

Surgical Antimicrobial Prophylaxis Guidelines

Appendix 13: Paediatric Surgical Procedures

This guideline applies to surgical procedures performed in paediatric patients aged from 3 months to 14 years. In select paediatric populations, clinicians may elect to use the adult guidelines at their own discretion. For more specialised procedures not included in this guideline, refer to the Women's and Children's Hospital surgical prophylaxis guidelines. For neonatal patients alternative antibiotic regimens may be required - seek expert advice.

Preoperative Considerations

Consider individual risk factors for every patient including the need for prophylaxis. Antibiotic choice/dose may need to be modified according to patient factors (e.g. immune suppression, presence of prostheses, allergies, renal function, obesity, malnutrition, diabetes, malignancy, infection at another site, colonisation with multi-drug resistant bacteria and available pathology).

Consider surgical wound classification (clean, clean-contaminated, contaminated, dirty-infected) when determining the need for, or choice of, antibiotic prophylaxis. Refer to [Surgical Antimicrobial Prophylaxis Prescribing Guideline](#) for further information.

Pre-existing infections (known or suspected) – if present, use appropriate treatment regimen instead of prophylactic regimen for procedure but ensure the treatment regimen has activity against the organism(s) most likely to cause postoperative infection. Adjust the timing of the treatment dose to achieve adequate plasma and tissue concentrations at the time of surgical incision and for the duration of the procedure - seek advice from ID or the AMS team if unsure.

Prophylaxis against endocarditis is indicated for patients with specific cardiac conditions. Refer to [Antibiotic Prophylaxis for Prevention of Endocarditis in High Risk Patients](#) for further information.

Practice Points

Dose, timing and administration of antibiotics

Dosing of antibiotic should generally be based on actual body weight except for gentamicin where ideal body weight (IBW) should be used. Paediatric doses should never exceed the recommended adult dose.

Surgical antibiotic prophylaxis must be administered before surgical incision to achieve effective plasma and tissue concentrations at the time of incision. Administration of any antibiotic after skin incision reduces effectiveness.

- > IV **cefazolin 30mg/kg (up to 2g)** can be given over 3-5 minutes and should be administered no more than 60 minutes before skin incision.
- > IV **gentamicin 2mg/kg** can be given over 30 minutes and should be administered within 120 minutes before surgical incision.
- > IV **metronidazole 12.5mg/kg (up to 500mg)** can be given over 20 to 30 minutes. It should be fully administered within 120 minutes of surgical incision. Maximum plasma and tissue concentrations occur at the conclusion of the infusion.
- > IV **clindamycin 15mg/kg (up to 600mg)** should be given over 10 to 15 minutes. It should be fully administered within 120 minutes of surgical incision. Maximum plasma and tissue concentrations occur at the conclusion of the infusion.
- > IV **vancomycin 30mg/kg (up to 1.5g)** infusion should be given over 2 hours (4 hours if history of infusion reaction (formerly "red man syndrome")). Vancomycin should be timed to begin 15 to 120 minutes before skin incision. This ensures adequate concentration at the time of incision and allows for any potential infusion-related toxicity to be recognised before induction. The infusion can be completed after skin incision.

High MRSA risk (defined as history of MRSA colonisation or infection OR frequent stays or a current prolonged stay in hospital with a high prevalence of MRSA OR residence in an area with high prevalence of MRSA OR current residence, or residence in the past 12 months, in a correctional facility):

- > Add vancomycin

Repeat dosing

A single preoperative dose is sufficient for most procedures; however repeat intraoperative doses are advisable:

- > If surgery is delayed or prolonged, administer a second dose of antibiotics after half the normal dosing interval (e.g. 4 hours for cefazolin, clindamycin and metronidazole, 6 hours for vancomycin and 12 hours for gentamicin), OR
- > if major blood loss occurs (> 15-20% of blood volume), following fluid resuscitation.

When measuring the time to a second intraoperative dose, measure the interval from the time of the first preoperative dose rather than the surgical incision time.

Recommended Prophylaxis

| Procedures | Recommended Prophylaxis | High Risk Penicillin / Cephalosporin Allergy* |
|--|--|---|
| ABDOMINAL SURGERY | | |
| Clean procedures (e.g. endoscopic or colonoscopic) | Prophylaxis NOT recommended | |
| Biliary tract | cefazolin IV 30mg/kg/dose (up to 2g) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) | vancomycin IV 30mg/kg/dose (up to 1.5g) PLUS gentamicin IV 2mg/kg/dose ^ |
| Hernia repair Splenectomy (vaccination and post-splenectomy antibiotic prophylaxis required in all cases) | cefazolin IV 30mg/kg/dose (up to 2g) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) | vancomycin IV 30mg/kg/dose (up to 1.5g) |
| All surgery involving incision into the small bowel, large bowel and rectum (including appendectomy) | cefazolin IV 30mg/kg/dose (up to 2g) PLUS metronidazole IV 12.5mg/kg/dose (up to | gentamicin IV 2mg/kg/dose (IBW)^ PLUS metronidazole IV 12.5 mg/kg/dose (up to |

Recommended Prophylaxis

| Procedures | Recommended Prophylaxis | High Risk Penicillin / Cephalosporin Allergy* |
|---|--|--|
| | 500mg) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) | 500mg) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) |
| EAR, NOSE AND THROAT PROCEDURES | | |
| Tonsillectomy* , adenoidectomy* , uncomplicated ear surgery , otoplasty , stapedectomy , nasal septoplasty , endoscopic sinus surgery , other uncomplicated nose or sinus surgery and minor clean procedures | Prophylaxis NOT recommended *Endocarditis prophylaxis may be required – refer to Antibiotic Prophylaxis for Prevention of Endocarditis in Cardiac Patients | |
| Major ear surgery Revision sinus surgery Complex septorhinoplasty Tympanomastoid surgery Laryngectomy (primary or salvage)* | cefazolin IV 30mg/kg/dose (up to 2g) PLUS metronidazole IV 12.5mg/kg/dose (up to 500mg) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) * POSTOPERATIVE doses can be considered but should not continue beyond 24 hours | vancomycin IV 30mg/kg/dose (up to 1.5g) PLUS (for laryngectomy or tympanomastoid surgery) gentamicin IV 2mg/kg/dose^ * POSTOPERATIVE doses can be considered but should not continue beyond 24 hours |
| ORAL / DENTAL SURGERY | | |
| Clean or clean-contaminated procedures not listed below Dental extractions, impactions, exposures, implants, minor pathology (soft tissue, cysts) | Prophylaxis NOT recommended | |
| Insertion of prosthetic material (except dental implants) Intraoral bone grafting Open reduction and internal fixation of mandibular or midfacial fractures Orthognathic surgery* | cefazolin IV 30mg/kg/dose (up to 2g) PLUS (if insertion through the skin and oral mucosa) metronidazole IV 12.5mg/kg/dose (up to 500mg) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) * POSTOPERATIVE doses can be considered for orthognathic surgery but should not continue beyond 24 hours. | clindamycin IV 15mg/kg/dose (up to 600mg) * POSTOPERATIVE doses can be considered for orthognathic surgery but should not continue beyond 24 hours. |
| ORTHOPAEDIC SURGERY | | |
| Arthroscopic procedures and other clean procedures not involving insertion of prosthetic material or avascular tissue | Prophylaxis NOT recommended | |
| Procedures involving insertion of prosthetic or allograft material Internal fixation of fractures | cefazolin IV 30mg/kg/dose (up to 2g) <u>High risk of MRSA infection or re-operation of bone and joint surgery:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) POSTOPERATIVE doses can be considered but should not continue beyond 24 hours. | vancomycin IV 30mg/kg/dose (up to 1.5g) |
| OPEN FRACTURES / SOFT TISSUE INJURIES / PLASTIC SURGERY | | |
| Open fractures (non-severe injuries*) Traumatic wounds (non-severe injuries) | cefazolin IV 30mg/kg/dose (up to 2g) <u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g) | clindamycin IV 15mg/kg/dose (up to 600mg) OR <u>For known MRSA colonisation/infection give INSTEAD:</u> |

Recommended Prophylaxis

| Procedures | Recommended Prophylaxis | High Risk Penicillin / Cephalosporin Allergy* |
|---|---|---|
| <p>**Broader antibiotic cover may be required for wounds that have been immersed in water – refer to the Therapeutic Guidelines</p> | <p>Prophylaxis for non-severe injuries comparable to Gustilo-Anderson type I or II can be discontinued at definitive wound closure. The total duration of prophylaxis should be no more than 72 hours, even if soft tissue coverage is not achievable.</p> | <p>vancomycin IV 30mg/kg/dose (up to 1.5g)</p> |
| <p>Open fractures (severe injury[†]) Traumatic wounds (severe injuries[#])</p> <p>**Broader antibiotic cover may be required for wounds that have been immersed in water – refer to the Therapeutic Guidelines</p> | <p>cefazolin IV 30mg/kg/dose (up to 2g) then 8-hourly for a further 2 doses</p> <p><u>PLUS for heavily contaminated severe injuries (e.g. agricultural injuries):</u> ADD metronidazole IV 12.5mg/kg/dose (up to 500mg) then 12-hourly for a further 1 dose</p> <p><u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g)</p> | <p>clindamycin IV 15mg/kg/dose (up to 600mg) then 8-hourly for a further 2 doses</p> <p>OR</p> <p><u>For known MRSA colonisation/infection give INSTEAD:</u> vancomycin IV 30mg/kg/dose (up to 1.5g) then 12-hourly for a further 1 dose</p> <p><u>PLUS for heavily contaminated severe injuries (e.g. agricultural injuries):</u> ADD metronidazole IV 12.5mg/kg/dose (up to 500mg) then 12-hourly for a further 1 dose</p> |
| <p>Do not continue prophylaxis for more than 24 hours after definitive closure of a severe injury comparable to Gustilo-Anderson type III. The total duration of prophylaxis should be no more than 72 hours, even if soft tissue coverage is not achievable.</p> | | |

UROLOGICAL PROCEDURES

Preoperative screening for bacteriuria is advised for all elective urological procedures apart from routine cystoscopy. If bacteriuria is confirmed, treatment is recommended with short course antibiotics even if the patient is asymptomatic. Choice of antibiotic is guided by results of cultures and susceptibility patterns. Preoperative treatment of bacteriuria does not exclude the need for surgical prophylaxis.

| | | |
|--|--|---|
| Circumcision, orchidopexy or hydrocele repair | Prophylaxis NOT recommended | |
| Endoscopic urological procedures | <p>gentamicin IV 2mg/kg/dose</p> <p><u>If gentamicin is contraindicated use:</u> cefazolin IV 30mg/kg/dose (up to 2g)</p> | gentamicin IV 5mg/kg/dose |
| Procedures that enter the urinary tract or involve prosthetic device implantation | <p>cefazolin IV 30mg/kg/dose (up to 2g)</p> <p>PLUS</p> <p>gentamicin IV 2mg/kg/dose</p> <p><u>If inadvertent rectal injury then:</u> ADD metronidazole IV 12.5mg/kg/dose (up to 500mg)</p> <p><u>High risk of MRSA infection:</u> REPLACE cefazolin with vancomycin IV 30mg/kg/dose (up to 1.5g)</p> | <p>gentamicin IV 2mg/kg/dose</p> <p>PLUS</p> <p>vancomycin IV 30mg/kg/dose (up to 1.5g)</p> <p><u>If inadvertent rectal injury then:</u> ADD metronidazole IV 12.5mg/kg/dose (up to 500mg)</p> |
| Procedures that enter the urinary tract or involve prosthetic device implantation in which entry into the bowel lumen is expected | <p>cefazolin IV 30mg/kg/dose (up to 2g)</p> <p>PLUS</p> <p>metronidazole IV 12.5mg/kg/dose (up to 500mg)</p> <p><u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g)</p> | <p>gentamicin IV 2mg/kg/dose</p> <p>PLUS</p> <p>metronidazole IV 12.5mg/kg/dose (up to 500mg)</p> <p><u>High risk of MRSA infection:</u> ADD vancomycin IV 30mg/kg/dose (up to 1.5g)</p> |

* High risk penicillin/cephalosporin allergy: History suggestive of high risk (e.g. anaphylaxis, angioedema, bronchospasm, urticaria, DRESS/SJS/TEN)

^ For procedures likely to continue for longer than 6 hours, a higher dose of gentamicin (5mg/kg/dose up to 480mg) can be considered

+ Open fractures - non-severe injuries: open fractures resulting from indirect injury or direct, low-energy injury (Gustilo-Anderson type I or II) – see Table 1

‡ Open fractures - severe injuries: open fractures resulting from high-energy injury or exhibiting high-energy fracture patterns (Gustilo-Anderson type III) – see Table 1

Traumatic wounds - severe injuries: muscular, skeletal and soft tissue trauma, crush injuries, penetrating injuries, stab wounds

Table 1: Gustilo-Anderson Classification of Open Fractures (Garner, 2020)

| | |
|--------|--|
| Type 1 | Open fracture with a wound less than 1cm long, low energy, without gross contamination |
| Type 2 | Open fracture with a wound 1-10cm long, low energy, without gross contamination or extensive soft-tissue damage, flaps, or avulsions |
| Type 3 | <p>A: Open fracture with a wound > 10cm with adequate soft-tissue coverage, or any open fracture due to high energy trauma or with gross contamination, regardless of the size of the wound</p> <p>B: Open fracture with extensive soft-tissue injury or loss, with periosteal stripping and bone exposure that requires soft-tissue coverage in the form of muscle rotation or transfer</p> <p>C: Open fracture associated with arterial injury requiring repair</p> |

Postoperative Care

Postoperative antibiotics are NOT indicated unless infection is confirmed or suspected. If infection is suspected, consider modification of antibiotic regimen according to clinical condition and microbiological results.

Prophylactic antibiotics until residual surgical drains (including extra-ventricular drains), intravascular or urinary catheters are removed is not supported by current evidence and increases the risk of adverse outcomes.

Definitions / Acronyms

| | | | |
|-------------|--|------------------|---|
| AMS | Antimicrobial Stewardship | DRESS | Drug rash with eosinophilia and systemic symptoms |
| ID | Infectious Diseases | IV | Intravenous |
| MRSA | Methicillin-resistant <i>Staphylococcus aureus</i> | SJS / TEN | Stevens-Johnson syndrome / Toxic epidermal necrolysis |

References

Antibiotic Expert Group. (2019). [Therapeutic Guidelines: Antibiotic. Version 16](#). Melbourne: Therapeutic Guidelines Limited.

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Australian Medicines Handbook Pty Ltd 2021 (online).

Garner, M.R., et al (2020). "Antibiotic prophylaxis in open fractures: evidence, evolving issues, and recommendations." J Am Acad Ortop Surg 28 (6): 309-315.

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