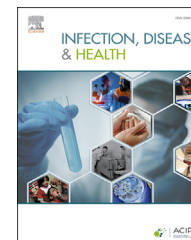


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Discussion paper

Surgical antibiotic prophylaxis – The evidence and understanding its impact on consensus guidelines

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KEYWORDS

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Abstract *Background:* Surgical site infections are complications of surgical care that may be prevented with appropriate surgical antibiotic prophylaxis (SAP). SAP is the most common indication for antimicrobial use in Australian hospitals; however, it is associated with high rates of inappropriate use.

Inappropriate SAP is associated with adverse consequences for both the patient and the community. The underlying reasons for inappropriate use, however, are not well delineated. Potential factors include the quality of the evidence base regarding SAP use and available guidelines.

Methods: The literature review focused on research classified as having Level 1 evidence according to the National Health and Medical Research Council (NHMRC) evidence hierarchy. Findings were then compared to the current Australian recommended guidelines (Therapeutic Guideline: Antibiotic Surgical Prophylaxis).

Results: Overall, 50 systematic reviews (SR) and meta-analysis (MAs) were identified for the review. The evidence examined highlights that first-generation cephalosporins are the antimicrobial agents of choice and single-dose prophylaxis is effective for the majority of surgical procedures included in this review. There is limited evidence pertaining to a specific optimal antimicrobial, dosing and timing. Thus, there is no overarching Level 1 evidence combining all elements for an optimal SAP regimen (i.e., choice of agent, dose, route and duration) to support individual Therapeutic Guideline: Antibiotic recommendations, although there may be Level 1 evidence for the individual elements.

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Conclusions: Considerable evidence supports the use of SAP; however, there are gaps in the evidence behind recommendations for the most appropriate SAP regimen for different surgical procedures. Expert consensus guideline development aims to narrow these gaps, but guideline implementability and uptake are influenced by multiple factors including the comprehensiveness of the evidence. Further research is warranted to examine guideline implementability and uptake, and to identify problematic areas surrounding surgical prophylaxis prescribing.

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Highlights

- Surgical site infections are complications of surgical care that may be prevented with appropriate surgical antibiotic prophylaxis (SAP). SAP is the most common indication for antimicrobial use in Australian hospitals; however, it is associated with high rates of inappropriate use.
 - Inappropriate SAP is associated with adverse consequences for both the patient and the community. The underlying reasons for inappropriate use, however, are not well delineated. Potential factors include the quality of the evidence base regarding SAP use and available guidelines.
 - The evidence for SAP across a range of surgical procedures can vary in quality. Recommendations for SAP encompass multiple surgical procedures and combine many elements of antimicrobial prescribing, i.e., indication, antimicrobial agent, dose, route, timing and duration. The broad nature of these recommendations may reflect the lack of overall Level 1 evidence (per the National Health and Medical Research Council hierarchy). This may be a barrier to uptake of and compliance with guidelines such as *Therapeutic Guidelines: Antibiotic*.
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Introduction

Surgical antibiotic prophylaxis (SAP) refers to the utilisation of antibiotics for the prevention of surgical site infections (SSIs) [1]. SSIs impact on both the patient and health care system through increased mortality and morbidity, prolonged hospital admission, reduced quality of life and additional financial costs for ongoing inpatient and outpatient treatment [2].

There is an extensive body of literature demonstrating the efficacy of SAP for the prevention of SSI [3–47]. Optimal use of antimicrobials in the operative setting includes prescribing the correct antimicrobial when indicated and adhering to the recommended drug dose, route and timing of administration, and duration [1,6,48]. The strength of the evidence for SAP efficacy varies greatly for different procedures and there is a wide range of guidelines available to assist clinical practice. The quality of the evidence behind these recommendations may influence prescriber perceptions, agreement with the guidelines, and their consequent prescribing behaviours [49–52].

In Australian hospitals and general practice, *Therapeutic Guidelines: Antibiotic (TG: Antibiotic)* [3] is the recommended guideline for the prescribing of antimicrobials, including SAP [53,54]. Guideline use is reinforced in the national *Antimicrobial Stewardship Clinical Care Standards* [55]. Based on data from the *National Antimicrobial Prescribing Survey (NAPS)* [56] and the *Surgical National Antimicrobial Prescribing Survey (SNAPS)* [57], SAP is the most common indication for antimicrobial use in Australian

hospitals, accounting for 15.5% of antimicrobial prescriptions [56]. Notably, prescriptions for SAP also have the highest rate of inappropriate use (40.5%) [56].

This discussion aims to explore the quality of the literature for SAP that informs the current *TG: Antibiotic Surgical Prophylaxis* [3] recommendations and identify potential gaps between the evidence and these recommendations.

Literature search

The literature review focused on research classified as having Level 1 evidence according to the National Health and Medical Research Council (NHMRC) evidence hierarchy [58]. Level 1 evidence includes systematic reviews (SR) and meta-analyses (MA) of randomised controlled trials (RCTs); this was extended to include SR/MAs that reviewed both RCTs and non-RCTs.

The review involved keyword searches of three electronic databases (MEDLINE, EMBASE and Google Scholar). Key search terms such as ‘anti-bacterial agents’, ‘antibiotic prophylaxis’, ‘antimicrobial’, ‘antimicrobial prophylaxis’, ‘operation’, ‘postoperative complications’, ‘prophylaxis’ and ‘surgical wound infection’ were used to focus the search on SAP for common surgical procedures. Further specific searches were conducted in relation to commonly performed surgical procedures in Australia [59], including cataract, orthopaedic, cardiac, colorectal, and obstetric and gynaecological procedures. Selection criteria included

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