Healthcare Improvement Scotland | SAPG Safeguarding antibiotics

Good practice recommendations for surgical antibiotic prophylaxis in adults in NHS Scotland

Aim

This document provides NHS boards with recommendations for local surgical and procedural prophylaxis guidance**.** Antibiotic prophylaxis is defined as the use of antibiotics before, during or after a diagnostic, therapeutic or surgical procedure to prevent infectious complications. Each NHS board, through its Antimicrobial Management Team (AMT), is responsible for maintaining guidelines including the key components outlined in the summary below.

Summary of good practice recommendations

1	Antibiotic prophylaxis guidance should be readily accessible to prescribers and should give specific recommendations on which interventional procedures require prophylaxis and which do not.
2	Guidance should include recommendations on choice and administration of antibiotics including timing, dose, route and duration specific to the intervention.
3	Guidance should take into account specific patient and operative factors including weight, length of surgery and intra-operative blood loss.
4	Guidance should highlight the need for careful assessment of preoperative antibiotic allergy and should include alternatives for those with true penicillin allergy.
5	Guidance should provide advice for circumstances where patients are colonised with multidrug resistant organisms, eg methicillin resistant *Staphylococcus aureus* (MRSA) or carbapenem producing enterobacteriaceae (CPE).
6	Guidance should incorporate specific local dose recommendations for the prophylactic use of gentamicin and glycopeptides.
7	Processes should be in place to monitor guideline compliance and outcomes.
8	Guidance should be subject to regular review by the AMT and formally updated every 3 years (following local process) in conjunction with the relevant specialties.
9	Systems should be in place to respond to suboptimal guideline compliance and suboptimal outcomes.
10	Guidance should be supported by training for those using the policy including prescribers and theatre staff.

Detailed recommendations

1. **Antibiotic prophylaxis guidance should be readily accessible to prescribers (eg via NHS board intranet, therapeutic handbook, posters in clinical areas, an app) and should give specific recommendations on which interventional procedures require prophylaxis and which do not**

   The guidance should include interventional procedures requiring antibiotic prophylaxis within the following areas: breast surgery; cardiology; cardiothoracic; ear, nose and throat, maxillofacial and oral surgery; endoscopy; general, including upper and lower gastrointestinal; gynaecology; interventional radiology; neurosurgery; obstetrics; ophthalmic surgery; orthopaedics; plastic surgery; transplant surgery; urology; vascular (*awaiting update of SIGN 104 currently withdrawn*).

2. **Guidance should include recommendations on choice and administration of antibiotics including timing, route, dose and duration specific to the intervention**

   a) **Antibiotic choice**
   - Choice and dose of antibiotic to be agreed by relevant specialties and the AMT, taking into account risk factors for surgical site infection and unintended consequences.
   - Use of narrow spectrum agent(s) with activity against likely organisms causing surgical site infections, when possible.
   - Restrict use of agents with increased capacity for promoting *C. difficile* infection and protected or 'alert' antibiotics, including World Health Organization reserve antimicrobials (eg cephalosporins, clindamycin, co-amoxiclav, piperacillin-tazobactam, quinolones and carbapenems), where possible, and consider benefits and risks of use.[1,2]

   b) **Timing**
   - Optimum timing is within 60 minutes prior to the start of the procedure or skin incision, usually at induction of anaesthesia, for all surgical procedures including Caesarean section.

   c) **Route**
   - Intravenous route of administration is preferred, except for some specific procedures.
   - Antibiotics should be administered in theatre and given as a bolus injection where possible.

   d) **Documentation**
   - The 'once only' section of a medicine chart or electronic prescription chart is recommended for prescribing prophylaxis to avoid multiple dosing and facilitate collection of audit data.
   - The antibiotic used, dose and time of administration may also be recorded on the anaesthetic record sheet.

   e) **Duration**
   - A single dose of antibiotic with a long enough half-life to achieve activity throughout the procedure is recommended. Exceptions to single dose are in orthopaedic arthroplasty, when up to 24 hours of prophylaxis is acceptable and cardiothoracic surgery, where up to 48 hours is acceptable.

3. **Guidance should take into account specific patient and operative factors including weight, length of surgery and intra-operative blood loss**
   - The use of larger doses in obese patients should be considered.
   - Repeat dosing may be required if the procedure lasts more than 4 hours or if there is intra-operative blood loss >1.5 litres (redose following fluid replacement).[3]

4. **Guidance should highlight the need for careful assessment of preoperative antibiotic allergy and should include alternatives for those with true penicillin allergy**

- Alternative agents should be advised for patients with penicillin or beta-lactam allergy with choice of agent based on the surgical procedure and the patient's risk factors. It is important to assess patients labelled as penicillin allergic appropriately and consider de-labelling where indicated.
- Local policies should highlight the potential for allergic reactions to teicoplanin. Risk is low (16.4 per 100,000) but reactions may be severe.[4]

5. Guidance should provide advice for circumstances where patients are colonised with multidrug resistant organisms (eg MRSA or CPE)

- Prophylaxis for patients with complex issues including multidrug resistance carriage should be discussed with a consultant microbiologist preoperatively.
- For patients colonised with MRSA, decolonisation therapy following local policy should be used prior to surgery, when possible, and antimicrobial prophylaxis should include cover for MRSA.
- For patients colonised with CPE, consult local microbiologist or infectious disease physician for advice on prophylaxis.

6. Guidance should incorporate specific local dose recommendations for the prophylactic use of gentamicin and glycopeptides

a) Gentamicin

- Avoid gentamicin in patients having orthopaedic implant surgery and caution is advised with high dose flucloxacillin (2g dose) due to the potential for impairment of renal function.
- Dosage recommendations are based on weight (usual range 2mg/kg to 5mg/kg), with patients who are overweight dosed according to adjusted body weight.
- Doses of up to 400mg can be given as a bolus injection over 3-5 minutes but it is recommended that higher doses be administered as a short infusion.
- A single dose of gentamicin will provide cover for 6 to 8 hours in patients with normal renal function and is very unlikely to result in renal toxicity even in patients with impaired renal function.
- A second dose of gentamicin may be given in situations of high blood loss. Give half the original dose or consider alternative antibiotic, eg co-amoxiclav, or if penicillin allergic give ciprofloxacin.
- In procedures longer than 8 hours consider redosing in patients with normal renal function (estimated glomerular filtration rate [eGFR] > 60).[3]
- Redosing is only required when doses less than or equal to 4mg/kg dosing regimen are used. For 5mg/kg dosing, do not redose with gentamicin. Patients undergoing colorectal surgery over 6 hours may require additional antibiotic prophylaxis.[5] As an alternative to redosing gentamicin consider co-amoxiclav, or if penicillin allergy, ciprofloxacin.[3]

b) Glycopeptides

- Indications for use - prophylaxis in patients with, or at high risk of, MRSA or in penicillin allergic patients undergoing major implant surgery when flucloxacillin is recommended first line.
- Advice on administration - teicoplanin can be administered as a bolus injection and can be prepared and given in theatre.
- Allergic reactions to teicoplanin are uncommon but can be severe. Ensure allergy review prior to administration and monitor carefully.[4,6]

7. Processes should be in place to monitor guideline compliance and outcomes

- AMTs should support clinical specialties in assessing and reviewing compliance with prophylaxis.

- Formal review of prophylaxis by the AMT should be undertaken in conjunction with other aspects of infection prevention with the Infection Prevention Control teams if there is emergent evidence of increasing surgical site infection or suboptimal practice. AMTs should discuss and review proposed actions with clinical teams.

8. **Guidance should be subject to regular review by the AMT and formal update every 3 years (following local process) in conjunction with the relevant specialties. Guideline review should take into account:**
    - Emergence or recognition of unintended consequences of guidance.
    - Local and national emerging antimicrobial resistance.
    - National and local surveillance of antimicrobial use.
    - Local surgical site infection rates.
    - Local qualitative data on prescribing (eg point prevalence surveys).
    - Local rates of unintended consequences (eg *Clostridioides difficile*, acute kidney injury)
    - Emerging evidence around surgical prophylaxis for established and new procedures.

9. **Processes should be in place to respond to suboptimal guideline compliance and suboptimal outcomes**
    - Selected unintended consequences of surgical prophylaxis guidelines should be considered and reviewed formally, as required. Examples may include renal toxicity, surgical site infections and Clostridioides difficile.

10. **Guidance should be supported by training on use for all involved staff including prescribers and theatre staff**

References

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Table of abbreviations

AMT	Antimicrobial Management Team
CPE	Carbapenem producing enterobacteriaceae
eGFR	Estimated glomerular filtration rate
MRSA	Methicillin resistant Staphylococcus aureus
SIGN	Scottish Intercollegiate Guidelines Network