SHC Antimicrobial Prophylaxis in Surgery Recommendations

1. **Antibiotic Selection:** Please refer to Table 1 & 2 for recommended antibiotic choices according to surgical procedure. Recommendations take into account current national guidelines and local susceptibility patterns. *Consider the addition of Vancomycin for all patients with known colonization with MRSA.*
2. **Antibiotic Dose:** Please refer to Table 3 for recommendations on dosing and re-dosing. If there is excessive intra-operative blood loss (i.e. >1500 mL), re-dosing earlier than specified may be warranted (with the exception of Vancomycin and aminoglycosides).
3. **Antibiotic Timing:** Pre-operative antibiotics should be administered within 60 minutes prior to incision. For antibiotics requiring prolonged infusions (e.g. Vancomycin, fluoroquinolones, & metronidazole), start the infusion 60-120 minutes prior to incision.
4. **Post-op Antibiotic Prophylaxis**: Antibiotic prophylaxis should not exceed 24 hours after the end of procedure (with the exception of cardiothoracic procedures where up to 48 hours may be acceptable). In many procedures, no doses after incision closure are necessary. For vancomycin, if 24h of prophylaxis is desired, administer second dose 12h after first pre-op dose for CrCL≥40. For CrCL<40 no additional doses are needed.

Table 1. Antibiotic Recommendations for Surgical Prophylaxis for non-OBGYN & non-Plastics Procedures

Surgical Procedure Type	Preferred Antibiotic(s)[1] (Includes patients with Type 1 PCN Allergy[2])	Type 1 Cephalosporin Allergy[1,2]
Cardiac, vascular, thoracic	Cefazolin[3]	Vancomycin
Cardiac, LVAD	Cefepime + Daptomycin	Aztreonam + Daptomycin
GI, gastroduodenal, biliary tract, non-obstructed small bowel	Cefazolin (prophylaxis) or Ceftriaxone (acute infection[4] or gross contamination)	Vancomycin + Tobramycin
GI, appendectomy, colorectal[5], obstructed small bowel	Cefazolin + Metronidazole (prophylaxis) or Ceftriaxone + Metronidazole (acute infection[4] or gross contamination)	Levofloxacin + Metronidazole[6]
Head & Neck • Non-mucosal (skin/ear/sinonasal) • Through mucous membranes	 • Cefazolin • Cefazolin + Metronidazole	 • Clindamycin • Clindamycin
Neurosurgery	Cefazolin (add Vanco if MRSA +)	Vancomycin
Orthopedic	Cefazolin (add Vanco if MRSA +)	Vancomycin
Spinal	Cefazolin (add Vanco if MRSA +)	Vancomycin ± Tobramycin [7]
Urologic[8] **e.g. Pubovaginal sling procedures, nephrectomy** Note: For urologic procedures such as prostatic biopsy, TURP, **a preoperative urine culture** is recommended and prophylaxis is based on culture results	Cefazolin • Involving bowel: Add Metronidazole • Involving prosthesis: Add Tobramycin	Vancomycin + Tobramycin • Involving bowel: Levofloxacin + Metronidazole • Involving prosthesis: Vancomycin + Tobramycin
Other General Surgery e.g. hernia repair	Cefazolin	Vancomycin

1. **Consider the addition of a single pre-op dose of Vancomycin for all patients with known MRSA colonization**. Per P&P#30097.99, MRSA nasal swab routinely done for patients undergoing neurosurgical, orthopedic, and spinal procedures.
2. **Type 1 Allergy**: Signs and symptoms include anaphylaxis, difficulty swallowing or breathing, facial swelling/angioedema, cardiovascular/syncope, and immediate hives within 60 minutes of medication administration. Note: delayed hives, rash is not an indication for using alternative agents. **CEFAZOLIN is a SAFE alternative in Type 1 PCN Allergy.**
3. In cardiac surgeries where surveillance data show MSSA as a cause of surgical-site infections despite cefazolin prophylaxis, cefuroxime may be considered as an alternative.
4. Ceftriaxone + Metronidazole is the preferred treatment for community-acquired intra-abdominal infection. Refer to the SHC Disease State Guidelines for more information.
5. For most patients, mechanical bowel preparation combined with oral neomycin sulfate + oral erythromycin base OR oral neomycin sulfate + oral metronidazole should be given in addition to IV prophylaxis.
6. Alternatively or if pregnant or lactating, use clindamycin + tobramycin + metronidazole in place of levofloxacin + metronidazole. Consider addition of tobramycin if involving lower lumbar and sacral spine or if surveillance data shows gram-negative organisms are a cause of surgical-site infections.
7. These are empiric recommendations in the absence of pre-operative urine cultures or when cultures are negative.
8. Fluoroquinolones, e.g. Ciprofloxacin or Levofloxacin, are generally not recommended due to reduced susceptibilities to *E. Coli* isolates at SHC. History of ESBL within 6mos, use ertapenem.

Table 2. Antibiotic Recommendations for Surgical Prophylaxis for OBGYN and Plastics Procedures

<table>
<tr><th>OB/GYN Surgery</th><th>Preferred Antibiotic(s)
(Including patients with Type 1 PCN Allergy)[A]</th><th>Type I Cephalosporin Allergy</th><th>Infectious Disease Hx</th></tr>
<tr><td>Cervical Cerclage</td><td rowspan="2">Cefazolin 2 g IV[B]</td><td rowspan="2">Clindamycin 900 mg IV <u>AND</u>
Tobramycin 7 mg/kg IV[D]</td><td rowspan="4">MRSA[F]: Consider <u>ADDING</u>
Vancomycin 20 mg/kg IV

ESBL[G]: Consider Ertapenem
1 g IV</td></tr>
<tr><td rowspan="2">Cesarean Section</td></tr>
<tr><td colspan="2">For unscheduled cesarean (ROM and/or laboring) OR scheduled cesarean with BMI >30:
<u>ADD</u> Azithromycin 500 mg IV (not indicated if receiving antibiotics for chorioamnionitis)</td></tr>
<tr><td>Colporrhaphy, Laparotomy/ Myomectomy, Vaginal Sling, Vulvectomy</td><td>Cefazolin 2 g IV[B]</td><td rowspan="3">Levofloxacin 750 mg IV <u>AND</u>
Metronidazole 500 mg IV[E]
OR
Clindamycin 900 mg IV <u>AND</u>
Tobramycin 7 mg/kg IV <u>AND</u>
Metronidazole 500 mg IV[DE]</td></tr>
<tr><td>Hysterectomy
(All: vaginal, abdominal, laparoscopic, robotic)</td><td>Cefazolin 2 g IV[B] <u>AND</u>
Metronidazole 500 mg IV[E]</td></tr>
<tr><td>Colon, Colorectal, Cytoreductive</td><td>Cefazolin 2 g IV[B] (or Ceftriaxone 2 g IV) <u>AND</u>
Metronidazole 500 mg IV[E]</td></tr>
<tr><td>GYN D&C, Endometrial Ablation, Hysteroscopy, IUD Insertion, Laparoscopy (no bowel/vagina entry), Tubal Ligation</td><td colspan="3">None Recommended
(presumes patient to be free of infection or without abnormal tubal architecture at time of surgery)</td></tr>
<tr><td rowspan="2">Uterine Aspiration/Evacuation: Suction D&C, Induced Abortion/D&E</td><td rowspan="2">Doxycycline 100 mg IV[H]</td><td>Doxycycline Allergy</td><td rowspan="2">MRSA: Additional Vancomycin <u>NOT</u> Recommended</td></tr>
<tr><td>Azithromycin 500 mg IV <u>OR</u>
Metronidazole 500 mg IV</td></tr>
<tr><th>Plastic Surgery</th><th>Preferred Antibiotic(s)[A]</th><th>Cephalosporin Allergy</th><th>MRSA[F]</th></tr>
<tr><td>Aesthetic Surgery
(Facelift, Blepharoplasty)</td><td>Cefazolin 2 g IV[B]</td><td>Vancomycin 20 mg/kg IV <u>OR</u>
Clindamycin 900 mg IV</td><td>Vancomycin 20 mg/kg IV</td></tr>
<tr><td>Breast Surgery</td><td>Cefazolin 2 g IV[B]

Consider <u>+</u> Tobramycin 7 mg/kg IV if reconstruction with implant or expander</td><td>Vancomycin 20 mg/kg IV <u>OR</u>
Clindamycin 900 mg IV

Consider <u>+</u> Tobramycin 7 mg/kg IV if reconstruction with implant or expander</td><td>Vancomycin 20 mg/kg IV

Consider <u>+</u> Tobramycin 7 mg/kg IV if reconstruction with implant or expander</td></tr>
<tr><td colspan="4">Post-Surgical Antibiotic Prophylaxis (PSAP)</td></tr>
<tr><td colspan="4">PSAP is generally <u>not</u> recommended following most OB/GYN procedures. PSAP is recommended if suboptimal pre-operative antisepsis and/or contamination in the surgical field. <u>Post-cesarean</u> PSAP is recommended if (a) patient did <u>not</u> receive adjunctive prophylaxis with azithromycin for unscheduled cesarean or (b) in scheduled surgery if BMI > 30: cephalexin PO + metronidazole PO for 48 hours (cephalosporin allergy: sulfamethoxazole/trimethoprim PO + metronidazole PO). <u>Post-GYN</u> surgery PSAP may be considered in patients with BMI ≥ 40 and/or immunodeficiency (e.g. cancer or uncontrolled diabetes): cefazolin + metronidazole for <u>≤</u> 24 hours (cephalosporin allergy: levofloxacin + metronidazole OR clindamycin + tobramycin + metronidazole OR). In the presence of infection at time of surgery, document the infection and follow SHC treatment recommendations.</td></tr>
</table>

[A]Type 1 Allergy: Signs and symptoms include anaphylaxis, difficulty swallowing or breathing, facial swelling/angioedema, cardiovascular/syncope, and immediate hives within 60 minutes of medication administration. Note: delayed hives, rash is not an indication for using alternative agents. CEFAZOLIN is a SAFE alternative in Type 1 PCN Allergy.

[B]Cefazolin: 3 g if ≥ 120 kg or BMI ≥ 40. Replace cefazolin with ceftriaxone for acute infection or gross contamination.

[C]Tobramycin: 440 mg IV is premade; consider for unscheduled (urgent and emergent) cases if dose is ~ 7 mg/kg (Pharmacist may adjust).

[E]Metronidazole: Add metronidazole when expanded anaerobic coverage needed (i.e. bowel/colon involvement, bowel/vaginal contamination, fecal spillage, cytoreductive surgery) and in all hysterectomies.

[F]Vancomycin: Consider adding vancomycin for patients with a history of MRSA infection within prior year or current MRSA colonization (Pharmacist may adjust).

[G]Ertapenem: Consider ertapenem in place of cefazolin for history of ESBL infection within prior year and/or current ESBL colonization.

[H]Doxycycline: Doxycycline route for obstetric D&C not clear in literature, if PO route chosen, give 200 mg 1 hour before procedure. IV route is indicated for D&E.

Table 3. Surgical Prophylactic Antibiotic Dosing and Re-dosing Recommendations

Prophylactic IV Antibiotic	Initial Dose Give within 1hr of incision	Repeat Pre-op Dose If dosed >1 hr prior to incision	Re-dosing[a] For longer procedures OR blood loss >1.5 L
Ampicillin-sulbactam (Unasyn®)	3 g	None	2 hrs: 3g
Azithromycin[b] (Zithromax®)	500 mg	None	Insufficient evidence
Aztreonam (Azactam®)	2 g	1 g	4hrs: 2 g
Cefazolin (Ancef®)	2 g 3 g: if ≥120 kg or BMI ≥40	>1hr: 1 g	4hrs: 2 g For OB, consider 3hrs: 2g
Cefepime	2 g	1 g	4hrs: 2g
Cefoxitin	2 g	1 g	2hrs: 2 g
Ceftriaxone (Rocephin®)	2 g	NA	NA
Cefuroxime	1.5 g	750 mg	4hrs: 1.5 g
Clindamycin (Cleocin®)	900 mg	>1hr: 300 mg	6hrs: 900 mg
Daptomycin	6 mg/kg	None	None
Doxycycline	100 mg	Insufficient evidence	Insufficient evidence
Ertapenem (Invanz®)	1 g	None	Insufficient evidence
Tobramycin[c]	7mg/kg (CrCl > 30) 2 mg/kg (CrCl < 30)	None	None
Levofloxacin[d] (Levaquin®)	750 mg <45 kg: 500 mg	None	12hrs: 500 mg
Metronidazole[d] (Flagyl®)	500 mg	None	8hrs: 500 mg
Piperacillin-tazobactam (Zosyn®)	4.5 g	4.5 g	2hrs: 4.5 g
Vancomycin[d] (Vancocin®)	20 mg/kg (max 2 g)	None	None
ORAL antibiotics for colorectal surgery prophylaxis *(used in conjunction with mechanical bowel preparation)*			
Erythromycin base	1 g	None	None
Metronidazole	1 g	None	None
Neomycin	1 g	None	None

[a] Administer repeat intraoperative dose at the designated time from initial/pre-op dose or when estimated blood loss >1.5 L.

[b] Azithromycin as adjunctive prophylaxis for non-elective cesarean should be administered after primary antibiotic prophylaxis (i.e. after cefazolin).

[c] High-dose tobramycin prophylaxis (7 mg/kg) only needs to be given once pre-operatively. This approach exploits the concentration-dependent killing and post-antibiotic effect of aminoglycosides, and is as efficacious as traditional dosing with less nephrotoxicity.

[d] Vancomycin, levofloxacin, & metronidazole administration should begin within 60-120 minutes of incision. For vancomycin, complete ≥1 g prior to incision if entire infusion cannot be completed prior to incision. Add metronidazole intra-operatively in the event of bowel involvement, incidental enterotomy, or spillage

The above guidelines are recommendations based on available literature and are not intended to replace clinical judgement.

References:

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5. Edwards FH, Engelman RM, Houck P, et al. The Society of Thoracic Surgeons Practice Guideline Series: Antibiotic Prophylaxis in Cardiac Surgery, Part I: Duration. Ann Thorac Surg 2006; 81: 397-404
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7. Achilles Prevention of infection s/p IAB SFP 20102 (Contraception 2011).
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