Bellin Health 2016 Antibiogram

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Bellin Health Systems Antibiogram

Note that this is NOT the same as the annually distributed antibiogram. Data includes ALL isolates in the Bellin System, please see page 4 for the annually distributed Bellin Hospital antibiogram.

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo (Drug/Bug).

ORGANISM	# Isolates	Ampicillin/amoxicillin	Ampicillin/Sulbactam	Cefazolin	Ceftazidime	Ceftriaxone	Cefepime	Ciprofloxacin	Clindamycin	Gentamicin	Nitrofurantoin*	Oxacillin	Penicillin	Piperacillin/Tazobactam	Tobramycin	Trimethoprim/sulfamethox.	Vancomycin
Gram negative																	
Acinetobacter baumannii	11		100		64		100	100		100					100	100	
Citrobacter freundii	99			0	91	93	100	90		95	95			92	96	83	
Enterobacter cloacae	164			0	88	87	100	99		99	27			87	99	94	
Escherichia coli	3413	60	67	89	96	96	97	82		94	97			97	95	82	
Klebsiella oxytoca	103	0	39	51	95	95	95	99		98	86			90	98	97	
Klebsiella pneumoniae	691	0	86	94	97	98	98	98		99	37			97	99	91	
Proteus mirabilis	270	83	90	86	98	98	99	81		94	0			100	94	81	
Pseudomonas aeruginosa	262				91	94		79						93	99		
Serratia marcescens	41			0	98	90	98	83		98	0				80	93	
Stenotrophomonas maltophilia	8															88	
Gram positive																	
Streptococcus pneumoniae	13					100						100	100			69	100
Enterococcus faecalis	325	100									99						98
Staphylococcus aureus	930							71	73		99	69				99	100
Staphylococcus coagulase neg.	199							57	70			45				65	98

*(Data for this antibiotic applies to urinary tract isolates only.)

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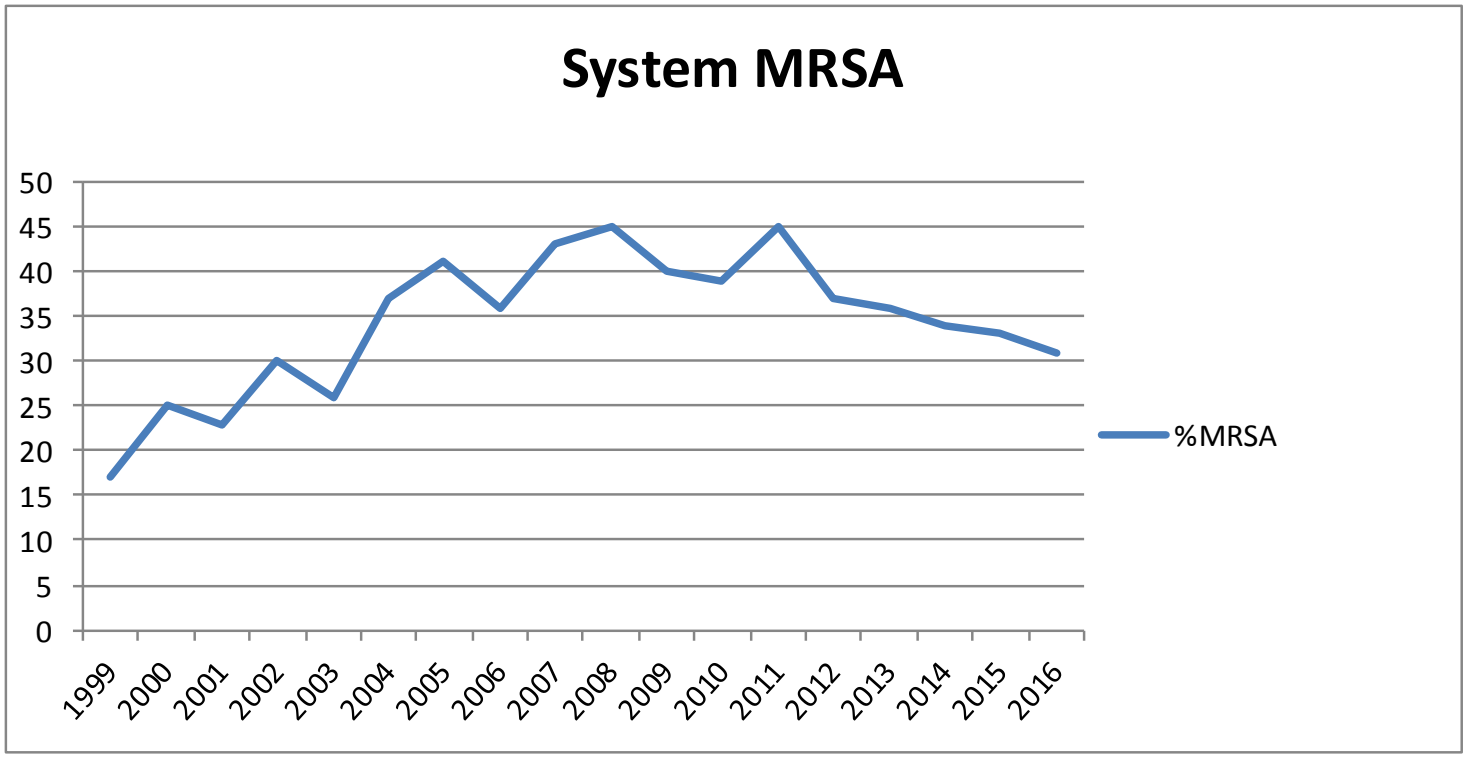
Bellin Health Systems MRSA Percentage

The acronym MRSA stands for Methicillin-Resistant *Staphylococcus aureus.*

This data is compiled from isolates identified in culture only, excluding nucleic acid amplification testing (NAAT) performed on nasal pre-surgical screens and skin/soft tissue infections.

Note that this is NOT the same as the annually distributed MRSA graph. Data includes ALL isolates in the Bellin System.

YEAR	%MRSA
1999	17
2000	25
2001	23
2002	30
2003	26
2004	37
2005	41
2006	36
2007	43
2008	45
2009	40
2010	39
2011	45
2012	37
2013	36
2014	34
2015	33
2016	31



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Bellin Hospital Antibiogram

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo (Drug/Bug).

ORGANISM	# Isolates	Ampicillin/amoxicillin	Ampicillin/Sulbactam	Cefazolin	Ceftazidime	Ceftriaxone	Cefepime	Ciprofloxacin	Clindamycin	Gentamicin	Nitrofurantoin*	Oxacillin	Penicillin	Piperacillin/Tazobactam	Tobramycin	Trimethoprim/sulfamethox.	Vancomycin
Gram negative																	
Citrobacter freundii	45			0	82	87	100	84		93	98			87	93	80	
Enterobacter cloacae	95			0	89	89	100	98		99	29			91	99	92	
Escherichia coli	1316	56	65	86	94	94	96	78		92	96			97	94	80	
Klebsiella oxytoca	62	0	35	48	95	95	95	98		98	81			87	98	97	
Klebsiella pneumoniae	325	0	87	94	98	98	98	98		100	39			98	100	94	
Proteus mirabilis	135	81	91	84	99	98	99	73		93	0			100	93	77	
Pseudomonas aeruginosa	163				90		95	81						92	98		
Gram positive																	
Streptococcus pneumoniae	9					100						100	100			67	100
Enterococcus faecalis	191	100									99						98
Staphylococcus aureus	439							67	72		99	66				99	100
Staphylococcus coagulase neg.	115							49	68			40				68	97

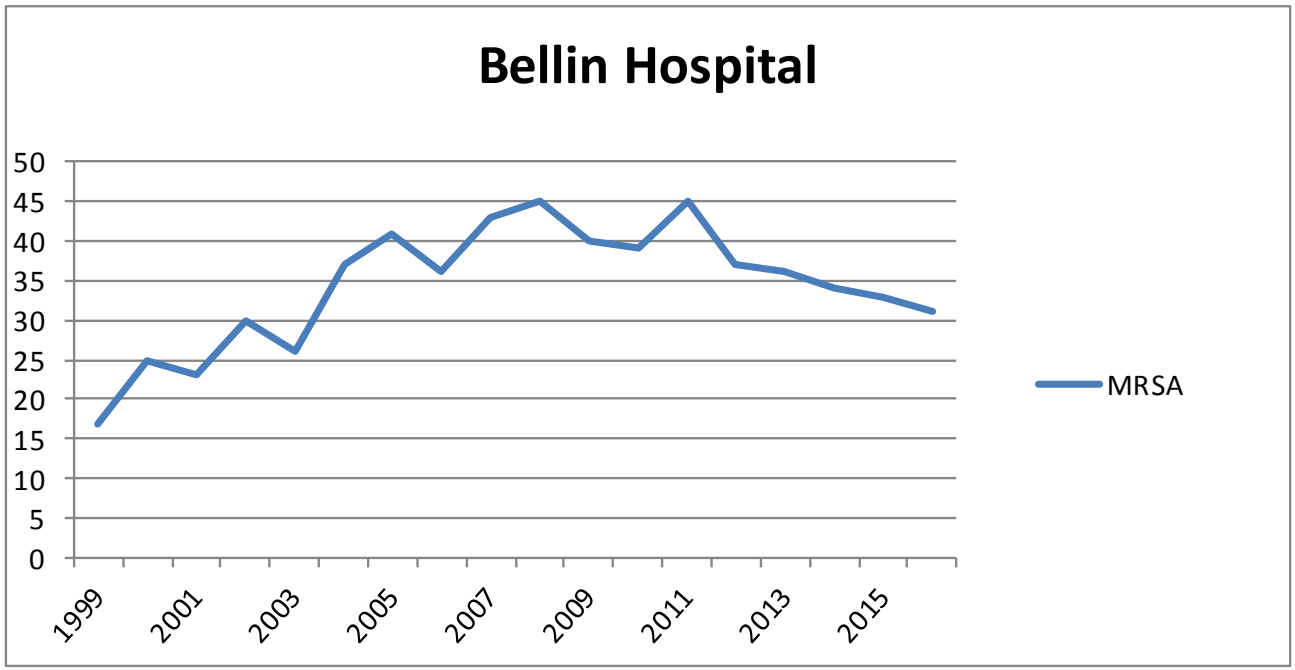
*(Data for this antibiotic applies to urinary tract isolates only.)

Bellin Hospital MRSA Isolates

The acronym MRSA stands for Methicillin-Resistant *Staphylococcus aureus.*

This data is compiled from isolates identified in culture only, excluding nucleic acid amplification testing (NAAT) performed on nasal pre-surgical screens and skin/soft tissue infections.

YEAR	%Methicillin-Resistant Staphylococcus aureus
1999	17
2000	25
2001	23
2002	30
2003	26
2004	37
2005	41
2006	36
2007	43
2008	45
2009	40
2010	39
2011	45
2012	37
2013	36
2014	34
2015	33
2016	31



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Bellin Hospital – Gram Negative Organisms

Medical, Surgical & Cardiac Unit

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo.
Note that some organisms were isolated fewer than 10 times, this may skew susceptibility percentages.

Medical, Surgical & Cardiac Unit Gram Negative	# Isolates	Ampicillin	Amp/Sulbactam	Cefazolin	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Nitrofurantoin*	Pip/Tazo	Tobramycin	TMX
All Sources												
Enterobacter cloacae	14			0	93	93	100	100	29	100	100	100
Escherichia coli	68	60	65	84	96	96	78	93	97	96	93	87
Klebsiella pneumoniae	23	0	91	96	100	100	100	100	39	100	100	100
Proteus mirabilis	6	67	100	67	83	83	83	100	0	100	100	100
Pseudomonas aeruginosa	21				86		81			90	100	
Serratia marcescens	4				100	100	100	100			50	100
Urine												
Escherichia coli	33	64	73	88	97	97	82	94	97	97	97	90
Klebsiella pneumoniae	10	0	100	100	100	100	100	100	20	100	100	100
Pseudomonas aeruginosa	3				67		67			67	100	
Blood												
Escherichia coli	5	40	40	80	100	100	60	100		75	100	50
Superficial Wound												
Escherichia coli	25	56	56	76	92	92	72	88		92	84	84
Enterobacter cloacae	11			0	100	100	100	100		100	100	100
Klebsiella pneumoniae	8	0	88	100	100	100	100	100		100	100	100
Pseudomonas aeruginosa	14				93		79			100	100	

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Bellin Hospital – Gram Positive Organisms

Medical, Surgical & Cardiac Unit

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo.
Note that some organisms were isolated fewer than 10 times, this may skew susceptibility percentages.

Medical, Surgical, & Cardiac Unit Gram Positive Organisms		Ampicillin	Ceftriaxone	Ciprofloxacin	Clindamycin	Nitrofurantoin	Oxacillin	Penicillin	TMX	Vancomycin
All Sources	# Isolates									
Enterococcus faecalis	45	100				100				100
Staphylococcus aureus	110			72	74	100	70		99	100
Staphylococcus coag neg	22			50	64	100	32		50	100
Urine										
Enterococcus faecalis	11	100				100				100
Staphylococcus coag neg	10			60		100			50	100
Blood/Sterile Fluids										
Staphylococcus aureus	17			65	59		59		100	100
Staphylococcus coag neg	4			25	50		25		100	100
Superficial Wound										
Staphylococcus aureus	82			74	78		71		99	100

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Bellin Hospital – Gram Negative Organisms

Intensive Care Unit

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo.
Note that some organisms were isolated fewer than 10 times, this may skew susceptibility percentages.

Intensive Care Unit Gram Negative Organisms	# Isolates	Ampicillin	Amp/Sulbactam	Cefazolin	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Nitrofurantoin*	Pip/Tazo	Tobramycin	TMX
All Sources												
Escherichia coli	18	61	67	89	94	94	72	89	100	94	94	78
Klebsiella pneumoniae	8*	0	75	100	100	100	100	100	38	100	100	100
Pseudomonas aeruginosa	4*				100		75			100	100	
Steno. maltophilia	3											100
Urine												
Escherichia coli	6	83	83	100	100	100	67	83	100	100	100	67
Blood/Sterile Fluids												
Escherichia coli	6	67	67	100	100	100	83	83		83	83	67
Respiratory												
Klebsiella pneumoniae	2	0	50	100	100	100	100	100		100	100	100
Pseudomonas aeruginosa	2				100		100			100	100	
Superficial Wound												
Escherichia coli	3	67	100	67	100	100	100	100		100	100	100

* Data for these organisms taken over an 18 month period

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Bellin Hospital – Gram Positive Organsims

Intensive Care Unit

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo.
Note that some organisms were isolated fewer than 10 times, this may skew susceptibility percentages.

Intensive Care Unit Gram Positive Organisms		Ampicillin	Ceftriaxone	Ciprofloxacin	Clindamycin	Nitrofurantoin	Oxacillin	Penicillin	TMX	Vancomycin
All Sources	# Isolates									
Enterococcus faecalis	5*	100				100				100
Enterococcus faecium	3*	67				33				67
Staphylococcus aureus	13			77	69	100	77		100	100
Staphylococcus coag neg	7			0	17	100	0		50	100
Blood/Sterile Fluids										
Staphylococcus aureus	4			100	100		100		100	100
Staphylococcus coag neg	4			0	25		0		0	100
Respiratory										
Staphylococcus aureus	6			50	33		50		100	100
Superficial Wound										
Staphylococcus aureus	2			100	100		100		100	100

* Data for these organisms taken over an 18 month period

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Bellin Hospital – Gram Negative Organisms – Emergency Department

Note that some organisms were isolated fewer than 10 times, this may skew Susceptibility percentages.

BMH - Emergency and Clinical Decision Unit Gram Negative Organisms	# Isolates	Ampicillin	Amp/Sulbactam	Cefazolin	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Nitrofurantoin*	Pip/Tazo	Tobramycin	TMX
All Sources												
Acinetobacter baumannii	4*		100		50		100				100	100
Citrobacter freundii	17			0	65	76	82	94	100	82	94	82
Citrobacter koseri	10*			100	100	100	100	100	100	100	100	100
Enterobacter aerogenes	12			0	83	83	100	100	8	83	100	100
Enterobacter cloacae	27			0	89	89	100	100	37	85	100	93
Escherichia coli	667	54	63	86	94	94	83	92	97	96	94	80
Haemophilus influenzae	2	50				100						0
Klebsiella oxytoca	23	0	43	57	100	100	96	100	87	96	100	96
Klebsiella pneumoniae	140	0	85	94	98	98	97	99	39	97	99	90
Proteus mirabilis	42	83	90	88	98	98	81	93	0	100	95	86
Pseudomonas aeruginosa	56				89		77			89	100	
Serratia marcescens	5*				100	100	100	100	0		80	100
Urine												
Citrobacter freundii	14			0	57	71	79	93	100	79	93	79
Enterobacter aerogenes	12			0	83	83	100	100	8	83	100	100
Enterobacter cloacae	17			0	88	88	100	100	41	82	100	88
Escherichia coli	596	55	64	86	94	94	84	92	84	96	95	80
Klebsiella oxytoca	17	0	41	47	100	100	94	100	82	94	100	94
Klebsiella pneumoniae	123	0	85	93	98	98	98	99	39	97	99	89
Proteus mirabilis	34	79	88	85	97	97	79	91	0	100	94	85
Pseudomonas aeruginosa	39				87		72			87	100	
Blood												
Escherichia coli	59	54	59	83	90	90	80	88		98	90	80
Klebsiella pneumoniae	11	0	82	100	100	100	91	100		100	100	91
Pseudomonas aeruginosa	7				100		71			100	100	
Superficial Wound												
Escherichia coli	10	30	60	70	90	90	80	90		100	90	80
Klebsiella pneumoniae	5	0	100	80	100	100	100	100		100	100	100
Proteus mirabilis	5	100	100	100	100	100	80	100		100	100	80
Pseudomonas aeruginosa	8				88		100			88	100	

* Data for these organisms taken over an 18 month period

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Bellin Hospital – Gram Positive Organisms

Emergency Department

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo.
Note that some organisms were isolated fewer than 10 times, this may skew susceptibility percentages.

BMH - Emergency and Clinical Decision Unit Gram Positive Organisms	# Isolates	Ampicillin	Ceftriaxone	Ciprofloxacin	Clindamycin	Nitrofurantoin	Oxacillin	Penicillin	TMX	Vancomycin
All Sources										
Enterococcus faecalis	57	100				100				98
Staphylococcus aureus	150			62	73	99	62		99	100
Staphylococcus coag neg	33			61	79	100	55		85	94
Streptococcus pneumonia	6		100					100	67	100
Beta Strep A,B,C,G	34	100	100		66			100	95	100
Urine										
Enterococcus faecalis	46	100				100				100
Staphylococcus aureus	18			22		100	44		100	100
Staphylococcus coag neg	30			63		100	57		91	93
Blood/Sterile Fluids										
Enterococcus faecalis	6	100								100
Staphylococcus aureus	30			67	67		77		100	100
Streptococcus pneumonia	6		100					100	67	100
Beta Strep A,B,C,G	30	100	100		72			100	95	100
Superficial Wound										
Staphylococcus aureus	86			66	81		58		98	100

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OHMC Emergency Department

Data is presented in a percentage of isolates susceptible per the listed antibiotic and organism combo.
Note that some organisms were isolated fewer than 10 times, this may skew susceptibility percentages.

OHMC - Emergency Department Gram Negative Organisms

All Sources	# Isolates	Ampicillin	Amp/Sulbactam	Cefazolin	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Nitrofurantoin*	Pip/Tazo	Tobramycin	TMX
Escherichia coli	60	48	53	90	100	100	85	90	100	95	92	87
Klebsiella pneumoniae	8	0	63	75	75	88	100	88	38	100	88	75
Pseudomonas aeruginosa	3				100		100			100	100	
Serratia marcescens	2				100	100	100	100	0		100	100

OHMC - Emergency Department Gram Positive Organisms

All Sources	# Isolates	Ampicillin	Cefotaxime	Ceftriaxone	Clindamycin	Erythromycin	Nitrofurantoin	Oxacillin	Penicillin	TMX	Vancomycin
Staphylococcus aureus	18				83		100	67		100	100
Beta Strep A,B,C,G	2	100	100	100	100	100			100	100	100

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Bellin Hospital Antimicrobial Resistance Trend Chart

In an effort to observe the relationship between antibiotic usage and organism susceptibilities on a year to year basis, this "heat chart" was created by comparing year to year Bellin Hospital antibiogram susceptibilities. The numbers for each organism/antibiotic combo represent a calculated P-value. The P-value was considered statistically significant if $P \leq 0.05$ generating a 95% confidence level that the changes in drug/bug susceptibility profiles were not mere random chance.

Statistically significant shift towards resistance for drug/bug combo.

Statistically significant shift towards sensitive for drug/bug combo.

2016 Antimicrobial Resistance Heat Map

	Amp	Amp-Sul	Cefazolin	Ceftaz	Ceftriax	Cipro	Genta	Nitro	Pip-Tazo	Tobra	TMX
Citrobacter freundii				0.12	0.35	0.09	0.28	≤0.05	0.66	1	0.16
Escherichia coli	0.59	1	≤0.05	≤0.05	≤0.05	0.52	≤0.05	≤0.05	1	0.2	0.52
Enterobacter cloacae				0.23	0.23	0.17	0.32	0.54	0.1	0.32	0.36
Klebsiella oxytoca		≤0.05	≤0.05	0.11	0.11	0.31	0.31	0.89	0.22	0.11	0.74
Klebsiella pneumoniae		0.46	0.32	≤0.05	≤0.05	1	≤0.05	≤0.05	≤0.05	0.07	0.6
Proteus mirabilis	0.82	0.11	0.81	0.48	1	0.35	0.53		0.24	0.75	0.24
Pseudomonas aeruginosa				0.52		0.81			0.47	0.56	

	Amp	Ceftriax	Cipro	Clinda	Nitro	Ox	Pen	TMX	Vanco
Streptococcus pneumoniae		1				≤0.05	1	0.18	1
Etnerococcus faecalis	0.16				0.42				0.42
Staphylococcus aureus			≤0.05	0.71	≤0.05	0.49		0.18	≤0.05
Staphylococcus coag neg.			0.46	0.63		0.1		≤0.05	0.69

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Antibiotic Costs

Drug	Approx. acquisition Cost Per Dose	Usual Adult Daily Dose	
Ampicillin 1 gm	$11.32	1 gm IV / IM q 6 hrs.	
Amp/Sulbactam 1.5 gm	$2.73 per vial	1.5 gm IV q 6 hrs.	
Aztreonam 1 gm	$32.93	1 gm IV q 8 hrs.	*
Penicillin 2.5 mU	$5.23	2.5 mU IV q 4 hrs.	
Pip / Tazo 3.375 gm	$9.10	3.375 gm IV q 6 hrs.	*
Nafcillin 1 gm	$13.12	1 gm q IV 4-6 hrs.	
Nafcillin 2 gm	$24.46		
Cefazolin 1 gm	$3.46	1 gm IV / IM q 8 hrs.	
Cefazolin 2 gm	$6.95		
Cefepime 2 gm	$6.00		
Cefotetan 1 gm	$13.51	1-2 gm IV q 6-8 hrs.	
Ceftazidime 1 gm	$5.86	1 gm IV / IM q 8 hrs.	*
Ceftriaxone 1 gm	$4.35	1 gm IV / IM q 24 hrs.	
Ceftriaxone 2 gm	$7.50		
Ciprofloxacin 400 mg (IV)	$2.19		
Metronidazole 500 mg (IV)	$1.02		
Gentamicin 80 mg vial	$4.09	Dose varies depending on age, weight, renal function	*
Tobramycin 80 mg vial	$2.95	Dose varies depending on age, weight, renal function	*
Clindamycin 600 mg (IV)	$4.31	300-900 mg IV q 8 hrs.	
Meropenem 500 mg	$6.30		
Meropenem 1 gm	$11.06		
Vancomycin 1 gm	$7.31	1 gm IV q 12 hrs.	*
Vancomycin 125 mg capsules	$9.40		
Nitrofurantoin 100 mg capsules	$1.35	100 mg po bid	

***Dose may need to be adjusted in patients with renal impairment. Contact pharmacist for more information.**

Antimicrobials, Trade Names, & Route of Administration

Antimicrobials categorized by Beta-lactams and Non-beta-lactams.

Table 1. Beta-Lactams

Antimicrobial Class	Antimicrobial Subclass	Antimicrobial Generic Name	Trade Name	Route of Administration		
				Oral (PO)	IM	IV
Penicillins	Penicillin	Penicillin		X	X	X
	Aminopenicillin	Ampicillin	Omnipen	X	X	X
			Polycillin			
		Amoxicillin	Amoxil/Polymox	X		
	Ureidopenicillin	Piperacillin	Pipracil		X	X
	Carboxypenicillin	Ticarcillin	Ticar		X	X
		Carbenicillin	Geocillin	X	X	X
	Penicillinase-stable penicillins	Oxacillin	Prostaphlin	X	X	X
		Nafcillin	Unipen		X	X
		Methicillin		X	X	X
B-lactam/b-lactamase inhibitor combinations		Amoxicillin-clavulanic acid	Augmentin	X		
		Ampicillin-sulbactam	Unasyn			X
		Piperacillin-tazobactam	Zosyn			X
		Ticarcillin-clavulanic acid	Timentin			X
		Ceftazidime-avibactam	Avycaz			X
	Cephalosporin I	Cefazolin	Ancef		X	X
			Kefzol			
		Cephalothin				X
		Cephalexin	Keflex	X		

Cephems	Cephalosporin II	Cefuroxime	Zinacef	X	X	X
			Kefurox			
			Ceftin			
		Cefprozil	Cefzil	X		
	Cephalosporin III	Cefotaxime	Claforan		X	X
		Ceftazidime	Fortaz		X	X
		Ceftriaxone	Rocephin		X	X
		Cefdinir	Omnicef	X		
		Cefpodoxime		X		
	Cephalosporin IV	Cefepime	Maxipim		X	X
	Cephalosporins with anti-MRSA activity	Ceftaroline	Teflaro			X
		Ceftobiprole	Zeftera/Zevtera			X
	Cephamycin	Cefmetaxole				X
		Cefotetan			X	
		Cefoxitin	Mefoxin			X
Monobactams		Aztreonam	Azactam			X
Penems	Carbapenems	Ertapenem	Invanz		X	X
		Imipenem	Primaxin			X
		Meropenem	Merem			X
		Doripenem	Doribax		X	X

Table 2: Non-beta-lactams

Antimicrobial Class	Antimicrobial Subclass	Antimicrobial Generic Name	Trade Name	Route of Administration		
				Oral (PO)	IM	IV
Aminoglycosides		Amikacin	Amikin		X	X
		Gentamicin	Garamycin		X	X
		Tobramycin	Nebcin		X	X
		Streptomycin			X	X
		Kanamycin	Kantrex		X	X

Ansamycins		Rifampin	Rifadin	X		X
			Rimactane			
Folate pathway inhibitors		Trimethoprim	Proloprim	X		
			Trimpex			
		Trimethoprim-sulfamethoxazole	Bactrim	X		X
Fosfomycins		Fosfomycin		X		
Glycopeptides	Glcycopeptide	Vancomycin	Vanococin	X		X
Glycylcyclines		Tigecycline	Tygacil			X
Lincosamides		Clindamycin	Cleocin	X	X	X
Lipopeptides		Daptomycin	Cubicin			X
	Polymyxins	Colistin				X
		Polymyxin B				X
Macrolides		Azithromycin	Zithromax	X		X
		Erythromycin	Erythrocin	X		X
			Pediamycin			
			Ilotycin			
		Clarithromycin	Biaxin	X		
Nitrofurans		Nitrofurantoin	Macrobid	X		
			Macrodantin			
Nitroimidazoles		Metronidazole	Flagyl	X		X
Oxazolidinones		Linezolid	Zyvox	X		X
Phenicols		Chloramphenicol		X		X
Streptogramins		Quinupristin-dalfopristin	Synercid			X
Tetracyclines		Tetracycline		X		X
		Doxycycline	Vibramycin	X		
Quinolones	Quinolone	Nalidixic acid		X		
	Fluoroquinolone	Ciprofloxacin	Cipro	X		X
		Gatifloxacin	Tequin	X		X
		Gemifloxacin	Factive	X		
		Levofloxacin	Levaquin	X		X
		Norfloxacin		X		