SURGICAL PROPHYLAXIS GUIDELINES FOR PAEDIATRICS FY 2015

How to use this table:

Always check G6PD & drug allergy status before prescribing.
Alternative therapy: only if severe penicillin allergy (as defined by extensive rash, angioedema or anaphylactic reactions)
**Note: cross-reactivity between penicillin and the carbapenem parent compound skin test is estimated to be around 1% in recent prospective studies. A test dose can be considered for patients who have experienced an IgE-mediated reaction/ positive skin test to penicillin.*
If in doubt, always refer ID.

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Additional References:

ASHP Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery 2013
The Sanford Guide to Antimicrobial Therapy 2014
KKH Antimicrobial Prophylaxis in Pediatric Surgery Guidelines 2008
TTSH Antibiotic Guidelines
SGH Antibiotic Guideline
Lexicomp Online

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Guiding principles for appropriate use of antimicrobials in surgical procedures

1) Appropriate antibiotic(s), adequate dose, achievement of proper timing before incision and maintaining therapeutic levels of antibiotic throughout the operation are critical.
2) **All antibiotics should be started within 30 to 60 minutes before surgical incision, except Vancomycin and Fluoroquinolones, which should be commenced 120 minutes before surgical incision in order to achieve adequate antibiotic concentrations.**
3) **Vancomycin and Fluoroquinolones should be administered over at least 1 hour, with completion within 1 hour of the skin incision.** However, Vancomycin infusion may be prolonged in the event of Red Man Syndrome (see "KKH Vancomycin Guidelines")
4) **Single-dose prophylaxis is usually sufficient. The duration of prophylaxis for all procedures should be less than 24 hours.**
    a. See column on "*Time for Repeat Dose (Hours)*": the recommended re-dosing time interval from initiation of pre-operative dose. If the duration of the procedure exceeds the recommended re-dosing interval, the antibiotic(s) should be re-administered.
    b. Re-administration may also be warranted if prolonged or excessive bleeding occurs or if there are other factors that may shorten the half-life of the prophylactic agent (e.g. extensive burns)
    c. Re-administration may not be warranted in patients in whom the half-life of the agent may be prolonged (e.g. patients with renal insufficiency or failure)
5) **Postoperative doses/ longer durations of antibiotic treatment beyond the duration of the operation DO NOT ADD BENEFIT or lower rates of surgical site infections and may increase the incidence of resistant pathogens in subsequent nosocomial infections.**
6) For patients known to be colonized with methicillin-resistant *Staphylococcus aureus* (MRSA) or at high risk of MRSA infections, it is reasonable to add a single preoperative dose of vancomycin to the recommended agent(s). (see "KKH Vancomycin Guidelines")
    a. High risk for MRSA infection includes:
        i. Pre-operative MRSA colonization/ history of MRSA infection
        ii. Neonates < 3 months of age who have been hospitalized since birth
        iii. >5 days stay in health care facility where MRSA is endemic
        iv. Prosthetic cardiac valve, joint/ vascular surgery where procedure is re-operation (return to theatre or revision)

References:

- Clinical practice guidelines for antimicrobial prophylaxis in surgery, Bratzler et al., Am J Health-Syst Pharm—Vol 70 Feb 1, 2013
- Prophylactic Antibiotics: Administration and Timing before Operation Are More Important than Administration after Operation; E. Patchen Dellinger; Clinical Infectious Diseases 2007; 44:928–30
- Centers for Disease Control and Prevention. Recommendations for preventing the spread of vancomycin resistance: recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC). MMWR 1995; 44 (No. RR-12)

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
CARDIAC see Ann Thorac Surg 2007;831569; Ann Thorac Surg 2006;81:397; J Pediatr Infect Dis Soc 2012;1:35							
Cardiac device insertion procedures (e.g., pacemaker implantation), ventricular assist devices	Mainly Gram-positive organisms including *S. aureus*, CoNS. Less commonly gram-negative organisms.	IV Cefazolin 30mg/kg/dose OR (IV Cloxacillin 25mg/kg/dose Q6H PLUS IV Gentamicin 2.5mg/kg/dose)	(IV Clindamycin 10mg/kg/dose OR IV Vancomycin 15mg/kg/dose Q6H) PLUS IV Gentamicin 2.5mg/kg/dose	30-60 min before surgery (IV Vanco: 120 min before surgery)	4 (Cefazolin, Clox); 6 (Clinda, Vanco) 8 (Genta)	Q8H, up to 72H	Addition of an aminoglycoside/ fluoroquinolone can be considered if gram-negative pathogens are of concern.
THORACIC see Ann Thorac Surg 2007;831569; Ann Thorac Surg 2006;81:397							
Non-cardiac procedures including lobectomy, pneumonectomy, lung resection, and thoracotomy, Video-assisted thoracoscopic surgery (VATS)	Mainly Gram-positive organisms including *S. aureus, S. epidermidis*, streptococci. Less commonly gram-negative organisms. Rarely fungal (*Candida* species).	IV Cefazolin 30mg/kg/dose (N.B.: Treatment for preexisting infection may be required and a longer duration may be considered)	IV Clindamycin 10mg/kg/dose OR IV Vancomycin 15mg/kg/dose	30-60 min before surgery (IV Vanco: 120 min before surgery)	4 (Cefazolin); 6 (Clinda, Vanco)	Once	As above.
GASTROINTESTINAL see Cochrane 2005;3:CD001439; Am J Health-Syst Pharm 2013;70:169							
Acute appendicitis (Simple/ Uncomplicated) **See: Infection 2012;40:635**	Gram-negative enteric organisms including *Bacteroides fragilis, E. coli.* Less commonly streptococci, staphylococci, enterococci species.	IV Gentamicin 2.5mg/kg/dose PLUS IV Metronidazole 7.5mg/kg/dose	IV Cefazolin 30mg/kg/dose PLUS IV Metronidazole 7.5mg/kg/dose	30-60 min before surgery	4 (Cefazolin); 6 (Metro); 8 (Genta)	Once, Q8H up to 24H	Single dose sufficient. No significant differences in post-operative SSI rates between single-dose and multi-dose (2-3 doses) administration in most studies. For neonatal necrotizing enterocolitis, refer “KKH Antibiotic Guidelines for Paediatrics”.

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
Acute appendicitis (Complicated*) **See: Pediatr Surg Int 2004;20:838; Diagnostic Microbiology and Infectious Disease 2011;69:376**	As Above, including *Pseudomonas.*	IV Ceftriaxone 50mg/kg/dose PLUS IV Metronidazole 7.5mg/kg/dose	(IV Ciprofloxacin 10mg/kg/dose OR IV Gentamicin 2.5mg/kg/dose) PLUS IV Metronidazole 7.5mg/kg/dose	30-60 min before surgery (IV Cipro: 120 min before surgery)	6 (Metro); 8 (Cipro, Genta) 24 (Ceftriaxone)	Till 24H afebrile then PO antibiotics as per pathway	*Complicated: includes perforated or gangrenous appendicitis, including peritonitis or abscess formation. For neonatal necrotizing enterocolitis, refer to "KKH Antibiotic Guidelines for Paediatrics".
Biliary tract (e.g. Kasai procedure) **See J Pediatr Surg 2003; 38:590**	*E. coli, Klebsiella* species, enterococci; less commonly other gram-negative organisms, streptococci, staphylococci. Occasionally anaerobes (*Clostridium* species).	(IV Ceftriaxone 50mg/kg/dose OR IV Amoxicilin/ Clav. (Amox) 25mg/kg/dose) WITH/WITHOUT IV Metronidazole 7.5mg/kg/dose	(IV Clindamycin 10mg/kg/dose OR IV Metronidazole 7.5mg/kg/dose) PLUS IV Gentamicin 2.5mg/kg/dose	30-60 min before surgery	4 (Cefazolin); 6 (Amox/Clav, Clinda, Metro); 8 (Genta); 24 (Ceftriaxone)	Once, up to 72H then PO antibiotics prophylaxis as per guidelines.	Post-Kasai prophylaxis with oral co-trimoxazole, cephalexin or neomycin up to 3yr of age may be useful in the prevention of recurrent cholangitis, refer "KKH Antibiotic Guidelines for Paediatrics".
Esophageal, Gastroduodenal	*E. coli, Proteus* species, *Klebsiella* species, staphylococci, streptococci, enterococci. Occasionally *Bacteroides* species.	IV Cefazolin 30mg/kg/dose	IV Clindamycin 10mg/kg/dose PLUS IV Gentamicin 2.5mg/kg/dose	30-60 min before surgery (IV Vanco: 120 min before surgery)	4 (Cefazolin); 6 (Clinda, Vanco); 8 (Genta)	Once	NA

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
Small bowel, Colorectal	*E. coli*, *P. aeruginosa*, streptococci, staphylococci, enterococci, *Bacteroides fragilis, Clostridium* species.	IV Ceftriaxone 50mg/kg/dose PLUS IV Metronidazole 7.5mg/kg/dose	(IV Clindamycin 10mg/kg/dose OR IV Metronidazole 7.5mg/kg/dose) PLUS IV Gentamicin 2.5mg/kg/dose	30-60 min before surgery	6 (Clinda, Metro); 8 (Genta) 24 (Ceftriaxone)	Once, up to 24H	No evidence supports greater efficacy for doses given after the completion of the procedure and should generally be continued for no more than 24 hours.
Endoscopic procedures (e.g. colonoscopy, oesophagogastroduodenoscopy) **See: Gut 2009;58:869; Gastrointestinal Endoscopy 2008; 67;791**	NA	NONE	NONE	NA	NA	NA	No antibiotic required
EAR, NOSE AND THROAT see Am J Health-Syst Pharm 2013;70:169							
Clean	NA	NONE	NONE	NA	NA	NA	No antibiotic required in most clean procedures. SSIs <1% for clean procedures without antimicrobial prophylaxis. Pre-operative single dose of IV Cefazolin 30mg/kg/dose reasonable if placement of prosthetic material.

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
Clean-contaminated* (e.g. tonsillectomy, adenoidectomy)	Staphylococci, streptococci (aerobic, anaerobic), oral anaerobes (e.g: *Bacteroides* species except *B. fragilis*), *Peptostreptococcus*, *Prevotella, Fusobacterium* species etc.	IV Amoxicilin/ Clav. (Amox) 25mg/kg/dose	IV Clindamycin 10mg/kg/dose PLUS IV Gentamicin 2.5mg/kg/dose	30-60 min before surgery	6 (Amox/Clav, Clinda); 8 (Genta)	Q8H, up to 24H	*Involves incision through the oral or pharyngeal mucosa. Addition of aminoglycoside to clindamycin appropriate if increased likelihood of gram-negative contamination of surgical site. Prophylaxis has not been shown to benefit for procedures like tonsillectomy or functional endoscopic sinus procedures. No significant differences in efficacy for regimens lasting longer than 24 hours.
NEUROSURGICAL see Cochrane 2006;3:CD005365; Am J Health-Syst Pharm 2013;70:169							
Clean/ Elective craniotomy and cerebrospinal fluid-shunting procedures	Mainly gram-positive bacteria, *S. aureus*, CoNS; rarely gram-negative bacteria.	IV Cefazolin 30mg/kg/dose (N.B.: Treatment for preexisting infection may be required and a longer duration may be considered)	IV Clindamycin 10mg/kg/dose OR IV Vancomycin 15mg/kg/dose	30-60 min before surgery (IV Vanco: 120 min before surgery)	4 (Cefazolin); 6 (Clinda, Vanco)	Once; up to 24H	Benefit of systemic antibiotic prophylaxis >24H post-op to prevent shunt infection is uncertain.

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
ORTHOPAEDIC see Pediatr Infect Dis J 2008;27:704; J Pediatr Ortop 2013:33:479; BMJ 2013;346:f2743							
Clean operations involving hand, knee, or foot and not involving implantation of foreign materials	NA	NONE (N.B.: Treatment for preexisting infection may be required and a longer duration may be considered)	NONE	NA	NA	NA	Risks of SSI and long-term sequelae low for procedures not involving implants. Antimicrobial prophylaxis is generally not recommended.
Orthopaedic surgery involving prosthesis or implant; Spinal procedures with and without instrumentation/ Implantation of internal fixation devices	*S. aureus*, CoNS (including *S. epidermidis*); gram-negative bacteria; Polymicrobial (spinal procedures).	IV Cefazolin 30mg/kg/dose Q8H	IV Clindamycin* 10mg/kg/dose OR IV Vancomycin 15mg/kg/dose Q6H	30-60 min before surgery (IV Vanco: 120 min before surgery)	4 (Cefazolin); 6 (Clinda, Vanco)	Once; up to 24H	No high-quality evidence supporting duration >24H; single doses have been used. *In comparison to Vancomycin, Clindamycin demonstrates a superior penetration to bone and soft tissues. Nasal mupirocin should be given to patients known to be colonized with MRSA.

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
UROLOGIC see Am J Health-Syst Pharm 2013;70:169; J Urology 2008;179:1379.							
Urological procedures	*E. coli,* other gram-negative organisms, enterococci, less commonly: *S. aureus*, CoNS, (*S. epidermidis, P. aeruginosa* if prosthesis implantation).	IV Cefazolin 30mg/kg/dose (N.B.: Treatment for preexisting infection may be required and a longer duration may be considered if placement of prosthetic material or manipulation of indwelling tube)	IV Gentamicin 2.5mg/kg/dose	30-60 min before surgery	4 (Cefazolin); 8 (Genta)	Once; Q8H up to 24H	No antimicrobial prophylaxis required for clean urologic procedures without risk factors* for post-operative infections. Treat UTI before procedure.
VASCULAR see J Vasc Interv Radiol 2010;21:1611; HICPAC 2011; http://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines-2011.pdf							
Central Venous Access/ Port insertion **Anesthesiology 2012; 116:539**	*S. aureus*, *S. epidermidis.*	NONE	NONE	NA	NA	NA	Central venous catheter placement: clean procedure, antimicrobial prophylaxis NOT routinely recommended. Single dose IV Cefazolin (alternative for severe penicillin allergy: IV Clindamycin) may be administered for immune-compromised patients with ANC<$1x10^9$/L, with history of catheter-related bloodstream infection, or high-risk neonates.

TYPE OF PROCEDURE	USUAL ORGANISMS	ANTIBIOTIC CHOICE		TIMING	TIME FOR REPEAT DOSE (Hours)	DURATION	REMARKS
		First-line	Alternative (severe penicillin therapy)				
PLASTICS see Am J Health-Syst Pharm 2013;70:169							
Cleft lip and palate/ Facial procedures	*S. aureus*, other staphylococci, streptococci; rarely gram-negative organisms.	IV Amoxicillin/Clav. (Amox) 25mg/kg/dose	IV Clindamycin 10mg/kg/dose WITH/ WITHOUT IV Gentamicin 2.5mg/kg/dose	At induction	6 (Amox/Clav, Clinda); 8 (Genta)	Once; up to 24H	No controlled trials have evaluated the role of antimicrobial prophylaxis in repair of cleft lip and palate.
DENTAL see Circulation 2007;116:1736							
Clean with risk factors or clean-contaminated	Streptococci (*Viridans* & other nutritional variants), *S. aureus*, enterococci.	PO Amoxicillin 50mg/kg/dose (max 2g) OR IV Ampicillin 50mg/kg/dose	IV/ PO Clindamycin 20mg/kg/dose	PO: 1 hour before surgery IV: 30-60 min before surgery	2 (Ampi); 6 (Clinda; Amox)	Once	Antimicrobial prophylaxis NOT routinely recommended for dental procedures. Pre-operative single dose may be administered for the prevention of infective endocarditis (see: “Antibiotic Prophylaxis for Infective Endocarditis” in KKH Paediatrics Antibiotic Guidelines) or in immunocompromised patients.