Surgical Antibiotic Prophylaxis - Adult

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women. Local microbiology and susceptibility/resistance patterns should be taken into consideration when selecting antibiotics.*

Patients scheduled for surgery should have the following antibiotics administered prior to their procedure:

- Vancomycin, ciprofloxacin/levofloxacin, and gentamicin are to be initiated 60-120 minutes prior to incision, and all other antibiotics are to be initiated within 60 minutes of incision
- Carefully evaluate allergy histories before using alternative agents - the majority of patients with listed penicillin allergies can safely be given cephalosporins or carbapenems
- If the patient has multiple known antibiotic drug allergies, is colonized with or has a history of a recent multi-drug infection, administer antibiotics as indicated or consider an outpatient Infectious Diseases referral
- Discontinue all antibiotics within 24 hours of first dose except for: 1) Treatment of established infection, 2) Prophylaxis of prosthesis in the setting of postoperative co-located percutaneous drains, 3) Intraoperative findings that raise the wound classification above 2 (*e.g.,* spillage of enteric contents, purulent fluid, etc.). All of these require appropriate documentation.
- See Appendix A for intraoperative re-dosing recommendations

MRSA screening should be performed on patients hospitalized within 30 days of procedure, transferred from skilled nursing facilities, with percutaneous lines/catheters, or with HIV. Any surgical patient with a history of MRSA infection or positive MRSA screening should receive vancomycin 1 gram IV as part of surgical prophylaxis. If vancomycin is being ordered based on standard disease site recommendations, a second dose is not necessary. Vancomycin prophylaxis should be considered for patients with known MRSA colonization or at high risk for MRSA colonization in the absence of surveillance data (*e.g.*, patients with recent hospitalization, nursing-home residents, hemodialysis patients). *American Society of Health-System Pharmacists (ASHP) guidelines.*

Disease Site	No Penicillin Allergy	Patients with Penicillin Allergy
Breast / Melanoma / Plastics	• Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
Head / Neck (ENT - Clean)	• Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
Head / Neck (ENT - Clean Contaminated)	Ampicillin and sulbactam 3 grams IV	• Levofloxacin 500 mg IV **and** • Less than 70 kg: clindamycin 600 mg IV **or** • Greater than or equal to 70 kg: clindamycin 900 mg IV
Neurosurgery	Skull base ONLY: • Ampicillin and sulbactam 3 grams IV	• Levofloxacin 500 mg IV **and** • Less than 70 kg: clindamycin 600 mg IV **or** • Greater than or equal to 70 kg: clindamycin 900 mg IV
	All other types: • Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV **or** • Levofloxacin 500 mg IV **and** • Less than 70 kg: clindamycin 600 mg IV **or** • Greater than or equal to 70 kg: clindamycin 900 mg IV

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Disease Site	No Penicillin Allergy	Patients with Penicillin Allergy
Vascular	• Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
GI (Clean)	• Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
GI	Gastric, Pancreas, Liver or Colorectal[1]: • Ertapenem 1 gram IV	Gastric, Pancreas, Liver, or Colorectal[1]: • Ciprofloxacin 400 mg IV **and** metronidazole 500 mg IV
Gynecologic	GI procedures unlikely[2]: • Metronidazole 500 mg IV **and** • Less than 120 kg: cefazolin 2 grams IV **or** • Greater than or equal to 120 kg: cefazolin 3 grams IV GI procedures likely: • Ertapenem 1 gram IV **and** preoperative bowel preparation[1]	GI procedure unlikely: • Ciprofloxacin 400 mg IV **and** metronidazole 500 mg IV GI procedure likely: • Ciprofloxacin 400 mg IV **and** metronidazole 500 mg IV **and** pre-operative bowel preparation[1]
Thoracic/Pulmonary/ Esophageal	Ampicillin and sulbactam 3 grams IV	• Ciprofloxacin 400 mg IV **and** • Less than or equal to 70 kg: vancomycin 1 gram IV **or** • Between 70 kg and 100 kg: vancomycin 1.5 grams IV **or** • Greater than or equal to 100 kg: vancomycin 2 grams IV
Orthopedics	Pelvic surgery ONLY: • Ceftriaxone 2 grams IV All other types: • Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	Vancomycin: • Less than or equal to 70 kg: 1 gram IV • Between 70 kg and 100 kg: 1.5 grams IV • Greater than or equal to 100 kg: 2 grams IV **or** Clindamycin: • Less than 70 kg: 600 mg IV • Greater than or equal to 70 kg: 900 mg IV
Endocrine Surgery	• Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV

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[1] Patients undergoing colorectal resection should be considered for preoperative mechanical and oral antibiotic bowel preparation which includes metronidazole 500 mg PO and neomycin 1 gram PO

[2] Patients with unanticipated GI procedures should receive ertapenem 1 gram IV intraoperatively as soon as need is identified

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Disease Site	No Penicillin Allergy	Patients with Penicillin Allergy
Pain Surgery	• Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	• Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
Genitourinary[1] **(Lower Urinary Tract)**	Cystourethroscopy with minor manipulation (high risk patients[2]): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO	Cystourethroscopy with minor manipulation (high risk patients[2]): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO
	Cystourethroscopy with mucosal break (*i.e.,* TURP, TURBT, laser enucleation/ ablation): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO	Cystourethroscopy with mucosal break (*i.e.,* TURP, TURBT, laser enucleation/ ablation): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO
	Prostate brachytherapy/cryotherapy: • Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	Prostate brachytherapy/cryotherapy: • Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
	Transrectal/Transperineal prostate biopsy: • Levofloxacin 500 mg IV or PO **or** gentamicin 1.5 mg/kg IM or IV **or** meropenem 1 gram IV[3]	Transrectal/Transperineal prostate biopsy: • Levofloxacin 500 mg IV or PO **or** gentamicin 1.5 mg/kg IM or IV **or** meropenem 1 gram IV[3]
Genitourinary[1] **(Upper Urinary Tract)**	Percutaneous Renal Surgery (PCNL): • Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	Percutaneous Renal Surgery (PCNL): • Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
	Ureteroscopy (with and without biopsy, laser lithotripsy, etc.): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO	Ureteroscopy (with and without biopsy, laser lithotripsy, etc.): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO

TURP = transurethral resection of the prostate TURBT = transurethral resection of a bladder tumor PCNL = percutaneous nephrolithonomy

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[1] Urology antibiotic prophylaxis recommendations are based on a negative pre-procedure urine culture; prophylaxis should be modified to account for organisms identified from the urine culture
[2] Risk factors to consider are history of recurrent or recent urinary tract infection, immunosuppression, uncontrolled diabetes
[3] Applicable only for cases performed in the outpatient operating room (ACB)

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Disease Site	No Penicillin Allergy	Patients with Penicillin Allergy
Genitourinary[1] **(Open/ laparoscopic/ robotic surgery)**	**Without** urinary tract entry (*e.g.,* adrenalectomy, lymphadenectomy, orchiectomy) **With** urinary tract entry (*e.g.,* nephrectomy, radical prostatectomy, urethroplasty, urethrectomy): • Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	**Without** urinary tract entry (*e.g.,* adrenalectomy, lymphadenectomy, orchiectomy) **With** urinary tract entry (*e.g.,* nephrectomy, radical prostatectomy, urethroplasty, urethrectomy): • Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
	With urinary tract entry and involving small/large bowel (cystectomy with urinary diversion, augmentation cystoplasty, ileal ureteral substitution): • Ceftriaxone 1 gram IV (for small bowel) • Ertapenem 1 gram IV (for large bowel)	**With** urinary tract entry and involving small/large bowel (cystectomy with urinary diversion, augmentation cystoplasty, ileal ureteral substitution): • Ciprofloxacin 400 mg IV (for small bowel) • Ciprofloxacin 400 mg IV **and** metronidazole 500 mg IV (for large bowel)
	Genitourinary prosthetic devices (penile prosthesis and artificial urinary sphincter): • Gentamicin 1.5 mg/kg IV **and** • Less than 120 kg: cefazolin 2 grams IV **or** • Greater than or equal to 120 kg: cefazolin 3 grams IV	Genitourinary prosthetic devices (penile prosthesis and artificial urinary sphincter): • Gentamicin 1.5 mg/kg IV **and** • Less than or equal to 70 kg: vancomycin 1 gram IV **or** • Between 70 kg and 100 kg: vancomycin 1.5 grams IV **or** • Greater than or equal to 100 kg: vancomycin 2 grams IV
	Vaginal Surgery (urethral sling, VVF repair, urethral diverticulectomy): • Less than 120 kg: cefazolin 2 grams IV • Greater than or equal to 120 kg: cefazolin 3 grams IV	Vaginal Surgery (urethral sling, VVF repair, urethral diverticulectomy): • Less than or equal to 70 kg: vancomycin 1 gram IV • Between 70 kg and 100 kg: vancomycin 1.5 grams IV • Greater than or equal to 100 kg: vancomycin 2 grams IV
	Shock wave lithotripsy (elevated risk factors[2]): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO	Shock wave lithotripsy (elevated risk factors[2]): • Ciprofloxacin 500 mg PO **or** sulfamethoxazole and trimethoprim 800 mg/160 mg PO

VVF = vesicovaginal fistula

[1] Urology antibiotic prophylaxis recommendations are based on a negative pre-procedure urine culture; prophylaxis should be modified to account for organisms identified from the urine culture

[2] Risk factors to consider are history of recurrent or recent urinary tract infection, immunosuppression, uncontrolled diabetes, and infectious stone

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APPENDIX A: Recommended Intraoperative Re-dosing Intervals for Commonly Used Surgical Prophylaxis Antimicrobials for Adults[1]

Antimicrobial	Half-life with normal renal function (hour)	Recommended re-dosing interval by creatinine clearance (CrCl)[1,2,3]				Additional considerations	Standard therapeutic dosing (outside of the operative setting) for CrCl > 50 mL/minute[4]
		CrCl > 50 mL/minute (hours)	CrCl 30-50 mL/minute (hours)	CrCl 10-29 mL/minute (hours)	CrCl < 10 mL/minute (hours)		
Ampicillin-sulbactam	0.8 - 1.3	2	4	8	N/A	• Consider re-dosing if there is excessive blood loss (*i.e.,* > 1,500 mL) • Consider utilizing standard, renally adjusted dosing intervals after patients have received 3 prophylactic antibiotic doses (1 preoperative and 2 intraoperative)[5]	3 grams IV every 6 hours
Cefazolin	1.2 - 2.2	4	8	12	N/A		2 grams IV every 8 hours
Cefoxitin	0.7 - 1.1	2	4	8	N/A		2 grams IV every 6 hours
Ciprofloxacin[6]	3 - 7	12	12	N/A	N/A		400 mg IV every 12 hours
Clindamycin[7]	2 - 4	6	6	6	6		900 mg IV every 8 hours
Ertapenem	3 - 5	N/A	N/A	N/A	N/A		1 gram IV every 24 hours
Gentamicin[8]	2 - 3	N/A	N/A	N/A	N/A		7 mg/kg IV times 1 dose, followed by serum level monitoring
Levofloxacin[6]	6 - 8	N/A	N/A	N/A	N/A		750 mg IV every 24 hours
Meropenem	1 – 2.5	3	6	10	N/A		1 gram IV every 8 hours
Metronidazole	6 - 8	12	12	12	12		500 mg IV every 12 hours
Vancomycin[9]	4 - 8	12	N/A	N/A	N/A		15 mg/kg IV every 12 hours

[1] Patients with impaired renal function need individualized initial and secondary antibiotic dosing based on CrCl and case type
[2] Recommended re-dosing intervals marked as "not applicable" (N/A) are based on case length < 24 hours. For longer procedures, re-dosing may be needed.
[3] Society guidelines (*e.g.*, ASHP Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery) do not provide recommended re-dosing intervals for patients with renal dysfunction. Listed intervals are extrapolated from approximately 2 times the reported drug half-lives in published literature in patients with renal dysfunction.
[4] Refer to the institutional renal dosing guide (internal only) or tertiary dosing references (*e.g.*, Lexicomp) for standard dosing interval renal dysfunction adjustments outside of the operative setting
[5] Society guidelines (*e.g.*, ASHP Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery) do not address this situation. These recommendations are based on internal expert opinion.
[6] While fluoroquinolones have been associated with an increased risk of tendinitis/tendon rupture in all ages, use of these agents for single-dose prophylaxis is generally safe
[7] Clindamycin is hepatically cleared and does not require adjustment for renal dysfunction
[8] 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 the patient's actual weight is more than 20% above ideal body weight (IBW), the dosing weight (DW) can be determined as follows: DW = IBW + 0.4 (actual weight – IBW).
[9] Vancomycin prophylaxis should be considered for patients with known MRSA colonization or at high risk for MRSA colonization in the absence of surveillance data (*e.g.,* patients with recent hospitalization, nursing home residents, hemodialysis patients). *ASHP guidelines.*

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