

Concise Antibigram Toolkit

How to Enter Data Manually Into an Antibigram Template

Once you've printed your results from WHONET, you're ready to enter the percent (%) susceptibilities into the antibiogram template. This should be fairly straightforward, but there are a few things to note before you begin:

1. **Only include an organism in your antibiogram if it has been isolated from at least four patients:**

On the WHONET printout, note the "Number of patients" column (see red arrow in Figure 1). This column contains the number of patients who had cultures from which each organism was isolated at least once. The percent (%) susceptibilities for each organism are based on susceptibility results from the number of isolates noted in the "Number of patients" column. Some of these numbers may be quite low, which could give unreliable percent (%) susceptibilities. For example, in Figure 1 you can see there is a "2" in the "Number of patients" column next to "*Enterobacter cloacae*" (see blue arrow). This means the percent (%) susceptibilities for *E. cloacae* are only based on two isolates and, as you can see, will all be 0 percent, 50 percent, or 100 percent. These numbers are clearly not very helpful, as even one more isolate with a different susceptibility pattern could change the percent (%) susceptibilities significantly. We therefore recommend that you **only include an organism in your antibiogram if it has been isolated from at least four patients** (i.e., a "4" in the "Number of patients" column).

In general, including organisms with four isolates will increase the number of organisms in your antibiogram. However, this is still a fairly low number of isolates and should be interpreted with caution. Percent (%) susceptibilities based on four isolates should give you a general idea of how effective various antibiotics are against those organisms, but organisms with more isolates will likely produce more accurate results in which you can have greater confidence.

Additionally, a higher number of isolates implies that that organism is infecting more people in your facility. Therefore, you may decide to give more weight to the percent (%) susceptibilities for organisms with more isolates when selecting empiric antibiotics (while still taking into account factors like likelihood of an organism given infection site, individual infection history, etc.).



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Title: Figure 1. Top section of the WHONET percent (%) susceptibilities printout.

Headings: Number of patients, Organism

Description: This figure shows the top section of the WHONET percent (%) susceptibilities printout. The red arrow points out the “number of patients” column which contains the number of patients who had cultures from which each organism was isolated at least once. The percent (%) susceptibilities for each organism are based on susceptibility results from the number of isolates noted in the “number of patients” column, as indicated by the blue arrow. It is recommended that only organisms with at least four isolates be included in the antibiogram.

Org	Organism	Number of patients	AMP %S	AMP %S	SMN %S	ATH %S	CDO %S	PHI %S	CTX %S	CAZ %S	CRD %S	CHL %S	CIP %S
ec1	Enterobacter cloacae	2	100	0	0	0	50.0	0	0	0	0	0	50.0
eco	Escherichia coli	28	100	82.9	50.0	78.6	0	65.7	46.7	0	0	0	53.6
ent	Enterococcus sp.	17	0	70.6	0	0	0	0	0	0	0	0	0
kl-	Klebsiella sp.	10	0	0	60.0	0	50.0	0	0	50.0	50.0	0	70.0
pm1	Proteus mirabilis	21	100	76.2	0	100	85.7	0	100	75.0	100	100	52.4

Number of isolates = 79

Org	COL %S	CAP %S	IMP %S	GEN %S	ISM %S	LVM %S	LMS %S	MIP %S	NIT %S	TEP %S	QDR %S	RIP %S	SEE %S	TCY %S	TOC %S	TOB %S	ENT %S	VPM %S	AMK %S	Number	
ec1			50.0	50.0	100	50.0															1
eco	100		100	82.9	100	53.6			88.2	82.9				67.9	100		54.3				2
ent		100				36.8	83.3	50.0			100			82.4	27.3						17
kl-			90.0	90.0	100	60.0			33.3	90.0				80.0							10
pm1			100	100	100	57.1			0	90.5		100		0	100	100	81.0				21

2. **Only include percent (%) susceptibilities for antibiotics where at least 70 percent of the isolates were tested against that antibiotic:**

If you look toward the bottom of your printout (or scroll all the way to the right on the susceptibilities table in WHONET), you will see that after the percent (%) susceptibilities, numbers are listed for each organism under each antibiotic (e.g., “AMP Number,” “SAM Number,” etc.; see Figure 2). These numbers indicate the number of isolates of each organism that were tested against a given antibiotic. For a given organism, this could be any number from 0 (blank) up to the total number of isolates included (listed in the “Number of patients” column). Different isolates of an organism are not always tested for susceptibilities to the exact same antibiotics. For example, in Figure 1 above you can see a “28” next to *Escherichia coli* in the “Number of patients” column, indicating that this nursing home had 28 first isolates of *E. coli* contributing susceptibility data to their antibiogram. However, you can see in Figure 2 below that there is a “27” under the “IPM Number” column next to *E. coli* (abbreviated “eco;” see red arrow). This indicates that only 27 of the *E. coli* isolates were tested against imipenem.

Title: Figure 2. Lower section of the WHONET percent (%) susceptibilities printout.

Headings: Org, CAZ Number, IPM Number

Description: This figure shows the lower section of the WHONET percent (%) susceptibilities printout. The red and blue arrows in the figure note the number of isolates of each organism that were tested against a given antibiotic. For example, there is a “27” under the “IPM Number” column next to *E. coli* (abbreviated “eco;” see red arrow). This indicates that only 27 of the *E. coli* isolates were tested against imipenem.

Number of isolates = 73

Org	AMP Number	SAM Number	ATH Number	CEC Number	PEP Number	CTX Number	CAZ Number	CEO Number	CHE Number	CIP Number	COL Number	DAF Number	STP Number
ec1	2	2		2	2		4	2		2	1	15	2
eco	28	28		28	2		6	6		28	1		28
ent	17												
kl-	10	10		10	2		4	4		10			10
pm1	21	2	1	21		1	4	4	2	21	1		20

Number of isolates = 74

Org	GEN Number	IPM Number	LVX Number	LMZ Number	MEZ Number	NIT Number	TRP Number	QDA Number	RIF Number	STR Number	TCV Number	TCC Number	TOS Number
ec1	2	2	2				2				2	1	
eco	28	27	28			17	28				28	1	
ent	17		11	6	4	10		3		17	11		1
kl-	10	9	10			6	10				10		
pm1	21	2	21			12	21		2		21	1	1

Number of isolates = 73

Org	SET Number	VAN Number
ec1	2	
eco	29	
ent		17
kl-	10	
pm1	21	

Number of isolates = 73

Similar to how a low number of overall isolates may lead to unreliable or misleading data, a low number of an organism’s isolates tested against a given antibiotic may lead to an inaccurate interpretation of susceptibility patterns. For example, while 27 out of 28 *E. coli* isolates tested against imipenem likely gives a fairly accurate idea of the overall percent (%) susceptibility of *E. coli* to imipenem in a facility, imagine if only six of the isolates were tested against an antibiotic, as is the case with ceftazidime (abbreviated “CAZ” in Figure 2 above; see blue arrow). This makes it much harder to gauge *E. coli*’s actual overall percent (%) susceptibility to ceftazidime. Although you can see in Figure 1 that 66.7 percent (or 4/6) of the *E. coli* isolates tested were susceptible to ceftazidime, imagine all 22 of those not tested happened to be resistant. In this case, the apparent susceptibility of 66.7 percent would in reality be much lower (only 14.3%). Because of this uncertainty, we recommend you **only include percent (%) susceptibilities for antibiotics where at least 70 percent of the isolates were tested against that antibiotic**. So, in the example, percent (%) susceptibilities for antibiotics which about 20 or more isolates were tested against should be included in the antibiogram. Accordingly, ceftazidime would not be included in this nursing home’s antibiogram.

Taking these points into account, you can begin to enter the percent (%) susceptibilities from your WHONET printout into the cells of the antibiogram template. For each percent (%) susceptibility which you are going to include, find the cell in the template which corresponds to that organism and antibiotic and enter the value. A key for the antibiotic abbreviations is listed at the bottom of the printout (see Figure 3). Continue until all of the values are transferred from the WHONET printout (except those which don’t fit the above criteria, that is, too few total isolates or an insufficient proportion of isolates tested

against a given antibiotic). As you go along, color any empty cells grey to make the antibiogram easier to read. Also, fill in the “Number of patients” column for each organism based on the numbers from the corresponding column on the WHONET printout.

Title: Figure 3. WHONET Percent (%) Susceptibilities Printout

Headings: Organism, Number of patients

Description: This figure illustrates an example of the full printout of percent (%) susceptibilities using the WHONET software.

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Toolkit Test                                     Page 1
Organism = eco,ent,pmi,kl-,ecl                 3-May-2012 13:52

Data files = gshosp-nhcombined cultures for whonet-48h-enterococcus sp.tkt
One per patient -- First isolate only
Use expert interpretation rules
Number of isolates = 78
    
```

Org	Organism	Number of patients	AMK %S	AMP %S	SAM %S	ATM %S	CZO %S	FEP %S	CTX %S	CAZ %S	CRO %S	CHL %S	CIP %S
ecl	Enterobacter cloacae	2	100	0	0		0	50.0		0	0		50.0
eco	Escherichia coli	28	100	42.9	50.0		78.6	0		66.7	66.7		53.6
ent	Enterococcus sp.	17		70.6									
kl-	Klebsiella sp.	10	0	0	60.0		60.0	0		50.0	50.0		70.0
pmi	Proteus mirabilis	21	100	76.2	0	100	85.7		100	75.0	100	100	52.4

Number of isolates = 78

Org	COL %S	DAP %S	ETP %S	GEN %S	IPM %S	LVX %S	LNZ %S	MPX %S	NIT %S	TZP %S	QDA %S	RIF %S	STR %S	TCY %S	TGC %S	TOB %S	SXT %S	VAN %S	AMK Number
ecl			50.0	50.0	100	50.0				0				0	0		50.0		1
eco	100		100	92.9	100	53.6			88.2	92.9				67.9	100		64.3		2
ent		100		88.2		36.4	83.3	50.0	100		100		82.4	27.3				58.8	2
kl-			90.0	90.0	100	80.0			33.3	90.0				80.0			80.0		1
pmi	0		100	100	100	57.1			0	90.5		100		0	100	100	81.0		1

Number of isolates = 78

Org	AMP Number	SAM Number	ATM Number	CZO Number	FEP Number	CTX Number	CAZ Number	CRO Number	CHL Number	CIP Number	COL Number	DAP Number	ETP Number
ecl	2	2		2	2		2	2		2			2
eco	28	28		28	2		6	6		28	1		28
ent	17											15	
kl-	10	10		10	2		4	4		10			10
pmi	21	1	1	21		1	4	4	1	21	1		20

Number of isolates = 78

Org	GEN Number	IPM Number	LVX Number	LNZ Number	MPX Number	NIT Number	TZP Number	QDA Number	RIF Number	STR Number	TCY Number	TGC Number	TOB Number
ecl	2	2	2				2						1
eco	28	27	28			17	28					28	1
ent	17		11	6	4	10		3		17		11	
kl-	10	9	10			6	10					10	
pmi	21	2	21			12	21			1		21	1

Number of isolates = 78

Org	SXT Number	VAN Number
ecl	2	
eco	28	
ent		17
kl-	10	
pmi	21	

Number of isolates = 78

AMK	Amikacin	GEN	Gentamicin
AMC	Amoxicillin/Clavulanic acid	IPM	Imipenem
AMP	Ampicillin	LVX	Levofloxacin
SAM	Ampicillin/Sulbactam	LNZ	Linezolid
ATM	Aztreonam	MEM	Meropenem
CZO	Cefazolin	MET	Methicillin
FEP	Cefepime	MPX	Moxifloxacin
CTT	Cefotetan	NAF	Nafcillin
CTX	Cefotaxime	NIT	Nitrofurantoin
FOX	Cefoxitin	OXA	Oxacillin
CPR	Cefprozil	PEN	Penicillin G
CAZ	Ceftazidime	TZP	Piperacillin/Tazobactam
CRO	Ceftriaxone	POL	Polymixin B
CHL	Chloramphenicol	QDA	Quinupristin/Dalfopristin
CIP	Ciprofloxacin	RIF	Rifampin
CLI	Clindamycin	STR	Streptomycin
COL	Colistin	TCY	Tetracycline
DAP	Daptomycin	TIC	Ticarillin
DOX	Doxycycline	TGC	Tigecycline
ETP	Ertapenem	TOB	Tobramycin
ERY	Erythromycin	SXT	Trimethoprim/Sulfamethoxazole
GAT	Gatifloxacin	VAN	Vancocycin