

Surgical Antimicrobial Prophylaxis Intervention Guidelines

**Hip and Knee
Arthroplasties**

**Surgical Site Infection
Improvement Programme**

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1 EXECUTIVE SUMMARY

An optimal surgical antimicrobial prophylaxis regimen that helps to reduce the risk of SSI ensures that patients receive ALL of the following:

1. **Correct antimicrobial choice and dose:** first choice for orthopaedic surgery is a ≥ 2 g dose of cefazolin.
2. **Correct antimicrobial timing:** antimicrobial prophylaxis is administered as a single dose 0 to 60 minutes before knife to skin.
3. **Correct duration:** antimicrobial is discontinued within 24 hours after surgery end time (3 additional doses at 8 hourly intervals).

2 PROGRAMME BACKGROUND

New Zealand studies show that 10 - 12 per cent of hospitalised patients have a healthcare associated infection (HAI) and of these, 20 per cent are surgical site infections (SSI) (Nicholls, 1997 and Graves, 2003). The consequences of these infections are well documented and include increased morbidity and mortality, prolonged hospital stays, additional interventions and treatment, all of which divert resources away from other priority areas.

Currently the true extent of SSI, the associated negative health, social and economic implications, and the impact of individual improvement activities throughout New Zealand is not known. Data from Auckland District Health Board in the late 1990's estimated that the annual financial cost of hospital acquired infections could be in the region of \$140m (Graves, 2003).

The overarching objective of the Surgical Site Infection Improvement Programme is to improve the quality of patient safety and care. It will also provide hospitals with a robust reporting system for infection rates, which can be made available to clinicians. Such a mechanism of feedback has been shown to lead to improvements in performance (Haley, 1985). The SSI Improvement Programme will also enable consistency in measurements and provide guidance on quality improvement interventions.

The SSI Improvement Programme seeks to achieve the following objectives:

- Deliver a consistent approach to the monitoring of surgical site infections through the implementation of a national SSI surveillance programme
- Provide accurate process and outcome measurement and reporting of surgical site infections through the implementation of this programme
- 25% reduction in surgical site infection rates through the implementation of best practice improvement interventions
- Encourage culture and behaviour change through the establishment of the SSI Surveillance Programme.

3 DOCUMENT PURPOSE

One of the most important interventions in preventing SSI is the optimisation of surgical antimicrobial prophylaxis (Classens, 1992). Surgical antimicrobial prophylaxis is the use of antibiotics to prevent SSI. It should be distinguished from the use of antibiotics in early treatment, where infection is already established, although not necessarily evident pre-operatively. Antimicrobial prophylaxis may be beneficial in surgical procedures associated with high rates of infection such as clean-contaminated or contaminated procedures. Antimicrobial prophylaxis may also be beneficial in clean surgery where prosthetic devices are implanted, because although the infection rate is low, the consequence of infection is severe (Bratzler, 2013).

Appropriate use of surgical antimicrobial prophylaxis is an evidence based intervention that has been shown to reduce surgical site infections in patients undergoing clean surgical procedures such as hip and knee arthroplasties (APIC, 2010).

This document has been produced to encourage healthcare professionals to use surgical prophylaxis more effectively to improve the safety and quality of care that patients receive. The appropriate use of surgical prophylaxis is the first in a series of SSI Improvement Programme intervention guidelines.

4 APPROPRIATE USE OF SURGICAL ANTIMICROBIAL PROPHYLAXIS

An optimal surgical antimicrobial prophylaxis regimen that helps to reduce the risk of SSI ensures that patients receive ALL of the following:

1. **Correct antimicrobial choice and dose:** first line of choice for orthopaedic surgery is a $\geq 2g$ dose of cefazolin.
2. **Correct antimicrobial timing:** antimicrobial prophylaxis is administered as a single dose 0 to 60 minutes before knife to skin.
3. **Correct duration:** antimicrobial is discontinued within 24 hours after surgery end time (3 additional doses at 8 hourly intervals).

Evidence supports the use of surgical antimicrobial prophylaxis for:

- Clean surgery involving the placement of a prosthesis or implant
- Clean-contaminated surgery
- Contaminated surgery.

The three components of appropriate use of antimicrobial prophylaxis are outlined on the following pages.

4.1 Correct Antibiotic Choice and Dose

The first choice for surgical antimicrobial prophylaxis for orthopaedic surgery is a \geq 2g dose of cefazolin

- Clindamycin (900mg) or vancomycin (1g up to 70kg and then 15mg/kg for patients weighing more than 70kg) should be reserved as alternative agents in the event of allergy to β -lactam agents.
- Vancomycin should be included with cefazolin for routine prophylaxis for patients known to be colonised with MRSA.

The recommended dose of cefazolin for ALL adults (\geq 18 years) is 2g.

- It is unclear if the dose of cefazolin for those patients weighing >120 kg should be increased to 3g. A number of studies, all with differing design, have looked at this issue and provide conflicting conclusions (Forse et al., 1989, Edmiston et al., 2004, Koopman et al., 2007, Van Kralingen et al., 2011 and Ho et al., 2012).

Rationale	This measure assesses whether DHBs are complying with evidence based practice.
Improvement	An increase in the <u>rate of compliance</u> i.e. xx% of patients received cefazolin \geq 2g as their first choice of antimicrobial.
Numerator statement	Number of procedures where a \geq 2g dose of cefazolin was administered.
Denominator statement	Number of procedures.

4.2 Correct Antibiotic Timing

Surgical antimicrobial prophylaxis is administered 0 to 60 minutes before knife to skin as a single dose

- Evidence indicates that antimicrobial prophylaxis should be given within the 60 minutes before the surgical incision (knife to skin) (Classens, 1992).
- To allow adequate time for the infusion to occur, patients who receive vancomycin should have the antibiotics initiated within two hours before the surgical incision.
- An additional dose of cefazolin may be necessary if the length of surgery is prolonged. It is recommended that re-dosing occur when the length of the procedure exceeds two half live's; as this is 1.2 – 2.2 hours for cefazolin, re-dosing should occur 4 hours after the first dose was given.
- Re-dosing should also be considered if there is excessive blood loss (>1500mL) in order to ensure an adequate antimicrobial level until wound closure.

Rationale	This measure assesses whether DHBs are complying with evidence based practice.
Improvement	An increase in the <u>rate of compliance</u> .
Numerator statement	Number of procedures in which antimicrobial prophylaxis was initiated within one hour prior to surgical incision (two hours if receiving vancomycin).
Denominator statement	Number of procedures.
Collection guidance	This is a Yes/No question. Was antimicrobial prophylaxis given within 60 minutes of knife to skin? If antimicrobial not administered or time of recording is not documented, count this case as one in which the patient was not given the antimicrobial on time, i.e. count as an error.

4.3 Correct Duration

Surgical antimicrobial prophylaxis discontinued within 24 hours after surgery end time

- Data and clinical practice guidelines do not support antimicrobial prophylaxis continuing beyond 24 hours (Bratzler, 2013). There is also no evidence for benefits of continuing antimicrobial administration until all drains or catheters are removed.
- Three doses of cefazolin (2g) administered eight hours post-operatively is accepted as discontinuation within 24 hours of surgery.
- The use of antimicrobials is not without risk for patients. Exposure to antimicrobials is associated with a greater risk of subsequent colonisation with resistant organisms.
- Antimicrobial use is a risk factor for *Clostridium difficile* associated disease.

Rationale	This measure assesses whether DHBs are complying with evidence based practice.
Improvement	An increase in the <u>rate of compliance</u> .
Numerator statement	Number of procedures where antimicrobial prophylaxis was discontinued within 24 hours after surgery end time.
Denominator statement	Number of procedures.
Collection guidance	This is a Yes/No question. Was prophylaxis discontinued within 24 hours of the end of surgery? Patients in whom antimicrobials are continued as <u>treatment</u> should be excluded from this measure.

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5 IMPLEMENTING SURGICAL ANTIMICROBIAL PROPHYLAXIS

In implementing the three components for appropriate use of antimicrobial prophylaxis we suggest clinicians consider the following where appropriate/applicable to their DHB:

- Engage with the Anaesthesia Service to ensure that the correct antimicrobial agent, timing and dose for perioperative prophylaxis occurs
- Use pre-printed or computerised instructions specifying post-operative antimicrobials and timely discontinuations
- Use electronic prescribing order sets or pathways to direct to the appropriate antimicrobials and timely discontinuation
- Change operating room drug stocks to include only recommended antimicrobial agents
- Use visible reminders/checklists/stickers
- Involve pharmacy, infection prevention and control, clinical microbiologists and infectious disease physicians to ensure appropriate timing, selection and duration
- Verify administration time during a specified “time out” period (e.g. 5 minutes) so action can be taken if not administered
- Use ward rounds and consider using pharmacist involvement to ensure antimicrobials are stopped within 24 hours of surgery.

Implementing the interventions to prevent SSI for hip and knee arthroplasty presents an important opportunity to build collaboration within the hospital setting, including the following:

- Enlisting the support of senior leadership in the hospital and surgical and anaesthesia departments
- Identifying one or two surgeons and anaesthetists to further champion the case and influence peers to enhance the adoption of, implementation of and adherence to the above interventions
- Exploring how to best communicate these interventions through strategies such as face-to-face communication at staff meetings, outreach to surgeons office, or telephone calls from leaders to their peers
- Building collaborative relationships between the hospital operating room management team (OR nurses, anaesthetists and anaesthetic technicians) and surgeons to establish reliable processes and hand-overs for pre-operative assessment, planning and follow up.

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