

Supplemental Table 1: Organisms in cultures removed due to absence of susceptibility results

Organism	Frequency
<i>Candida albicans</i>	661
<i>Streptococcus</i>	404
<i>Candida glabrata</i>	261
<i>Citrobacter</i>	245
<i>Escherichia</i>	244
<i>Staphylococcus</i>	234
<i>Lactobacillus</i>	194
<i>Gardnerella vaginalis</i>	165
<i>Enterococcus</i>	160
<i>Klebsiella</i>	149
<i>Enterobacter</i>	147
<i>Yeast</i>	139
<i>Enterococcus species</i>	123
<i>Candida tropicalis</i>	97
<i>Pseudomonas</i>	77
<i>Candida parapsilosis</i>	45
<i>Candida krusei</i>	45
<i>Aerococcus species</i>	40
<i>Proteus</i>	37
<i>Pseudomonas aeruginosa</i>	35
<i>Diphtheroids</i>	34
<i>Escherichia coli</i>	30
<i>Candida kefyr</i>	18
<i>Enterococcus faecalis</i>	18
<i>Candida lusitanae</i>	17
Beta hemolytic <i>Streptococcus</i>	16

<i>Stenotrophomonas maltophilia</i>	13
<i>Klebsiella pneumoniae</i>	13
<i>Candida</i>	11
<i>Corynebacterium</i> species	10
Others (Each less than 10):	124

Supplemental Table 2: Cohort co-morbidities by antibiotic susceptibility

	All	Cefazolin		Cefepime		Ceftriaxone		Cipro		Pip Tazo	
		S	R	S	R	S	R	S	R	S	R
	n=6366	n=3100	n=3265	n=4110	n=2249	n=3575	n=2741	n=3064	n=3300	n=5219	n=1144
Hospital visits in past year											
Emergency department only											
0	5480 (86.1)	2669 (48.7)	2811 (51.2)	3529 (64.4)	1948 (35.6)	3082 (56.7)	2354 (43.3)	2641 (48.2)	2837 (51.8)	4495 (82.0)	984 (18.0)
1	630 (9.89)	308 (48.9)	321 (51.0)	417 (66.5)	210 (33.5)	350 (56.0)	275 (44.0)	309 (49.0)	321 (51.0)	508 (88.9)	120 (19.1)
>1	256 (4.04)	123 (48.1)	133 (52.0)	164 (64.3)	91 (35.7)	143 (56.1)	112 (43.9)	114 (44.5)	142 (55.5)	216 (84.4)	40 (15.6)
ED to inpatient admission											
0	4745 (74.5)	2524 (53.2)	2220 (46.8)	3230 (68.1)	1511 (31.8)	2855 (60.2)	1849 (39.0)	2445 (51.5)	2299 (48.5)	4042 (85.2)	701 (14.8)

Yes	991 (15.6)	307 (31.0)	684 (69.0)	485 (49.1)	502 (50.9)	378 (38.6)	602 (61.4)	285 (28.8)	705 (71.2)	702 (70.8)	289 (29.2)
No	5,375 (84.4)	2,793 (52.0)	2,581 (48.0)	3,625 (67.5)	1,747 (32.5)	3,197 (59.9)	2,139 (40.1)	2,779 (51.7)	2,595 (48.3)	4,517 (84.1)	855 (15.9)
Cephalosporin											
Yes	1,231 (19.3)	417 (33.9)	814 (66.1)	676 (55.0)	552 (45.0)	523 (42.8)	699 (57.2)	495 (40.2)	735 (59.8)	901 (73.2)	330 (26.8)
No	5,135 (80.7)	2,683 (52.3)	2,451 (47.7)	3,434 (66.9)	1,697 (33.1)	3,052 (59.9)	2,042 (40.1)	2,569 (50.0)	2,565 (50.0)	4,318 (84.1)	814 (15.9)
Penicillin											
Yes	829 (13.0)	255 (30.8)	574 (69.2)	444 (53.8)	382 (46.2)	330 (40.4)	486 (59.6)	299 (36.1)	529 (63.9)	559 (67.4)	270 (32.6)
No	5,537 (87.0)	2,845 (51.4)	2,691 (48.6)	3,666 (66.3)	1,867 (33.7)	3,245 (59.0)	2,255 (41.0)	2,765 (49.9)	2,771 (50.1)	4,660 (84.2)	874 (15.8)
Carbapenem											
Yes	258 (4.1)	62 (24.0)	196 (76.0)	117 (45.7)	139 (54.3)	77 (30.1)	179 (69.9)	78 (30.4)	179 (69.6)	149 (58.0)	108 (42.0)
No	6,108 (95.9)	3,038 (49.7)	3,069 (50.3)	3,993 (65.4)	2,110 (34.6)	3,498 (57.7)	2,562 (42.3)	2,986 (48.9)	3,121 (51.1)	5,070 (83.0)	1,036 (17.0)
Antimicrobial resistant organisms in past 6 months											
MDRO											
Yes	482 (7.6)	114 (23.7)	368 (76.3)	216 (45.0)	264 (55.0)	151 (31.5)	328 (68.5)	131 (27.2)	350 (72.8)	279 (58.0)	202 (42.0)
No	5,884 (92.4)	2,986 (50.8)	2,897 (49.2)	3,894 (66.2)	1,985 (33.8)	3,424 (58.7)	2,413 (41.3)	2,933 (49.9)	2,950 (50.1)	4,940 (84.0)	942 (16.0)
MRSA											
Yes	249 (3.9)	64 (25.7)	185 (74.3)	122 (49.2)	126 (50.8)	91 (36.8)	156 (63.2)	78 (31.5)	170 (68.5)	160 (64.3)	89 (35.7)

No	6,117 (96.1)	3,036 (49.6)	3,080 (50.4)	3,988 (65.3)	2,123 (34.7)	3,484 (57.4)	2,585 (42.6)	2,986 (48.8)	3,130 (51.2)	5,059 (82.7)	1,055 (17.3)
VRE											
Yes	207 (3.3)	49 (23.7)	158 (76.3)	93 (44.9)	114 (55.1)	60 (29.3)	145 (70.7)	55 (26.6)	152 (73.4)	113 (54.6)	94 (45.4)
No	6,159 (96.7)	3,051 (49.5)	3,107 (50.5)	4,017 (65.3)	2,135 (34.7)	3,515 (57.5)	2,596 (42.5)	3,009 (48.9)	3,148 (51.1)	5,106 (82.9)	1,050 (17.1)
Cephalosporin- resistant Klebsiella											
Yes	38 (0.6)									11 (28.9)	27 (71.1)
No	6,328 (99.4)									5,208 (82.3)	1,117 (17.7)
ESBL											
Yes	64 (1.0)	12 (18.8)	52 (81.2)	23 (35.9)	41 (64.1)	15 (23.4)	49 (76.6)			29 (45.3)	35 (54.7)
No	6,302 (99.0)	3,088 (49.0)	3,213 (51.0)	4,087 (64.9)	2,208 (35.1)	3,560 (56.9)	2,692 (43.1)			5,190 (82.4)	1,109 (17.6)
CRE											
Yes	16 (0.3)										
No	6,350 (99.7)										
MDR Acinetobacter											
Yes	38 (0.6)			17 (45.9)	20 (54.1)	11 (28.9)	27 (71.1)	9 (23.7)	29 (76.3)	22 (59.5)	15 (40.5)
No	6,328 (99.4)			4,093 (64.7)	2,229 (35.3)	3,564 (56.8)	2,714 (43.2)	3055 (48.3)	3271 (51.7)	5,197 (82.2)	1,129 (17.8)

Yes	640 (10.1)	197 (30.8)	443 (69.2)	342 (53.7)	295 (46.3)	257 (40.5)	378 (59.5)	183 (28.6)	456 (71.4)	408 (63.9)	230 (36.1)
No	5,726 (89.9)	2,903 (50.7)	2,822 (49.3)	3,768 (65.9)	1,954 (34.1)	3,318 (58.4)	2,363 (41.6)	2,881 (50.3)	2,844 (49.7)	4,811 (84.0)	914 (16.0)
Quinolone											
Yes	641 (10.1)	174 (27.1)	467 (72.9)	323 (50.6)	315 (49.4)	229 (35.9)	408 (64.1)	118 (18.4)	522 (81.6)	401 (62.8)	238 (37.2)
No	5,725 (89.9)	2,926 (51.1)	2,798 (48.9)	3,787 (66.2)	1,934 (33.8)	3,346 (58.9)	2,333 (41.1)	2,946 (51.5)	2,778 (48.5)	4,818 (84.2)	906 (15.8)
Cephalosporin											
Yes	725 (11.4)	157 (21.7)	568 (78.3)	327 (45.3)	395 (54.7)	232 (32.3)	487 (67.7)	190 (26.2)	534 (73.8)	441 (61.0)	282 (39.0)
No	5,641 (88.6)	2,943 (52.2)	2,697 (47.8)	3,783 (67.1)	1,854 (32.9)	3,343 (59.7)	2,254 (40.3)	2,874 (51.0)	2,766 (49.0)	4,778 (84.7)	862 (15.3)
Penicillin											
Yes	1,288 (20.2)	438 (34.0)	850 (66.0)	705 (54.9)	580 (45.1)	554 (43.4)	722 (56.6)	456 (35.4)	831 (64.6)	894 (69.5)	392 (30.5)
No	5,078 (79.8)	2,662 (52.4)	2,415 (47.6)	3,405 (67.1)	1,669 (32.9)	3,021 (59.9)	2,019 (40.1)	2,608 (51.4)	2,469 (48.6)	4,325 (85.2)	752 (14.8)
Carbapenem											
Yes	89 (1.4)	11 (12.4)	78 (87.6)	33 (37.5)	55 (62.5)	17 (19.1)	72 (80.9)	19 (21.3)	70 (78.7)	43 (48.9)	45 (51.1)
No	6,277 (98.6)	3,089 (49.2)	3,187 (50.8)	4,077 (65.0)	2,194 (35.0)	3,558 (57.1)	2,669 (42.9)	3,045 (48.5)	3,230 (51.5)	5,176 (82.5)	1,099 (17.5)
Documented medication allergies											
Penicillin											
Yes	1,284 (20.2)	617 (48.1)	667 (51.9)	807 (62.9)	477 (37.1)	710 (56.0)	557 (44.0)	555 (43.2)	729 (56.8)	1,065 (83.0)	218 (17.0)

No	5,082 (79.8)	2,483 (48.9)	2,598 (51.1)	3,303 (65.1)	1,772 (34.9)	2,865 (56.7)	2,184 (43.3)	2,509 (49.4)	2,571 (50.6)	4,154 (81.8)	926 (18.2)
Carbapenem											
Yes	21 (0.3)			11 (52.4)	10 (47.6)					11 (52.4)	10 (47.6)
No	6,345 (99.7)			4,099 (64.7)	2,239 (35.3)					5,208 (82.1)	1,134 (17.9)
Quinolone											
Yes	455 (7.1)	158 (34.7)	297 (65.3)	257 (56.6)	197 (43.4)	201 (44.5)	251 (55.5)	211 (46.4)	244 (53.6)	363 (80.0)	91 (20.0)
No	5,911 (92.9)	2,942 (49.8)	2,968 (50.2)	3,853 (65.2)	2,052 (34.8)	3,374 (57.5)	2,490 (42.5)	2,853 (48.3)	3,056 (51.7)	4,856 (82.2)	1,053 (17.8)
Sulfonamide											
Yes	869 (13.7)	389 (44.8)	480 (55.2)	550 (63.5)	316 (36.5)	471 (54.6)	391 (45.4)	394 (45.4)	474 (54.6)	716 (82.5)	152 (17.5)
No	5,497 (86.3)	2,711 (49.3)	2,785 (50.7)	3,560 (64.8)	1,933 (35.2)	3,104 (56.9)	2,350 (43.1)	2,670 (48.6)	2,826 (51.4)	4,503 (81.9)	992 (18.1)
Cephalosporin											
Yes	325 (5.1)	130 (40.0)	195 (60.0)	196 (60.3)	129 (39.7)	159 (49.4)	163 (50.6)	126 (38.8)	199 (61.2)	253 (77.8)	72 (22.2)
No	6,041 (94.9)	2,970 (49.2)	3,070 (50.8)	3,914 (64.9)	2,120 (35.1)	3,416 (57.0)	2,578 (43.0)	2,938 (48.7)	3,101 (51.3)	4,966 (82.2)	1,072 (17.8)
Glycopeptide											
Yes	157 (2.5)	57 (36.3)	100 (63.7)	84 (53.5)	73 (46.5)	74 (47.4)	82 (52.6)	57 (36.3)	100 (63.7)	120 (76.4)	37 (23.6)
No	6,209 (97.5)	3,043 (49.0)	3,165 (51.0)	4,026 (64.9)	2,176 (35.1)	3,501 (56.8)	2,659 (43.2)	3,007 (48.4)	3,200 (51.6)	5,099 (82.2)	1,107 (17.8)
Aminoglycoside											
Yes	29 (0.5)			21 (72.4)	8 (27.6)	17 (58.6)	12 (41.4)	16 (55.2)	13 (44.8)		

No	6,337 (99.5)			4,089 (64.6)	2,241 (35.4)	3,558 (56.6)	2,729 (43.4)	3,048 (48.1)	3,287 (51.9)		
Metronidazole											
Yes	47 (0.7)	24 (51.1)	23 (48.9)	32 (68.1)	15 (31.9)	27 (57.4)	20 (42.6)	25 (53.2)	22 (46.8)		
No	6,319 (99.3)	3,076 (48.7)	3,242 (51.3)	4,078 (64.6)	2,234 (35.4)	3,548 (56.6)	2,721 (43.4)	3,039 (48.1)	3,278 (51.9)		

*factors with cells with n<10, that were not included in models are not shown

Supplemental Table 3: Major Rules used to fill in Unreported Susceptibilities for relevant antibiotics

Rule	Number of Cells Filled
ceftriaxone resistant implies resistant to cefazolin	2409
<i>Enterococcaceae</i> are resistant to cefepime	2255
<i>Enterococcaceae</i> are resistant to ceftriaxone	2255
<i>Enterococcaceae</i> are resistant to ciprofloxacin	2237
<i>Enterobacteriaceae</i> which are ampicillin + sulbactam sensitive are also sensitive to piperacillin + tazobactam	2080
<i>Enterococcaceae</i> which are ampicillin sensitive are also sensitive to piperacillin + tazobactam	1780
cefazolin sensitive implies sensitive to ceftriaxone	1045
<i>Pseudomonas aeruginosa</i> are resistant to cefazolin	665
<i>Pseudomonas aeruginosa</i> are resistant to ceftriaxone	599
<i>Staphylococcaceae</i> are resistant to ciprofloxacin	569
<i>Enterococcaceae</i> which are ampicillin resistant are also resistant to piperacillin + tazobactam	475
<i>Staphylococcaceae</i> which are cefazolin resistant are also resistant to cefepime	363
doripenem resistant implies resistant to ceftriaxone	348
<i>Streptococcaceae</i> are sensitive to piperacillin + tazobactam	243
<i>Streptococcaceae</i> are sensitive to cefazolin	243
<i>Streptococcaceae</i> are sensitive to cefepime	241
<i>Streptococcaceae</i> are sensitive to ceftriaxone	241
<i>Staphylococcus aureus</i> (methicillin resistant) are resistant to beta-lactam	208

<i>Enterobacter cloacae</i> are resistant to cefazolin	207
<i>Staphylococcus</i> which are nafcillin sensitive are also sensitive to cefepime	204
<i>Staphylococcaceae</i> which are nafcillin resistant are also resistant to beta-lactam	201
<i>Citrobacter</i> are resistant to cefazolin	148
Group b streptococcus are resistant to ciprofloxacin	144
<i>Staphylococcaceae</i> which are cefazolin sensitive are also sensitive to piperacillin + tazobactam	119
Doripenem resistant implies resistant to ceftriaxone	104

Supplemental Table 4: Frequency of Organisms in final dataset

Organism	Frequency
<i>Escherichia coli</i>	3515
<i>Enterococcus faecalis</i>	1720
<i>Klebsiella pneumoniae</i>	1209
<i>Pseudomonas aeruginosa</i>	665
<i>Enterococcus faecium</i>	495
<i>Proteus mirabilis</i>	433
<i>Enterobacter cloacae</i>	240
<i>Staphylococcus epidermidis</i>	213
Methicillin resistant <i>Staphylococcus aureus</i>	208
<i>Klebsiella oxytoca</i>	166
<i>Citrobacter freundii</i>	149
<i>Streptococcus agalactiae</i>	144
<i>Staphylococcus aureus</i>	119
<i>Morganella morganii</i>	109
<i>Aerococcus urinae</i>	96

<i>Enterobacter aerogenes</i>	85
<i>Serratia marcescens</i>	73
<i>Citrobacter koseri</i>	61
<i>Acinetobacter baumannii</i>	60
<i>Providencia stuartii</i>	49
<i>Stenotrophomonas maltophilia</i>	31
<i>Corynebacterium species</i>	29
<i>Providencia rettgeri</i>	27
<i>Citrobacter amalonaticus</i>	16
<i>Enterococcus avium</i>	16
<i>Proteus vulgaris</i>	16
<i>Pseudomonas fluorescens</i> group	12
<i>Staphylococcus haemolyticus</i>	12
Others (each less than 10)	126