2021 VAPAHCS GRAM-NEGATIVE ORGANISM (% Susceptibility)	# isolates tested	Beta lactams												Aminoglycosides			Fluoroquinolones / Miscellaneous				
		Penicillins				Cephalosporins						Carbapenems									
		Ampicillin	Amoxicillin/ clavulanate	Ampicillin/ sulbactam (CR)	Piperacillin/ tazobactam	Cefazolin^ *applies to urine only*	Cefoxitin	Cefpodoxime	Ceftriaxone	Ceftazidime (R)	Cefepime (CR)	Ertapenem	Meropenem (R)	Gentamicin	Tobramycin	Amikacin (CR)	Ciprofloxacin (CR)	Levofloxacin (CR)	Aztreonam (R)	Nitrofurantoin *applies to urine only*	Trimethoprim/ sulfamethoxazole
Acinetobacter baumaunii	11*	-	-	100*	82*	-	-	-	-	91*	100*	-	100*	100*	100*	-	91*	91*	-	-	100*
Citrobacter freundii#	32	-	-	-	72	-	-	63#	63#	69#	100	96*	97	97	91	100	84	78	63	85*	81
Citrobacter koseri	50	-	100*	100	100	95^	96	98	98	98	100	100	100	96	98	100	100	100	100	92	98
Enterobacter cloacae#	89	-	-	-	90	-	-	78#	85#	90#	99	96	99	100	99	100	99	97	93	40	92
Escherichia coli~	636	56	87	64	96	81^	92	86	90	90	93	100	100	91	91	100	75	74	90	98	77
Klebsiella aerogenes#	44	-	-	-	89	-	-	82#	89#	89#	100	100	100	100	100	100	95	95	89	19	100
Klebsiella oxytoca~	80	-	67*	62	91	52^	99	96	91	98	97	100	100	99	97	100	97	99	94	82	94
Klebsiella pneumoniae~	252	-	100*	83	94	88^	95	90	90	90	94	99	99	94	93	100	89	90	91	26	88
Morganella morganii	48	-	-	17	100	-	67	-	93	92	100	100	100	91	98	100	81	83	98	-	83
Proteus mirabilis	183	85	96*	91	100	75^	95	96	97	97	97	100	100	91	93	100	77	77	96	-	77
Providencia rettgeri	24*	-	-	58*	100*	-	100*	96*	96*	92*	100*	100*	100*	96*	96*	100*	92*	83*	96*	-	92*
Providencia stuartii	6*	-	-	-	100*	-	100*	100*	100*	100*	100*	100*	100*	-	-	100*	17*	17*	100*	-	50
Pseudomonas aeruginosa	208	-	-	-	94	-	-	-	-	93	95	-	95	95	99	99	87	85	62	-	-
Serratia marcescens#	36	-	-	-	97	-	-	-	92#	97#	100	97	97	100	89	100	89	89	97	-	100
Stenotrophomonas maltophilia	22*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	82*	-	-	95*
Cost per day ($)		$	$	$	$	$	$	$	$	$$	$$	$$	$	$	$	$	$	$	$$$	$	$

FOOTNOTES * Fewer than 30 isolates were tested. Due to the small number of isolates tested, results may be statistically unreliable (i.e. interpret with caution).

(CR) Criteria restricted. ampicillin/sulbactam for animal bite wounds; cefepime for neutropenic fever; amikacin for gram-negative organisms resistant to gentamicin/tobramycin; streptomycin for gentamicin-resistant Enterococcal endocarditis; ciprofloxacin for Pseudomonas infection, gram negative bacteremia, intra-abdominal infection if severe anaphylactic beta lactam allergy, severe sepsis (as part of empiric combination therapy), urology surgical prophylaxis, epididymitis if non-STD enteric orgs, prostatitis/ pyelonephritis if TMP/SMX resistant organism/susceptibility unknown, traveler's diarrhea (not SE Asia) if azithromycin contraindicated; levofloxacin for community-acquired pneumonia if severe beta lactam allergy, epididymitis. Use for other indications requires Infectious Diseases approval.

(R) Restricted. Use of these agents requires Infectious Diseases approval.

^ Actual cefazolin urine susceptibilities are likely better than what is listed in this column (due to MIC interpretation differences).

Enterobacter, Klebsiella aerogenes (formerly Enterobacter), Citrobacter, and Serratia may develop resistance during prolonged therapy (approx 4 days) with 3rd generation cephalosporins as a result of derepression of AmpC beta-lactamase. Therefore, isolates that are initially susceptible may become resistant after initiation of therapy. Repeat testing may be warranted. For blood culture/sterile sites, ID consult is recommended.

~ %ESBL: E.coli 10% (94% of 51 E.coli isolates tested susceptible to fosfomycin), Klebsiella oxytoca 6%, Klebsiella pneumoniae 10%

Cost per day ($): $ < 25; $$ 25-100; $$$ 100-200

2021 VAPAHCS GRAM-POSITIVE ORGANISM (% Susceptibility)	**# isolates tested**	Beta lactams: Penicillins / Cephalosporins				Fluoroquinolones / AGs (for synergy only)			Miscellaneous								
		Penicillin	Oxacillin	Ampicillin	Ceftriaxone	Levofloxacin (CR)	Gentamicin (a)	Streptomycin (a)(R)	Clindamycin	Daptomycin (d)(R)	Erythromycin	Linezolid (R)	Nitrofurantoin *applies to urine only*	Rifampin (b)(R) *not for monotherapy*	Tetracycline	Trimethoprim/ sulfamethoxazole	Vancomycin
Enterococcus faecalis	362	-	-	100	-	-	78	88	-	98	-	100*	99	-	21	-	99
Enterococcus faecium	24*	-	-	21*	-	-	91*	27*	-	100*	-	93*	46*	-	54*	-	46*
Staphylococcus aureus (MRSA)	95	-	-	-	-	-	-	-	58	100	19	99	100	100	82	96	100
Staphylococcus aureus (MSSA)	271	31	100	-	-	83	-	-	80	100*	73	100	94	100	96	99	100
Staphylococcus, coag-negative	187	16	62	-	-	71	-	-	78	-	55	100	100	98	84	66	100
Staphylococcus lugdunensis	24*	42*	96*	-	-	-	-	-	85*	-	85*	100*	100*	100*	96*	96*	100*
Streptococcus agalactiae (gp B)	19*	100*	-	100*	100*	100*	-	-	65*	-	59*	100*	-	-	-	-	100*
Streptococcus pneumoniae (c)	6*	100*(c)	-	-	100*(c)	100*	-	-	-	-	50*	100*	-	-	83*	83*	100*
Cost per day ($)		$	$	$	$	$	$	$	$	$$	$	$-$$	$	$	$-$$	$	$

CANDIDA SP. **Jan 2010-Dec 2021 - isolated from blood cultures** (% Susceptibility)	**# blood isolates tested**	Fluconazole	Voriconazole (CR)	Echinocandins[a] -Micafungin preferred echinocandin (CR)	Amphotericin B[b] -Ambisome preferred liposomal (R)
C. albicans	24*	96 (SDD 4)*	96*	100*	100*
C. glabrata	35	11 (SDD 89)*	88	97	100*
C. krusei	2*	-	100*	50*	100*
C. parapsilosis	8*	75 (SDD12)*	88 (SDD12)*	100*	100*
C. tropicalis	4*	75*	67*	100*	100*
Cost per day ($)		$	$-$$	$$	$$$$

FOOTNOTES

*** Fewer than 30 isolates were tested. Due to the small number of isolates tested, results may be statistically unreliable (i.e. interpret with caution).**

(a) Test for Enterococcal high-level resistance to aminoglycosides (AGs), gentamicin (MIC 500 mcg/mL) and streptomycin (MIC 2000 mcg/mL): S: synergy with beta-lactams likely, R: synergy with beta-lactams unlikely.

(b) Rifampin should NOT be used as monotherapy for treatment of Staphylococcal infections.

(c) % susceptibility for S.pneumoniae- non-meningitis: penicillin 100% (5/5), ceftriaxone 100% (5/5); meningitis: penicillin 80% (4/5), ceftriaxone 100% (5/5).

(d) Daptomycin was only tested against 10 E.faecium isolates; 6 were vancomycin-resistant Enterococcus isolates.

(CR) Criteria restricted. levofloxacin for community-acquired pneumonia if severe beta lactam allergy, epididymitis; micafungin for blood culture positive for yeast pending speciation; voriconazole for Aspergillus prophylaxis for high risk patients (AML, post all-HCT on chronic GVHD immunosuppression); post-lung/solid organ transplant Candida/Aspergillus prophylaxis per transplant center. Use for other indications requires ID approval.

(R) Restricted. Use of these agents requires Infectious Diseases (ID) approval.

~ % inducible clindamycin resistance: MRSA 12%; MSSA 16%, Streptococcus agalactiae 6%

SDD Susceptible dose-dependent (higher dose necessary)

a Micafungin is the preferred echinocandin at VAPAHCS. While caspofungin / anidulafungin primarily tested, susceptibilities to all echinocandins may be extrapolated.

b Specific cut-offs not provided; in general, MIC ≥ 1 mcg/mL is usually considered resistant.

Cost per day ($): $ < 25; $$ 25-100; $$$ 100-200; $$$$ > 200

ANAEROBES **Jan 2019-Dec 2021** (% Susceptibility)	**# isolates tested** (a)	Penicillin	Piperacillin/ tazobactam	Meropenem (R)	Clindamycin	Metronidazole
Bacteroides fragilis	25*	-	91*	96*	52*	100*
Bacteroides sp. NOT fragilis (b)	30	-	55*	97*	14*	100*
Gram negative rods (other) (c)	30	45*	100*	100*	42*	100*
Clostridium perfringens	7*	100*	100*	100*	86*	100*
Clostridium sp. NOT perfringens (d)	5*	100*	100*	100*	40*	100*
Gram positive rods (other) (e)	5*	100*	100*	100*	100*	-
Cost per day ($)		$	$	$	$	$

FOOTNOTES

*** Fewer than 30 isolates were tested. Due to the small number of isolates tested, results may be statistically unreliable (i.e. interpret with caution).**

(a) Not all isolates tested for susceptibility (0 gram positive cocci were tested for susceptibilities. e.g., Anaerococcus, Peptoniphilus, Peptostreptococcus)

(b) Includes 2 B. caccae, 4 B. ovatus, 18 B.thetaiotaomicron, 5 B. uniformis, 1 B. vulgatus

(c) Includes 8 Fusobacterium (7 nucleatum, 1 spp), 22 Prevotella (3 P. bivia, 1 P. buccae, 2 P. denticola, 5 P. disiens, 3 P. intermedia, 2 P. melaninogenica, 2 P. oralis, 4 spp)

(d) Includes 1 C. ramosum, 1 C. septicum, 3 C. sporogenes

(e) Includes 5 Cutibacterium acnes (0 Actinomyces, Bifidobacterium, Lactobacillus, etc.)

(R) Restricted. Use of these agents requires Infectious Diseases (ID) approval.

Cost per day ($): $ < 25; $$ 25-100; $$$ 100-200; $$$$ > 200

VAPAHCS Fluoroquinolone Alternatives

Note: Use of fluoroquinolones is associated with increased risk of C.difficile infection/gram negative resistance/MRSA, with multiple potential adverse effects (e.g. QTc prolongation, peripheral neuropathy, tendon inflammation/ rupture, mental health side effects, hypoglycemia, aortic aneurysm/ dissection), which may be disabling and potentially permanent.

FDA alerts 5/2016, 7/2016, 7/2018, and 12/2018 advise against use of fluoroquinolones if there are alternative treatment options

Fluoroquinolone	Common Indications	Potential Oral Alternatives*	Comments
Ciprofloxacin *ID Criteria Restricted*	▪ UTI ▪ Intra-abdominal infection (with metronidazole) ▪ Nosocomial pneumonia (double *Pseudomonas* coverage) ▪ Spontaneous bacterial peritonitis (SBP) prophylaxis	*UTI*: nitrofurantoin; TMP/SMX; cephalexin; cefpodoxime *SBP prophylaxis*: cefpodoxime; TMP/SMX	Not reliable against gram positive organisms (*Streptococcus pneumoniae, Staphylococcus spp)*; No anaerobic activity
Levofloxacin *ID Criteria Restricted*	▪ CAP / Nosocomial pneumonia (double *Pseudomonas* coverage) ▪ Rhinosinusitis ▪ COPD exacerbation ▪ UTI	*CAP, sinusitis*: oral beta-lactam‡ + azithromycin or doxycycline *COPD*: amoxicillin/clavulanate; azithromycin; doxycycline *UTI*: nitrofurantoin; TMP/SMX; cephalexin; cefpodoxime	No anaerobic activity
Moxifloxacin *ID Restricted*	▪ CAP ▪ Rhinosinusitis ▪ COPD exacerbation ▪ Intra-abdominal infection (caution: incr anaerobe resistance)	*CAP, sinusitis*: oral beta-lactam‡ + azithromycin or doxycycline *COPD*: amoxicillin/clavulanate; azithromycin; doxycycline *Intra-abdom*: cefpodoxime + metronidazole; amoxicillin/clav	Not recommended in UTI treatment No *Pseudomonas* activity Limited anaerobic activity

KEY: *Consider susceptibility data and need for renal dose adjustments; UTI - Urinary tract infection; TMP/SMX - trimethoprim/sulfamethoxazole; CAP - Community-acquired pneumonia; COPD – Chronic obstructive pulmonary disease; ‡According to IDSA guidelines for CAP and rhinosinusitis, **preferred** oral beta-lactam agents are high dose **amoxicillin** (1g PO TID) or Augmentin XR (nonformulary 2g/125mg PO BID). **Cefpodoxime** (200mg PO BID) is also an **alternative** option.

4/2014, Updated 2022