NATIONAL ANTIBIOTIC GUIDELINES 2016

Department of Health

NATIONAL ANTIBIOTIC GUIDELINES

(Surgical Prophylaxis)

ANTIBIOTIC PROPHYLAXIS TO PREVENT SURGICAL INFECTIONS

General Comments

ADULTS:

I. Surgical prophylaxis is recommended only when the potential benefits exceed the risks and the anticipated costs.

II. The antibiotic chosen must cover the expected pathogens for the operative site and take into account local resistance patterns.

III. Effective prophylaxis requires antimicrobial serum and tissue concentrations above the minimum inhibitory concentration (MIC) for the probable organisms associated with the specific procedure at the time of incision and throughout the duration of the procedure.

A. *Timing is crucial. Intravenous antimicrobial must be started within 60 minutes before surgical incision.* ***Exceptions****: Vancomycin and fluoroquinolones require 1- to 2-hour infusion times; hence, dose is started 2 hours before surgical incision. Rapid infusion of vancomycin may result in hypotension and other signs and symptoms of histamine release (red man syndrome).*

B. *A single dose of antimicrobial with a long enough half-life to achieve activity throughout the operation is sufficient for prophylaxis under most circumstances. Post-procedure doses are generally not needed.*

C. *For procedures lasting more than two half-lives of the prophylactic agent, or when there is excessive blood loss (>1,500 mL), intraoperative supplementary dose(s) may be required. Re-dosing interval is measured from time of the pre-operative dose.*

IV. The use of vancomycin is discouraged but may be justifiable in centers where rates of post-operative infection with methicillin-resistant *Staphylococcus aureus* (MRSA) are high, or in patients with known MRSA colonization or at high risk for this (e.g., hemodialysis patients). It is also an alternative when patients have a history of an immediate type of allergic reaction to beta-lactams (anaphylaxis, laryngeal edema, bronchospasm, hypotension, local swelling,

urticaria or pruritic rash occurring immediately after a beta-lactam dose) or exfoliative dermatitis (e.g., Stevens-Johnson syndrome).

A. *Unlike beta-lactams, vancomycin has no activity against gram-negative organisms. When gram-negative bacteria are a concern (as shown by local surveillance data), adding a second agent with appropriate in vitro activity may be necessary. This can be done by adding cefazolin to vancomycin in the non-allergic patient. In patients intolerant of or allergic to beta-lactams, use vancomycin with another gram-negative antibiotic (e.g., aminoglycoside, fluoroquinolone, or aztreonam).*

V. For patients currently given therapeutic antibiotic(s) for infection remote to surgery site and when the antibiotic regimen is appropriate also for prophylaxis, a dose should be given within an hour prior to incision.

VI. The risks of pre-surgical prophylaxis include *Clostridium difficile* infection and allergic reactions.

PEDIATRIC PATIENTS:

I. The principles mirror those for antibiotic prophylaxis in adults. However, data in the pediatric population are limited and recommendations have largely been extrapolated from studies in adults.

II. Recommendations are generally the same as for adults except for dosing.

III. Fluoroquinolones should not be used because of the potential for toxicity.

RECOMMENDED ANTIBIOTIC PROPHYLAXIS REGIMEN BY SURGICAL PROCEDURE

Type of surgery	Regimen	Comments
Cardiovascular Surgery • Reconstruction of abdominal aorta • Leg vascular procedures that involve a groin incision • Any vascular procedure with insertion of prosthesis/foreign body • Lower extremity amputation for ischemia • Cardiac surgery • Permanent pacemakers • Heart transplant • Implanted cardiac defibrillators	**Cefazolin** 2 g as a single dose for <120kg OR 3 g IV ≥ 120 Kg OR **Cefuroxime** 1.5 g IV as a single dose	Single infusion just before surgery is as effective as multiple doses. Prophylaxis beyond 24 hours is not recommended No prophylaxis is needed for cardiac catheterization, carotid and brachiocephalic procedures without insertion of prosthetic grafts, and intravascular central line insertion (tunnelled/ untunnelled).
	If allergic to beta-lactams: **Vancomycin** ≤ 90 kg: 1 g IV as a single dose > 90 kg: 1.5 g IV as a single dose	For prosthetic heart valves, it is recommended to stop prophylaxis either after removal of the retrosternal drainage catheters or just give a 2nd dose after coming off bypass.
	Consider **intranasal mupirocin** the evening before surgery, on the day of surgery, and bid for 5 days post-surgery in patients with positive nasal culture for *Staphylococcus aureus*.	**Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA

Gastroduodenal/Biliary Gastroduodenal, includes percutaneous endoscopic gastrostomy (high risk only),pancreaticoduodenectomy (Whipple procedure)	**Cefazolin** 2 g IV (3 gms if wt.≥ 120 kg) OR **Cefoxitin** 2 g IV OR **Ceftriaxone** (2 g IV) as a single dose	Gastroduodenal (PEG placement) high-risk conditions include: marked obesity, obstruction, decreased gastric acid or decreased motility, gastric bleeding, cancer.
Low risk, laparoscopic cholecystectomy	No prophylaxis	
Biliary, includes high risk laparoscopic cholecystectomy, open cholecystectomy	Open cholecystectomy: **Cefazolin** 2 g IV (3 g if wt.≥ 120 kg) OR **Cefoxitin** 2 g IV	Biliary high-risk factors include: age >70 years, diabetes, immune-suppression, acute cholecystitis, pregnancy, non-functioning gallbladder, obstructive jaundice or common duct stones, anticipated bile spillage or procedure duration >2h
Endoscopic retrograde cholangiopancreatography	If without obstruction: No prophylaxis If with obstruction: **Ciprofloxacin** 500-750 mg PO or 400 mg IV 2h prior to procedure OR **Piperacillin-tazobactam** 4.5 g IV 1h prior to procedure	Achieving adequate drainage is important to prevent post-procedural cholangitis or sepsis. The greatest benefits from prophylaxis are most likely attained when complete drainage cannot be achieved.

Colorectal surgery	**Parenteral regimens :** **Cefazolin** 2 g IV (3 gms if wt.≥ 120 kg) PLUS **Metronidazole** 0.5g IV OR **Cefoxitin** 2 g IV OR **Ceftriaxone** 2 g IV PLUS **Metronidazole** 0.5 g IV OR **Ampi-Sulbactam** 3 gm IV **If with beta-lactam allergy:** **Clindamycin** 900 mg IV PLUS **Gentamicin** 5 mg/kg IV OR **Aztreonam** 2 g IV OR **Ciprofloxacin** 400 mg IV	Prevention of surgical site infection includes a combination of: • Mechanical bowel preparation • Oral antibiotic • IV antibiotic Cefazolin and Metronidazole can be given together in same IV bag Need to repeat cefazolin dose 4 hours after the initial pre-op dose

	Oral regimens (At 1 pm, 2 pm and 11 pm of preop day)**:** **Neomycin** 1 g PLUS **Erythromycin base** 1 g PO	On the pre-operative day: 1. Do bowel preparation at 10 am using 4L polyethylene glycol electrolyte solution PO over 2h. 2. Clear liquid diet only. 3. NPO after midnight.
Small bowel surgery without obstruction	**Cefazolin** 2 g IV (3 g if wt.≥ 120 kg)	
with obstruction	As for colorectal parenteral regimen	
Appendectomy for uncomplicated appendicitis	**Cefoxitin** 2 g IV OR **Cefazolin** 2 g IV (3 g if wt.≥ 120 kg) PLUS **Metronidazole** 0.5 g IV	

Head and Neck Surgery	**Cefazolin** 2 g IV single dose PLUS **Metronidazole** 0.5 g IV OR **Clindamycin** 600-900 mg IV single dose ± **Gentamicin** 5 mg/kg IV single dose	The efficacy of prophylaxis is best established for head and neck cancer surgery. Wound infection rates can still be high though even with prophylaxis. Clean, uncontaminated head and neck surgery does not require prophylaxis except when there is placement of prosthetic material. Prophylaxis is not indicated for tonsillectomy and functional endoscopic sinus procedures.
Neurosurgical Procedures Clean, non-implant; e.g. elective craniotomy	**Cefazolin** 2 g IV (3 gms if wt.≥ 120 kg) Alternative: **Vancomycin** If ≤90 kg, 1 g IV If ≥90 kg: 1.5 g IV OR **Clindamycin** 900 mg IV once	**Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA
Clean, contaminated (cross sinuses, or naso/oropharynx)	**Clindamycin** 900 mg IV (single dose) OR **Ampicillin-sulbactam** 3g IV	

CSF shunt surgery, intrathecal pumps	OR **Cefuroxime** 1.5 g IV PLUS **Metronidazole** 0.5 g IV **Cefazolin** 1-2 g IV once Alternative: **Vancomycin** If ≤90 kg, 1 g IV If ≥90 kg: 1.5 g IV OR **Clindamycin** 900 mg IV once	**Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA
Obstetric/Gynecologic Surgery Vaginal or abdominal hysterectomy	**Cefazolin** 2 g IV OR **Cefoxitin** 2g IV OR **Ampicillin-sulbactam** 3 g IV Alternative: **Clindamycin** 900 mg IV PLUS **Gentamicin** 5 mg/kg IV x 1 dose	

Caesarean section for premature rupture of membranes or active labor	**Cefazolin**2 g IV Alternative: **Clindamycin** 900 mg IV PLUS **Gentamicin** 5 mg/kg IV x 1 dose	May be administered before skin incision or after cord is clamped.
Ophthalmic	Topical **neomycin-polymixin B–gramicidin** OR **fluoroquinolone** given as 1 drop q5-15 min x 5 doses within the hour before start of procedure Optional at the end of procedure: **Cefazolin** 100 mg by subconjunctival injection OR **Cefazolin** 1-2.5 mg intracameral OR **Cefuroxime** 1 mg	Most available data involve cataract procedures.
Orthopedic Surgery Total joint replacement (TJR), spinal procedures, hip fracture repair, implantation of internal fixation devices (screws, nails, plates, wires)	**Cefazolin** 2 g IV pre-op Alternative; **Vancomycin** If ≤90 kg, 1 g IV If ≥90 kg: 1.5 g IV	Stop prophylaxis within 24h of surgery. For TJR (other than hip), finish the initial antibiotic infusion before the tourniquet is inflated Antibiotic-impregnated bone cement in addition to intravenous antibiotic is commonly practiced for joint replacements.

Clean operations of hands, feet and arthroscopy w/o implantation of foreign materials	OR **Clindamycin** 900 mg IV. Consider intranasal **mupirocin** if colonized with *S. aureus*. Prophylaxis not indicated	**Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA
Thoracic Noncardiac procedures, including lobectomy, pneumonectomy, lung resection, and thoracotomy Video-assisted thoracoscopic surgery	**Cefazolin** 2 g IV x 1 dose OR **Ampicillin-sulbactam** 3 g IV x 1 dose OR **Clindamycin** 900 mg IV x 1 dose	
Urologic Surgery/Procedure Cystoscopy	• Prophylaxis generally not necessary if urine is sterile. May give a fluoroquinolone or cotrimoxazole for those with potentially adverse host factors (e.g., advanced age, immunocompromised state, anatomic abnormalities, etc.) • Treat patients with UTI based on urine c/s prior to procedure	Modify antimicrobial to target urinary pathogens based on local resistance patterns. Increasing cotrimoxazole and/or fluoroquinolone (FQ) resistance among enteric gram-negative bacteria has been a concern.
Cystoscopy with manipulation	**Ciprofloxacin** 500 mg PO OR **Levofloxacin** 500 mg PO	Procedures include ureteroscopy, biopsy, fulguration, TURP, etc. Treat UTI with targeted therapy before procedure if possible.

Transrectal prostate biopsy	Alternative: **Cotrimoxazole** 800/160 mg PO in settings with low rates of resistance **Ciprofloxacin** 500 mg po 12 hrs prior to biopsy and repeated 12 hrs after 1st dose	Screening stool culture pre-procedure for colonization with fluoroquinolone-resistant organisms is increasingly used to guide the choice of prophylaxis, which should ideally be based on susceptibility of prevailing organisms.
Others Breast surgery, herniorrhaphy	**Cefazolin** 1-2 g IV x 1 dose OR **Ampicillin-sulbactam** 3 g IV x 1 dose OR **Clindamycin** 900 mg IV x 1 dose	

Recommended Doses for PEDIATRIC PATIENTS and REDOSING INTERVALS for Commonly Used Antimicrobials for Surgical Prophylaxis (The dosage recommendations are only applicable for patients beyond the Newborn Period)

Antibiotic	Dose For Pediatrics	Half-Life In Adults With Normal Renal Function (hours)*	Redosing Interval (From Initiation Of Preoperative Dose) (hours) **
Ampicillin-Sulbactam	50 mg/kg of the ampicillin component	0.8-1.3	2
Ampicillin	50 mg/kg	1-1.9	2
Aztreonam	30 mg/kg	1.3-2.4	4
Cefazolin	30 mg/kg	1.2-2.2	4
Cefuroxime	50 mg/kg	1-2	4
Cefoxitin	40 mg/kg	0.7-1.1	2
Ceftriaxone	50-75 mg/kg	5.4-10.9	NA
Ciprofloxaxin	10 mg/kg	3-7	NA
Clindamycin	10 mg/kg	2-4	6
Fluconazole	6 mg/kg	30	NA
Gentamicin***	2.5 mg/kg based on dosing weight	2-3	NA
Metronidazole	15 mg/kg	6-8	NA
Piperacillin-Tazobactam	Infants 2-9 mos: 80 mg/kg of the piperacillin component	0.7-1.2	2

	Children > 9 mos and < 40 kg: 100 mg/kg of the piperacillin component		
Vancomycin	15 mg/kg	4-8	NA
Oral Antibiotics for Colorectal Surgery in Conjunction with Mechanical Bowel Preparation			
Erythromycin base	20 mg/kg	0.8-3	NA
Metronidazole	15 mg/kg	6-10	NA
Neomycin	15 mg/kg	2-3	NA

* The maximum pediatric dose should not exceed the usual adult dose. Pediatric patients weighing more than 40 kg should receive weight-based doses unless the dose or daily dose exceeds the recommended adult dose.

** For antimicrobials with a short half-life (e.g., cefazolin or cefoxitin) used for long procedures, redosing during surgery is recommended at an interval of approximately two times the half-life of the agent in patients with normal renal function. Recommended redosing intervals marked as “not applicable” (NA) are based on typical case length; for unusually long procedures, redosing may be needed.

*** In general, gentamicin for surgical antibiotic prophylaxis should be limited to a single dose given preoperatively. Dosing is based on the patient’s actual body weight. If actual body weight is more than 20% above ideal body weight (IBW), the dosing weight (DW) can be determined as follows: DW = IBW + 0.4 (actual wt. – IBW).

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