

# Summary

## Antibiotic prophylaxis in orthopedic surgery



Surgical site infections (SSI) post-orthopedic surgery are associated with significant morbidity, limb disability and mortality. Appropriate antibiotic prophylaxis pre-op (in addition to non-pharmacologic measures following basic principles of surgical management) are critical to prevent SSI. There is considerable variability in the choice of agent and duration of prophylactic regimens, depending on the type of surgery and the specific environment.

This document is an update from the last MUHC antibiotic surgical prophylaxis guidelines for orthopedic surgery. Recommendations are based on evidence gathered from the 2018 SSI report. Gram-positive pathogens (mainly *S. aureus*) accounted for close to 70% of all SSI post-orthopedic surgery at the MUHC, while gram-negative organisms were isolated in about 30% of cases.

### Microbiology of SSI at MUHC (2018)

- Non-spinal surgery (N=46):
  - *S. aureus*: 46% (MRSA 24%)
  - *Coag-neg Staph*: 7%
  - *Streptococcus sp*: 7%
  - *Enterococcus sp*: 4%
  - *Enterobacter sp*: 7%,
  - *Pseudomonas sp*: 4%,
  - Other gram-negative bacteria: 17%
  - *Candida sp*: 2%
- Spinal surgery (N=5):
  - *S. aureus*: 3 cases
  - *Enterobacter sp*: 1 case
  - *Pseudomonas sp*: 1 case

### Optimal timing of prophylactic antibiotics and duration:

Administration of antibiotics should be optimally timed to allow for appropriate distribution in operative tissue and vary depending on the agent used. The duration of antibiotic prophylaxis also varies depending on patient risk factors, type and duration of surgery.

Cefazolin: 60 minutes before incision; should be re-administered if the surgery lasts more than 3 hours

Ceftriaxone: 60 minutes before incision

Tobramycin: 60 minutes before incision

Vancomycin: 120 minutes before incision

*\*If the patient is on antibiotics at the time of the surgical procedure, it is recommended to still administer the appropriate prophylactic antibiotic pre-incision as outlined below EXCEPT if patient on vancomycin or tobramycin\**

Surgery type	Prophylaxis choice
<b>Closed fracture</b> <b>Open fracture Gustilo 1 or 2</b>  <i>Staphylococcus sp</i> <i>Streptococcus sp</i>	<b>Cefazolin</b> <sup>1</sup> 2 g IV q8h x 24h  <i>If known MRSA carrier or previous MRSA infection:</i> <b>Cefazolin</b> <sup>1</sup> 2 g IV q8h <b>AND Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) q12h x 24h  <i>If severe hypersensitivity reaction to cephalosporins:</i> <b>Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) q12h x 24h
<b>Open fracture Gustilo 3</b>  <i>Staphylococcus sp</i> <i>Streptococcus sp</i> Gram-negative rods	<b>Ceftriaxone</b> 2 g IV q24h for up to 24h after wound closure or 72h ( <i>whichever comes first</i> )  <i>If known MRSA carrier or previous MRSA infection:</i> <b>Ceftriaxone</b> 2 g IV q24h <b>AND Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) q12h x 24h after wound closure or 72h ( <i>whichever comes first</i> )  <i>If severe hypersensitivity reaction to cephalosporins:</i> <b>Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) q12h <b>AND Tobramycin</b> <sup>3</sup> 5 mg/kg IV (max 400 mg) q24h for up to 24h after wound closure or 72h ( <i>whichever comes first</i> )
<b>Open fracture with soil contamination, fecal contamination or impaired vascularization</b>  <i>Staphylococcus sp; Streptococcus sp;</i> Gram-negative rods; <i>Clostridium sp</i>	<b>Ceftriaxone</b> 2 g IV q24h <b>AND Penicillin G</b> <sup>4</sup> 4 million units IV q4h for up to 24h after wound closure or 72h ( <i>whichever comes first</i> )  <i>If severe hypersensitivity reaction to beta-lactam antibiotics:</i> <b>Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) q12h <b>AND Tobramycin</b> <sup>3</sup> 5 mg/kg IV (max 400 mg) q24h for up to 24h after wound closure or 72h ( <i>whichever comes first</i> )
<b>Open fracture with water contamination (e.g. water sports)</b>  <i>Aeromonas sp; Pseudomonas sp</i>	<b>Piperacillin-tazobactam</b> <sup>5</sup> 4.5 g IV q6h for up to 24h after wound closure or 72h ( <i>whichever comes first</i> )  <i>If severe hypersensitivity reaction to penicillin antibiotics:</i> <b>Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) q12h <b>AND Tobramycin</b> <sup>3</sup> 5 mg/kg IV (max 400 mg) q24h for up to 24h after wound closure or 72h ( <i>whichever comes first</i> )
<b>Hip or knee arthroplasty</b>  <i>Staphylococcus sp</i> <i>Streptococcus sp</i>	<b>Cefazolin</b> <sup>1</sup> 2 g IV x 1 pre-op then 2 g IV q8h x 2 doses post-op  <i>If known MRSA carrier or previous MRSA infection:</i> <b>Cefazolin</b> <sup>1</sup> 2 g IV x 1 pre-op then 2 g IV q8h x 2 doses post-op <b>AND Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) x 1 pre-op then 2 <sup>nd</sup> dose after 12h  <i>If severe hypersensitivity reaction to cephalosporins:</i> <b>Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) x 1 pre-op then 2 <sup>nd</sup> dose after 12h
<b>Spine surgery – Cervical and thoracic</b>  <i>Staphylococcus sp</i>	<b>Cefazolin</b> <sup>1</sup> 2 g IV x 1 pre-op then 2 g IV q8h x 2 doses post-op  <i>If known MRSA carrier or previous MRSA infection:</i> <b>Cefazolin</b> <sup>1</sup> 2 g IV x 1 pre-op then 2 g IV q8h x 2 doses post-op <b>AND Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) x 1 pre-op then 2 <sup>nd</sup> dose after 12h  <i>If severe hypersensitivity reaction to cephalosporins:</i> <b>Vancomycin</b> <sup>2</sup> 15 mg/kg IV (max 2 g) x 1 pre-op then 2 <sup>nd</sup> dose after 12h

## Spine surgery – Lumbar

*Staphylococcus sp*  
Gram-negative rods

**Cefazolin**<sup>1</sup> 2 g IV x 1 pre-op then 2 g IV q8h x 2 doses post-op **AND**  
**Tobramycin**<sup>3</sup> 5 mg/kg IV x 1 pre-op (max: 400 mg)

*If known MRSA carrier or previous MRSA infection:*

**Cefazolin**<sup>1</sup> 2 g IV x 1 pre-op then 2 g IV q8h x 2 doses post-op **AND** **Tobramycin**<sup>3</sup> 5 mg/kg IV (max 400 mg) x 1 pre-op **AND** **Vancomycin**<sup>2</sup> 15 mg/kg IV (max 2 g) x 1 pre-op then 2<sup>nd</sup> dose after 12h

*If severe hypersensitivity reaction to cephalosporins:*

**Vancomycin**<sup>2</sup> 15 mg/kg IV (max 2 g) q12h x 1 pre-op then 2<sup>nd</sup> dose after 12h **AND** **Tobramycin**<sup>3</sup> 5 mg/kg IV (max 400 mg) x 1 pre-op

<sup>1</sup> Cefazolin: If weight > 120 kg, increase dose to 3 g IV; cefazolin can be safely given if allergy only to penicillins; if CrCl 10-30 mL/min, give q12h instead of q8h; if CrCl <10 mL/min: 1 g IV q24h

<sup>2</sup> Vancomycin: If CrCl < 30 mL/min, give q24h instead of q12h; therapeutic drug monitoring not needed if only given x 24h

<sup>3</sup> Tobramycin: If CrCl < 60 mL/min, decrease dose to 2 mg/kg IV; therapeutic drug monitoring not needed if only given x 24h

<sup>4</sup> Penicillin: If CrCl 10-50 mL/min: decrease dose to 3 million units; If CrCl < 10 mL/min decrease dose to 2 million units

<sup>5</sup> Piperacillin-tazobactam: If CrCl 20-40 mL/min: 4.5 g IV q8h; CrCl < 20 mL/min: 2.25 g IV q6h; hemodialysis: 2.25 g IV q8h

Drafted by F. Bourdeau (Pharmacy)

Reviewed by Q. Li (Pharmacy), M. Semret (ID), Dr Berry (Orthopedic)

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