SHC Surgical Antimicrobial Prophylaxis Guidelines

I. Purpose/Background

This document is based upon the 2013 consensus guidelines from American Society of Health-System Pharmacists (ASHP), the Infectious Diseases Society of America (IDSA), the Surgical Infection Society (SIS) and the Society for Healthcare Epidemiology of America (SHEA) (1). The Stanford Antimicrobial Safety and Sustainability Program, in conjunction with the anesthesiology and surgical departments, adapted its content to SHC as part of the 2015 SSI Taskforce.

1. **Choice of antibiotics**: Please see table I for acceptable choices of antibiotics based upon surgical procedure. Consider the addition of vancomycin or clindamycin for patients known to be colonized with MRSA.

2. **Dose of antibiotics**: Please see Table II for dosing and re-dosing guidelines. We recommend weight-based dosing of both cefazolin and vancomycin. Cefazolin should be administered every 4 hours; clindamycin every 8 hours; vancomycin does not require re-dosing given its long half-life. We recommend clinicians consider re-dosing earlier than specified in Table II if there is excessive intra-operative blood loss (e.g. >1500 mL). Aminoglycosides and vancomycin should not be re-dosed in this setting.

3. **Timing of the pre-operative antibiotic dose**: Guidelines recommend that pre-operative antibiotics be administered <60 minutes prior to incision. The guidelines have not narrowed the window for pre-operative antibiotics despite acknowledging that recent data supports that antibiotics administered <30 minutes prior to incision may be more efficacious than those administered >60 minutes. Pre-operative antibiotics should reach acceptable tissue concentrations prior to the incision time in order to be effective. Cefazolin (2 grams) given 30 minutes prior to incision exceeds the minimum concentration needed; however data is lacking regarding the window between 1-30 minutes. (2)

   Thus, we recommend that the optimal window for pre-operative antibiotics is ~15 – 45 minutes prior to incision. Because vancomycin and fluoroquinolones require a prolonged infusion time to avoid intolerance, especially at higher doses, guidelines recommend that vancomycin infusion may begin 60-120 minutes prior to incision (it's long half-life makes this acceptable.)

4. **Duration of post-operative antibiotics**: We recommend that all patients receive <24 hours of post-operative antibiotics. In many procedures, no doses after incision closure are necessary.

Table I. Preferred Empiric Agent by Surgical Type. (1)

	Preferred Agent	Beta-lactam allergy
Cardiac Surgery/ Vascular/Thoracic	Cefazolin	Vancomycin[1]
Cardiac Surgery with prosthetic material	Cefazolin + vancomycin	Vancomycin[1]
Cardiac device insertion (e.g., pacemaker implantation)	Cefazolin	Vancomycin[1]
Gastroduodenal	Cefazolin	Vancomycin[1] + gentamicin
Biliary Tract	Cefazolin	Metronidazole + Levofloxacin
Colorectal, appendectomy	Cefazolin + metronidazole	Metronidazole + Levofloxacin

	Preferred Agent	Beta-lactam allergy
Other general surgery (e.g. hernia repair, breast)	Cefazolin	Vancomycin[1]
Cesarean delivery	Cefazolin	Clindamycin[1] + gentamicin
Gynecological (eg hysterectomy)	Cefazolin	Clindamycin[1] + gentamicin
Head & Neck	Clean (incision through skin): Cefazolin Clean-contaminated: • Ear/sinonasal procedure: Cefazolin • Procedures w/ oral mucosa breach: Cefazolin + Metronidazole Contaminated: Cefazolin + metronidazole	Clindamycin
Neurosurgery	Cefazolin	Vancomycin[1]
Orthopedics	Cefazolin	Vancomycin[1]
Plastic Surgery	Cefazolin	Vancomycin[1]
Urology[2] *These are empiric recommendations when no pre-op urine culture data is available or cultures were negative.*	Cefazolin Open/laparoscopic involving intestine (clean-contaminated, e.g., radical cystectomy with ileal conduit): • Cefoxitin If prosthetic material involved in urologic procedures, should add one-time dose of gentamicin	Gentamicin[2a] + Clindamycin[2b] Open/laproscopic (clean:skin incision, does not involve GU tract): • Clindamycin[2b] Open/laparoscopic involving intestine (clean-contaminated, e.g., radical cystectomy with ileal conduit) • Metronidazole + Levofloxacin If prosthetic material involved in urologic procedures, should add one-time dose of gentamicin if not already given

Notes:

1. Clindamycin can be used as an alternative to vancomycin. Clindamycin and vancomycin are recommended alternative agents to cefazolin for patients with beta-lactam allergies. According to our 2015 hospital-wide antibiogram (link), 81% of MSSA isolates were susceptible to clindamycin, while 100% were susceptible to vancomycin. If practical, we recommend vancomycin as the preferred choice for those with beta-lactam allergies.
2. Urology notes
   [a] Ciprofloxacin is a reasonable alternative. However, according to the 2015 SHC antibiogram (link), more *E. coli* isolates were susceptible to aminoglycosides than fluoroquinolones
   [b] If significant concern for MRSA, vancomycin should be considered as an alternative to clindamycin. According to our 2015 hospital wide antibiogram, only 50% of MRSA isolates are susceptible to clindamycin, while 100% were susceptible to vancomycin. In addition, clindamycin has limited urinary penetration. However, vancomycin infusion should be started 60-120 minutes prior to incision to allow for complete drug administration. (see Table 2)
3. If cultures will be obtained intra-operatively, prophylactic antibiotics should be withheld.

Table II: Dosing and re-dosing of antimicrobial agents.(1)

Antimicrobial	Recommended Dose	Re-dosing (hours)	Notes
Commonly used			
Cefazolin	2 grams > 120 kg = 3 grams	4	
Clindamycin	900 mg	6	
Vancomycin	< 80 kg = 1 gram 80 – 99 kg = 1.25 grams 100 -120 kg = 1.5 grams >120 kg = 2 grams	12	Requires prolonged infusion time, can be given 60-120 minutes prior to incision
Other			
Ampicillin-sulbactam	3 grams	2	
Aztreonam	2 grams	4	
Cefotetan	2 grams	6	
Cefoxitin	2 grams	2	
Ceftriaxone	2 grams	N/A	
Cefuroxime	1.5 grams	4	
Ciprofloxacin	400 mg	8	Requires prolonged infusion time, can be given 60-120 minutes prior to incision
Ertapenem	1 gram	N/A	
Gentamicin	5 mg/kg (single dose) If CrCl <20, 2mg/kg (single dose) or consult pharmacy	N/A	
Levofloxacin	500 mg	N/A	Requires prolonged infusion time, can be given 60-120 minutes prior to incision
Metronidazole	500 mg	12	
Tobramycin	5 mg/kg (single dose) If CrCl <20, 2mg/kg (single dose) or consult pharmacy	N/A	

Table III: Post-op dosing

Antimicrobial	Recommended Dose (Many procedures require no post-op doses of antimicrobials. If desired, limit duration to <24 hours post closure)
Cefazolin	2 grams q8h up to 2 doses
Clindamycin	900 mg q8h up to 2 doses
Vancomycin	1 grams q12h up to 1 dose
Ampicillin-sulbactam	3 grams q6h up to 3 doses
Aztreonam	2 grams q8h up to 2 doses
Cefotetan	2 grams q12h up to 1 dose
Cefoxitin	2 grams q6h up to 3 doses
Ceftriaxone	No post-op doses needed (q24h hour dosing)
Cefuroxime	1.5 grams q8h up to 2 doses
Ciprofloxacin	400 mg q12h up to 1 dose
Gentamicin	No post-op doses needed (q24h hour dosing)
Levofloxacin	No post-op doses needed (q24h hour dosing)
Metronidazole	500 mg q8h up to 2 doses
Tobramycin	No post-op doses needed (q24h hour dosing)

II. References:

1. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Heal Pharm. 2013;70(3):195–283.

2. Douglas A, Udy A a., Wallis SC, Jarrett P, Stuart J, Lassig-Smith M, et al. Plasma and tissue pharmacokinetics of cefazolin in patients undergoing elective and semielective abdominal aortic aneurysm open repair surgery. Antimicrob Agents Chemother. 2011;55(11):5238–42.

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C. Review and Renewal Requirement
This document will be reviewed every three years and as required by change of law or practice
D. Revision/Review History:
Surgical review: Jonathan Berek MD, Jack Boyd MD, James Chang MD, Stuart Goodman MD PhD, Mary Hawn MD, Griff Harsh MD, Serena Hu MD, John Morton MD, Andrew Shelton MD, Lawrence Shuer MD, Eila Skinner MD, Gary Steinberg MD PhD, Mark Welton MD 8/19/2016
Anesthesiology review: Ron Pearl MD PhD, Cliff Schmiesing MD 8/19/2016
Pharmacy review: Manya Sarram 8/19/2016
E. Approvals
SASS/SSI taskforce updated – 8/19/2016
Approved Antibiotic Subcommittee – 6/2/2016, 8/17/2017
Approved by P&T Committee – 6/17/2016, 9/15/2017

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