.

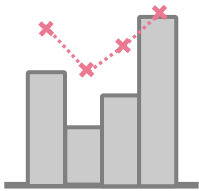
Antimicrobial stewardship (AMS) is an ongoing and systematic effort to optimise the use of antimicrobial medicines.¹ Within a health service organisation, a formal AMS program aims to improve patient outcomes, ensure cost effective therapy, and reduce the impact of inappropriate or unnecessary antimicrobial prescribing.²

An AMS program should be evaluated against selected key performance indicators (KPIs), which are measures of impact used to evaluate the success of these programs as a quality improvement strategy. A suitable selection of KPIs provides the committee that oversees AMS, healthcare executives and other stakeholders with concise information about the direct or indirect effects of AMS initiatives. It should be noted however, that KPI results should not be evaluated as ‘pass or fail’, but rather as a quantitative measure of ongoing development or a prompt for action.

Identifying objective and reliable KPIs can be challenging in a real-world environment, but is the only way to demonstrate effectiveness or progress over time. Individual healthcare facilities need to select KPIs that are objective, informative, and achievable, and take care to acknowledge the limitations of their data within their interpretation and analysis.

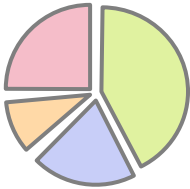
Useful KPIs for AMS programs generally focus on quantity and quality of antimicrobial usage, as well as relevant process and outcome measures of AMS.

QUANTITY MEASURES



How much antimicrobial therapy are we using over time?

QUALITY MEASURES



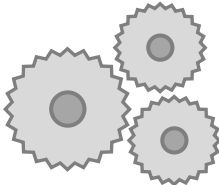
To what extent are we using our antimicrobials appropriately?

OUTCOME MEASURES



What are the ultimate results or consequences of our AMS initiatives?

PROCESS MEASURES



How reliable are our processes for optimising AMS in everyday practice?

Australians are among the highest consumers of antimicrobials in the developed world,³ and up to 50% of antimicrobial use in Australian hospitals may be inappropriate.¹

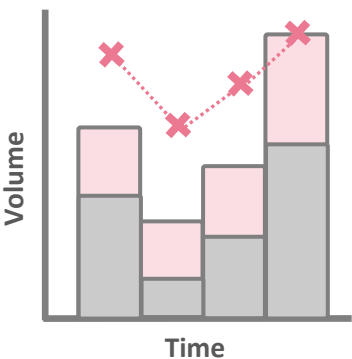
Selecting quality measures of antimicrobial usage

AMS initiatives optimise the quality of antimicrobial usage by improving the appropriateness of necessary use (e.g. ensuring optimal antimicrobial therapy for sepsis) and reducing rates of unnecessary use (e.g. preventing prolonged courses of standard surgical prophylaxis).



Point prevalence studies or snapshot surveys that review the quality or ‘appropriateness’ of antimicrobial use offer valuable insight into the effectiveness of an AMS program.^{4,5,7} Expertise provided by infectious diseases physicians and medical microbiologists helps to legitimise audits of appropriateness⁵ and supports the feedback of results to prescribers. In facilities where this expertise may be lacking, compliance with guidelines (for empiric therapy) or microbiology results (for directed therapy) may be used as a surrogate measure of appropriateness.^{8,9}

Selecting quantity measures of antimicrobial usage



Measuring the volume of antimicrobials used over time offers valuable insight into overall consumption and helps to identify relevant changes or trends in usage. The simplest method of monitoring usage involves calculating the total number of grams or vials of a particular antimicrobial used each month and reviewing this information at regular intervals. More advanced methods of data review can enhance the usefulness of this raw consumption data by incorporating measures of hospital activity

(e.g. usage per 1,000 occupied bed days) and the standard doses of each antimicrobial product (called ‘defined daily doses’ or ‘DDDs’). This analysis allows facilities to draw comparisons between different antimicrobial agents and usage rates in other facilities.^{5,6}

Some NSW hospitals have used long-term data to extrapolate a relationship between usage rates of specific antimicrobials and overall prescribing quality. This may lead to the development of local consumption targets, such as a goal of “no more than 20 DDDs per 1,000 occupied bed days for all third generation cephalosporins”. When consumption exceeds the allocated target, the AMS committee recognises that this is likely indicative of an increase in inappropriate prescriptions and can take action as required.

Suggested KPIs for quality measures include:

- Percentage of appropriate antimicrobial orders over time, reviewed by agent and clinical unit
- Percentage of appropriate orders for antimicrobials identified as problematic or high-risk
- Percentage of appropriate antimicrobial orders for specified infective conditions

Suggested KPIs for quantity measures include:

- DDDs per 1,000 occupied bed days of third generation cephalosporins, quinolones and carbapenems
- DDDs per 1,000 occupied bed days for antimicrobials identified as problematic or high-risk

Useful Resources

➤ National Antimicrobial Prescribing Survey (NAPS)

NAPS facilitates local point prevalence studies and provides definitions and guidance to assist in determining appropriateness across individual wards or whole facilities⁷. Information about using the NAPS data collection tool and registration for the annual national survey is available on the [NAPS website](#).

➤ Indicators for Quality Use of Medicines in Australian Hospitals

The NSW Therapeutic Advisory Group has developed a number of indicators which are useful quality and/or process measures for AMS. Indicator 2.1 and 2.5 use concordance with guidelines as a surrogate measure of appropriateness in surgical prophylaxis and community acquired pneumonia¹⁰. Indicator 2.2 reviews concordance of antimicrobial prescribing processes with local restriction policy. Indicator manuals may be downloaded from the [NSW Therapeutic Advisory Group website](#).

➤ Monitoring and Reporting Antimicrobial Usage (Fact Sheet)

Produced by the Clinical Excellence Commission, this fact sheet provides NSW public hospitals with guidance on how best to monitor antimicrobial consumption. It is available for download from the [Quality Use of Antimicrobials in Healthcare website](#) and includes information on the [National Antimicrobial Utilisation Surveillance Program \(NAUSP\)](#).

➤ 5x5 Antimicrobial Audit Package

This audit methodology focuses on the process and quality of empirical antimicrobial prescribing by asking 5 yes/no questions in 5 patients per week. A comprehensive audit package is being piloted throughout 2014, and is available for download from the [Quality Use of Antimicrobials in Healthcare website](#).

The following resources offer further discussion of KPIs within the context of AMS:

- [A Practical Guide to Antimicrobial Stewardship in Hospitals](#)¹² (Booklet)
- [Core Elements of Hospital Antibiotic Stewardship Programs](#)¹³ (CDC Document)
- Antimicrobial stewardship: a matter of process or outcome?¹⁴ (Journal Article)

References: Please see the QUAH page on the CEC website for full fact sheet references. (www.cec.health.nsw.gov.au/programs/quah)

Selecting **outcome measures** for AMS initiatives



One of the core objectives of an AMS program is to improve the effectiveness of patient care. Quantifying the impact of AMS initiatives on patient-focused outcomes is often challenging however, as these results are influenced by a wide range of factors. While an AMS program may improve outcomes such as length of inpatient stay or mortality from infection,⁵ it is not feasible to control or adjust for all confounding variables and is therefore difficult to verify a direct cause-and-effect relationship.¹¹ Measures based on rates of antibiotic-related complications, mortality, readmission, or ICU admission can still be useful, but may be best employed as balancing measures or measures of unintended consequences as opposed to specific outcome indicators.¹²

A potential adverse effect of broad-spectrum antimicrobial use is the development of antibiotic-associated *Clostridium difficile* infection (CDI). CDI rates have been used widely in the US and UK as measures of the impact of AMS programs.¹²⁻¹⁴ If used as a KPI for AMS programs, hospital-acquired (as opposed to 'hospital identified') CDI rates should be reviewed in conjunction with consumption data for antibiotics that are associated with an increased risk of developing CDI.¹⁴

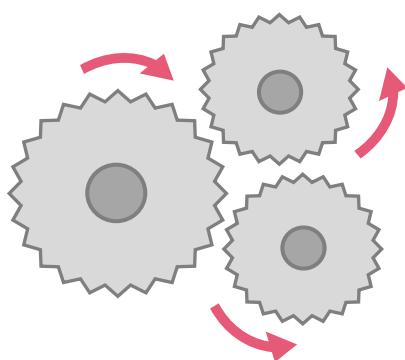
Monitoring antimicrobial resistance (AMR) is required for AMS programs,¹⁵ and local resistance rates in specific infection types may be used to inform local guidelines. Some hospitals use AMR rates to evaluate AMS interventions,¹⁶ although there are limitations to this practice. Patterns of antibiotic susceptibility in cases of hospital-acquired infections, reviewed in conjunction with corresponding antibiotic usage rates, may provide a more reliable assessment of impact.^{13,16}

Advice regarding use of **outcome-based KPIs** for AMS

It is difficult to recommend specific outcome-based KPIs for AMS, however the following should be monitored (in association with the Infection Prevention and Control Committee):

- Antimicrobial resistance rates in *Staphylococcus aureus* infections (at minimum, MRSA rates in *S. aureus* bloodstream infections)
- *Clostridium difficile* infection rates
- Antimicrobial resistance rates in organisms that have been identified as problematic or high-risk. Example organisms include *Enterococcus faecium*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Enterobacter cloacae*.

Selecting **process measures** for AMS initiatives



Process measures are commonly used as AMS program KPIs. These measures provide a reflection of the quality of care, provided that a link between the application of a process and its beneficial outcome has already been established.¹⁶ Rates of compliance with guidelines or restriction policy, point-of-care interventions made or acceptance of advice offered by the AMS team are example measures of processes known to improve patient care outcomes.¹⁶

The 5x5 Antimicrobial Audit methodology measures two process indicators for empiric antimicrobial prescribing, and is based on the work of the Scottish Antimicrobial Prescribing Group.¹⁷ The indicators are documentation of a clear indication for antimicrobial therapy and concordance with locally endorsed guidelines or the *Therapeutic Guidelines: Antibiotic* (or non-concordance with a documented reason).¹⁸ Similar indicators are used in a range of antimicrobial audit tools.^{7,9}

Suggested KPIs for **process measures** include:

- Percentage of empiric antimicrobial orders where antimicrobial choice is concordant with locally-endorsed guidelines
- Percentage of restricted antimicrobial orders that are concordant with approved restriction criteria
- Rate of acceptance of antimicrobial advice provided by expert clinicians and/or restricted antimicrobial approvers