

**TITLE: SURGICAL PROPHYLAXIS: ANTIBIOTIC RECOMMENDATIONS FOR ADULT PATIENTS**

**GUIDELINE:**

Antibiotics are administered prior to surgical procedures to prevent surgical site infections.

**PURPOSE:**

1. To provide antibiotic recommendations for surgical prophylaxis in adult patients taking into account the site of infection, most common organisms, hospital epidemiology and susceptibilities, expert opinion, and cost.
2. To optimize antibiotic use and patient outcomes in the prevention of surgical site infections while limiting the emergence of resistance bacteria. These recommendations are modified from many sources including the *Treat Guidel Med Lett* 2009; 7(82):47-52 and *Clin Infect Dis* 2004; 38:1706-15.

*(For endocarditis prophylaxis, consult the NYPH recommendations for the prevention of endocarditis based on the American Heart Association recommendations, Circulation 2007; 115.)*

**APPLICABILITY:**

All centers

**PROCEDURE:**

1. **Choice of antimicrobial agent (see Table 2 and 3)**
  - A. Drug chosen should be active against the pathogens most commonly associated with wound infections following the specific procedure and against the pathogens endogenous to the region of the body being operated.
  - B. Selection of an appropriate agent for specific patients should take into account not only comparative efficacy but also adverse-effect profiles and patient drug allergies.
  - C. For most procedures, cefazolin 1 g or cefoxitin 2 g should be the agent of choice because of their relatively long duration of action, their effectiveness against the organisms most commonly encountered in surgery, and their relatively low cost.
  - D. Clindamycin or vancomycin should be used in penicillin-allergic patients.
    - 1) Clindamycin may be preferable for patients not at risk for infections due to resistant-gram positive organisms secondary to its narrower-spectrum and a more rapid infusion time.
    - 2) Routine vancomycin use is discouraged.

- E. Modification of a surgical prophylaxis regimen may be necessary in patients with pre-existing infections prior to surgery, significant length of hospital stay prior to surgery, and previous positive cultures/colonization. Consult Infectious Diseases for specific recommendations.
- F. For patients already receiving antibiotics prior to surgery, it is often not necessary to administer additional antibiotics for surgical prophylaxis provided the current regimen is appropriate in spectrum for the surgery planned and timing of administration of the current antibiotic regimen is optimized relative to incision time. Consult Infectious Diseases for specific recommendations.
- G. Maximal doses (e.g. cefazolin 2 g) should be considered for patients weighing >80 kg.

## **2. Timing**

- A. Infusion of antibiotics for surgical prophylaxis should begin within 1 hour prior to incision (exceptions are cesarean procedures and oral antimicrobials for colonic procedures).
  - 1) Vancomycin may begin within 2 hours prior to incision due to the longer infusion time and to ensure adequate tissue levels at the time of incision.
- B. All antibiotic infusions should be completed prior to incision. Recent data suggests that administration “as near to the incision time as possible” may not be optimal. Administration 15-30 minutes to 1 hour prior to the incision may be more ideal. (Garey et al. *J Antimicrob Chemother* 2006; 58: 645-650; Weber et al. *Annals of Surgery* 2008; 247: 918-926)

## **3. Duration**

- A. The optimal duration of perioperative prophylaxis is unknown. It is unlikely that further benefit is attained by the administration of additional doses beyond wound closure and post-operative prophylaxis is not recommended.
- B. Single prophylactic doses +/- additional intraoperative doses in prolonged procedures are strongly recommended. If prophylaxis is extended beyond the operative period, antibiotics should be discontinued within 24 hours unless otherwise specified.
- C. Additional intraoperative doses are strongly recommended in prolonged procedures at intervals approximating two times the half-life of the drug. This roughly corresponds with redosing antimicrobials at a frequency of one interval shorter than usual (see Table 1). Additional intraoperative doses may not be warranted in patients for whom the half-life of the antimicrobial is prolonged, such as those patients with renal insufficiency.
- D. The continuation of prophylaxis until all catheters and drains have been removed is not appropriate.

**TABLE 1: Administration and intraoperative redosing**

Drug	Cefazolin	Cefoxitin	Ampicillin/ sulbactam	Clindamycin	Gentamicin	Ampicillin	Vancomycin	Metronidazole	Aztreonam	Fluconazole	Rifampin	Trimethoprim /sulfa
Usual IV Dose	1 – 2 grams	2 grams	3 grams	600 mg	1.5 mg/kg	2 grams	15 mg/kg (usually 1 gram)	500 mg	1 – 2 grams	400 mg	600 mg	160 mg (TMP)
Redosing frequency intra-operatively	q4 hrs	q3 hrs	q3 hrs	q8 hrs	No redose	q4 hrs	q8 hrs (highly dependent on renal function – no redose for patients with ↑ SCr)	q8 hrs	q6 hrs	No redose	No redose	q8 hrs (highly dependent on renal function – no redose for patients with ↑ SCr)
Administration	IV push (3-5 min) OR 30 minute infusion	IV push (3-5 min) OR 30 minute infusion	30 minute infusion	30 minute infusion	30 minute infusion	15-30 minute infusion	60 minute infusion (doses > 1 gram require 90 minute infusion)	30 minute infusion	30 minute infusion	2 hour infusion	30 minute infusion	60 minute infusion

**TABLE 2: Adult Gentamicin Dosing for Surgical Prophylaxis Based on Weight**  
*(doses should be rounded to facilitate preparation, administration, and availability of gentamicin)*

Weight (kg)	Gentamicin Dose to Administer (1.5 mg/kg/dose)
30-40	60 mg
41-50	70 mg
51-60	90 mg
61-70	100 mg
71-100	120 mg
> 100 kg	Use alternative if appropriate: aztreonam 2 g

TABLE 3: Antibiotic choice and duration

	NATURE OF OPERATION	PATHOGENS	PRIMARY ANTIBIOTIC PROPHYLAXIS RECOMMENDED	ALTERNATIVE	DURATION OF PROPHYLAXIS
1. CARDIAC	Coronary artery bypass, other open-heart surgery	<i>Staphylococcus aureus, S. epidermidis</i>	cefazolin 1-2 grams IV q8h	vancomycin 1 gram IV q12h	For up to 24 hours
	Prosthetic valve	<i>Staphylococcus aureus, S. epidermidis</i>	cefazolin 1-2 grams IV q8h ± gentamicin 1.5 mg/kg IV x 1	vancomycin 1 gram IV q12h ± gentamicin 1.5 mg/kg IV x 1	For up to 24 hours
	Pacemaker, defibrillator placement	<i>Staphylococcus aureus, S. epidermidis</i>	cefazolin 1-2 grams IV q8h <sup>1a</sup>	clindamycin 600 mg IV q8h <sup>1a</sup> <u>or</u> vancomycin 1 g IV q12h	For up to 48 hours (maximum)
		1a May be switched post-op to oral cephalexin 500 mg PO q6h <u>or</u> cefadroxil 1 g PO q12h <u>or</u> clindamycin (for PCN-allergic patients) 450 mg PO q8h for a total duration not to exceed 48 hours.			
2. GASTRO-INTESTINAL	Esophageal, gastroduodenal	Enteric gram-negative bacilli, gram-positive cocci	cefazolin 1-2 grams IV <sup>2a</sup> <u>or</u> CEFOXITIN 2 GRAMS IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV <sup>2a</sup>	1 Pre-op Dose
	PEG placement, PEG revision	Enteric gram-negative bacilli, gram-positive cocci	cefazolin 1-2 grams IV <u>or</u> cefoxitin 2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Bariatric surgery	<i>Staphylococcus aureus, Streptococcus sp.,</i>	cefazolin 2-3 grams IV ± metronidazole 500 mg IV	clindamycin 900 mg IV	1 Pre-op Dose
	Biliary tract	Enteric gram-negative bacilli, enterococci, clostridia	cefazolin 1-2 grams IV <sup>2b</sup> <u>or</u> cefoxitin 2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV <sup>2b</sup>	1 Pre-op Dose
	Colorectal	Enteric gram-negative bacilli, anaerobes, enterococci	<u>Oral:</u> neomycin + erythromycin base (after appropriate diet and catharsis); 1 gram of each at 1pm, 2pm and 11pm the day before an 8am operation ( <i>Adjust timing for a later operative start</i> ) <u>or</u> <u>IV:</u> cefazolin 1-2 grams IV + metronidazole 500 mg IV <u>or</u> cefoxitin 2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Appendectomy, non-perforated	Enteric gram-negative bacilli, anaerobes, enterococci	cefoxitin 2 grams IV <u>or</u> cefazolin 1-2 grams IV + metronidazole 500 mg IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	2a High risk only (morbid obesity, esophageal obstruction, decreased gastric acidity or gastrointestinal motility) 2b High risk only (Age>70 yrs, biliary stent, non-functioning gall bladder, obstructive jaundice or common duct stones)				

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	NATURE OF OPERATION	PATHOGENS	PRIMARY ANTIBIOTIC PROPHYLAXIS RECOMMENDED	ALTERNATIVE	DURATION OF PROPHYLAXIS
<b>3. GENITOURINARY</b>	Cystoscopy alone	Enteric gram-negative bacilli, enterococci	<u>HIGH RISK ONLY</u> <sup>3a</sup> ampicillin 2 grams IV + gentamicin 1.5 mg/kg IV <u>or</u> cefazolin 1-2 grams IV	<u>HIGH RISK ONLY</u> <sup>3a</sup> clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Cystoscopy with manipulation or upper tract instrumentation (lithotripsy, ureteroscopy)	Enteric gram-negative bacilli, enterococci	ampicillin 2 grams IV + gentamicin 1.5 mg/kg IV <u>or</u> cefazolin 1-2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Open or laparoscopic surgery (percutaneous renal surgery, procedures with entry in the urinary tract, and those involving implantation of a prosthesis)	Enteric gram-negative bacilli, enterococci	cefazolin 1-2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Transrectal prostate biopsy	Enteric gram-negative bacilli, enterococci	cefoxitin 2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Penile prosthesis insertion, removal, revision	Enteric gram-negative bacilli, enterococci	vancomycin 1 gram IV + gentamicin 1.5 mg/kg IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	<i>3a High risk (urine culture positive or unavailable, pre-operative catheter, placement of prosthetic material); transurethral resection of prostate</i>				
<b>4. GYNECOLOGIC AND OBSTETRIC</b>	Vaginal, abdominal, or laparoscopic, hysterectomy	Enteric gram-negative bacilli, anaerobes, Group B strep, enterococci	cefazolin 1-2 grams IV or cefoxitin 2 grams IV	clindamycin 600 mg IV ± gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Synthetic pubovaginal sling	Enteric gram-negative bacilli, anaerobes, Group B strep, enterococci	cefazolin 1-2 grams IV or cefoxitin 2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
	Cesarean section	Enteric gram-negative bacilli, anaerobes, Group B strep, enterococci	cefazolin 1 gram IV or cefoxitin 2 grams IV	clindamycin 600 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose or After Cord-clamping
<b>5. HEAD AND NECK</b>	Incisions through oral or pharyngeal mucosa	Anaerobes, enteric gram negative bacilli, <i>S. aureus</i>	cefazolin 1-2 grams IV	clindamycin 600-900 mg IV + gentamicin 1.5 mg/kg IV	1 Pre-op Dose
<b>6. NEURO-SURGERY</b>	Craniotomy	<i>S. aureus</i> , <i>S. epidermidis</i>	cefazolin 1-2 grams IV	vancomycin 1 gram IV	1 Pre-op Dose

	NATURE OF OPERATION	PATHOGENS	PRIMARY ANTIBIOTIC PROPHYLAXIS RECOMMENDED	ALTERNATIVE	DURATION OF PROPHYLAXIS
7. OPHTHALMIC		<i>S. epidermidis</i> , <i>S. aureus</i> , streptococci, enteric gram-negative bacilli, <i>Pseudomonas aeruginosa</i>	gentamicin, tobramycin, moxifloxacin, gatifloxacin or neomycin-gramicidin-polymyxin B; multiple drops topically over 2 to 24 hours		For up to 24 hours
8. ORTHOPEDIC	Total joint replacement, internal fixation of fractures	<i>S.aureus</i> , <i>S. epidermidis</i>	cefazolin 1-2 grams IV q8h	clindamycin 600 mg IV q8h <u>or</u> vancomycin 1 gram IV q12h	For up to 24 hours
9. THORACIC (NON-CARDIAC)		<i>S. aureus</i> , <i>S. epidermidis</i> , streptococci, enteric gram-negative bacilli	cefazolin 1-2 grams IV	vancomycin 1 gram IV	1 Pre-op Dose

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	NATURE OF OPERATION	PATHOGENS	PRIMARY ANTIBIOTIC PROPHYLAXIS RECOMMENDED	ALTERNATIVE	DURATION OF PROPHYLAXIS
<b>10. TRANSPLANTS</b>	Heart		cefazolin 1-2 grams IV	vancomycin 1 gram IV	1 Pre-op Dose
	Lung <sup>10a</sup>		ampicillin/sulbactam (Unasyn®) 3 grams IV q6h	aztreonam 1 g IV q8h + vancomycin 1 g IV q12h	For up to 5 days
	Kidney		cefazolin 1-2 grams IV	vancomycin 1 gram IV	1 Pre-op Dose
	Liver		ampicillin/sulbactam (Unasyn®) 3 grams IV q6h	aztreonam 1 g IV q8h + metronidazole 500 mg IV q12h + vancomycin 1 g IV q12h	For up to 24 hours
	LVAD (CUMC)		rifampin 600 mg PO or IV x 1 + fluconazole 400 mg PO or IV x 1 + TMP/SMX 160 mg (TMP) IV q8h for up to 48 hrs	rifampin 600 mg PO or IV x 1 + fluconazole 400 mg PO or IV x 1 + vancomycin 1 g IV q12h for up to 48 hrs	For up to 48 hours
	Pancreas or kidney/pancreas		ampicillin/sulbactam (Unasyn®) 3 grams IV q6h for up to 24 hours + fluconazole 400 mg IV q24h for up to 48 hours	clindamycin 600 mg IV q8h + aztreonam 1 g IV q8h for up to 24 hours + fluconazole 400 mg IV q24h for up to 48 hours	For up to 24 - 48 hours
		<i>10a Antibiotics listed are for routine ("non-septic") lung transplants. Modification of antibiotic regimens is necessary in cases where culture and susceptibility data from the donor and/or recipient are available.</i>			
<b>11. VASCULAR</b>	Arterial surgery involving a prosthesis, the abdominal aorta, or a groin incision	<i>S. aureus</i> , <i>S. epidermidis</i> , enteric gram-negative bacilli	cefazolin 1-2 grams IV	vancomycin 1 gram IV	1 Pre-op Dose
	Lower extremity amputation for ischemia	<i>S. aureus</i> , <i>S. epidermidis</i> , enteric gram-negative bacilli, clostridia	cefazolin 1-2 grams IV	vancomycin 1 gram IV	1 Pre-op Dose

**RESPONSIBILITY:**

Joint Subcommittee on Anti-Infective Use

**GUIDELINE DATES:**

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