Antibiotic Prophylaxis in Open Fractures

Effective Date: 10/21/2024

Retires Policy Dated: N/A

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Updated Date: N/A

Purpose

Open fractures are high energy injuries with increased risk of infection **due to** potential exposures of bone and deep tissue to environmental debris. Infection can lead to complications including non-union of bone, delayed healing, soft tissue infection and osteomyelitis. Infectious risk increases with increased severity of injury.

Process

1. The Trauma Surgeon/designee will consult the Orthopedic Surgeon on call when a trauma patient is identified with an open fracture.
2. Initial fracture stabilization/splinting will be provided by the trauma team.
3. Tetanus status will be determined and updated as necessary.
4. Wound management:
    - Initial wound will be covered with saline soaked dressing.
    - Washout and debridement will occur within 24 hours.
    - With visible contamination, washout and debridement should occur within 6 hours.
5. Document the type of fracture utilizing Open Fracture Gustilo Classification
6. Antibiotic Recommendations
    - The first dose of antibiotics should be administered in the trauma bay within 60 minutes of arrival
    - Antibiotic selection will be based on fracture type, any contamination, and medication allergies
    - Intraoperative redosing is required to ensure adequate serum and tissue concentrations of the antibiotic for the duration of the procedure
    - Intraoperative dosing intervals of open fracture antibiotics will follow standard operating room procedures

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- Re-dosing interval should be measured from the time of administration of the preoperative dose, not from the beginning of the procedure
- Intraoperative redosing is recommended, for the purposes of this guideline, for cefazolin (at 4 hours) and piperacillin-tazobactam (at 2 hours), if the duration of the procedure exceeds two half-lives of the drug or if there is excessive blood loss during the procedure (e.g., for every 1500 ml blood loss)

Fracture Type	Fracture Characteristics per Gustilo-Anderson Classification	Infection Rate
Type I Fracture	Open fracture with clean wound < 1 cm long	0-2%
Type II Fracture	Open fracture with clean wound > 1 cm long without extensive soft tissue damage, flaps, or avulsions	2-7%
Type III Fracture	Open segmental fracture or a single fracture with extensive soft tissue injury. Also includes injuries older than 8 hours	
	IIIA: Adequate soft tissue coverage of the fracture despite high-energy trauma or extensive laceration or skin flaps	5-10%
	IIIB: Inadequate soft tissue coverage with periosteal stripping. Soft tissue reconstruction is necessary.	10-50%
	IIIC: Open fracture associated with arterial injury requiring repair	25-50%

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Fracture Type	Recommended Antibiotics	Alternative if contraindication to recommended antibiotics	If MRSA risk*, or known MRSA Colonization Add
I or II	(< 120 kg) Cefazolin 2000 mg IV q 8 hrs or (≥ 120 kg) Cefazolin 3000 mg IV q 8 hrs x 24 hrs after wound closure	Vancomycin x 24 hours after wound closure: Loading dose: 20 to 35 mg/kg Initial maintenance dose and interval determined by nomogram; typically 15 to 20 mg/kg every 8 to 12 hours for most patients with normal renal function Subsequent dose and interval adjustments based on AUC-guided (preferred) or trough-guided serum concentration monitoring‡	Vancomycin x 24 hours after wound closure: Loading dose: 20 to 35 mg/kg Initial maintenance dose and interval determined by nomogram; typically 15 to 20 mg/kg every 8 to 12 hours for most patients with normal renal function Subsequent dose and interval adjustments based on AUC-guided (preferred) or trough-guided serum concentration monitoring‡

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III	Ceftriaxone 2000 mg IV q 24 hrs x 48 hours after wound closure	Levofloxacin 750 mg IV q24 hrs x 48 hrs after closure	Vancomycin x 48 hours after wound closure: Loading dose: 20 to 35 mg/kg Initial maintenance dose and interval determined by nomogram; typically 15 to 20 mg/kg every 8 to 12 hours for most patients with normal renal function Subsequent dose and interval adjustments based on AUC-guided (preferred) or trough-guided serum concentration monitoring‡
Contaminated with soil or fecal matter	Ceftriaxone 2000 mg IV q 24 hrs x 48 hours after wound closure **PLUS** Metronidazole 500 mg IV q 8 hrs x 48 hrs after wound closure	Levofloxacin 750 mg IV q24 hrs x 48 hrs after closure **PLUS** Metronidazole 500 mg IV q 8 hrs x 48 hrs after wound closure	Vancomycin x 48 hours after wound closure: Loading dose: 20 to 35 mg/kg Initial maintenance dose and interval determined by nomogram; typically 15 to 20 mg/kg every 8 to 12 hours for most patients with normal renal function Subsequent dose and interval adjustments

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			based on AUC-guided (preferred) or trough-guided serum concentration monitoring‡
Contaminated with standing water	Piperacillin/tazobactam 4.5 g IV over 30 min x 1 followed by 4.5 g IV q 8 hrs over 4 hours x 48 hrs after wound closure	Preferred: Meropenem 1000 mg IV over 30 min or IV push x 1 followed by 500 mg IV q 6 hrs over 3 hours x 48 hrs after wound closure	Vancomycin x 48 hours after wound closure: Loading dose: 20 to 35 mg/kg Initial maintenance dose and interval determined by nomogram; typically 15 to 20 mg/kg every 8 to 12 hours for most patients with normal renal function Subsequent dose and interval adjustments based on AUC-guided (preferred) or trough-guided serum concentration monitoring‡

*** MRSA risk** = recent health care exposure (hospitalization, dialysis dependence, recent surgery), immune compromised, or history of diabetes

‡ = pharmacy to dose per facility protocol

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Version Control Record			
Version	**Date**	**Author/Reviewer**	**Description of Changes**
1	10/21/2024	Paul Wisniewski, D.O.	Initial review and update to reflect latest evidence/practice

References

1. TQIP Best Practices in the Management of Orthopedic Trauma. November 2015.
2. UpToDate.ABxPPxOpen.2022AntibioticsforPatientswithopenfractures. *https://www.uptodate.com/contents/image?imageKey=ID%2F126266&topicKey=SURG%2F15150&search=Open%20fracture&rank=8~150&source=see_link*
3. Evidence-based protocol for prophylactic antibiotics in open fractures Improved antibiotic stewardship with no increase in infection rates. *https://journals.lww.com/jtrauma/Abstract/2014/09000/Evidence_based_protocol_for_prophylactic.2.aspx*

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