

Concise Antibiogram Toolkit

Getting Started—Sources of Data

Once you decide that an antibiogram will be a useful tool for your facility, there are a few things to consider.

1. What will you need to create the antibiogram?
2. What data are needed to create an antibiogram?
3. How do you interpret your antibiogram?
4. How will the tool be implemented in your facility?
5. How often will the antibiogram be updated?

What will you need to create the antibiogram?

To create your facility's antibiogram, you will need some working knowledge of computers and a good understanding of culturing practices and infection control.

The resources included in this toolkit can be used with the 2007 (or later) Microsoft Office suite. The software recommended to create the antibiogram (WHONET) can be downloaded for free from the Internet at <http://www.who.int/drugresistance/whonetsoftware/en/>. It is important that you be able to use Microsoft Office and feel comfortable learning new software.

You will also need some knowledge of how the tool will be used in your facility. One factor to consider is whether the antibiogram will be used by physicians and health care workers in the entire facility or only by those on a certain floor or ward. This information may result in the decision to create separate antibiograms instead of one facility-wide tool. An infection control professional could be ideal for creating and maintaining your antibiogram as well as for teaching other personnel how to interpret the results.

What data are needed to create an antibiogram?

An antibiogram cannot be developed without specific information about your facility's microbiological cultures. You will need to access the results of the cultures, including those concerning antibiotic susceptibilities. You can potentially obtain these data from several different sources.

Potential Data Sources

Laboratory—electronic or paper based

The most convenient way to obtain data for your facility's antibiogram may be to contact the primary laboratory from which you obtain culture results. This laboratory may be independent or affiliated with another health care facility, such as a hospital. The laboratory that processes your cultures will have a record of the antibiotic susceptibility tests performed for each culture. You may be able to ask the laboratory for this information. Whether you receive this information in electronic or paper format will affect how you process the data further. If at all possible, try to obtain your data electronically, either in a spreadsheet or text file. Paper-based results will require that the data be manually entered into a spreadsheet before using WHONET (See Tool "How to



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Enter Data Manually Into an Antibiogram Template” and Tool “Antibiogram Data Entry Form”).

- Who do you ask for the data?

If you are not familiar with the staff of your primary laboratory, it can be difficult to determine how to best obtain the data for an antibiogram. You can contact the director of your primary laboratory. If you commonly use more than one facility, you may need to contact the director of each laboratory.

- What data do you request?

After you have identified who will be sending you the necessary data, you can ask for culture data specific to your facility and within the date range of interest. You can begin with data spanning a minimum of 6 months, but a period of 1 year is recommended. Request the following data elements from your contact:

- Culture ID number
- Patient ID number
- Patient name
- Culture date
- Culture source
- Culture results (organism(s))
- Antibiotic susceptibilities

If you will be adding elements to the laboratory data once you receive it, be sure to ask for the data in a spreadsheet format. You might want to add room numbers or other patient characteristics before converting the spreadsheet into a text file and importing the file into WHONET.

If the laboratory cannot send you this information electronically, ask if you can receive a printed report. As long as the data elements are present in the report, you can enter the information into a spreadsheet manually.

Resident medical charts

If you have difficulty obtaining the required data directly from your laboratory, you can review the charts of your residents and abstract the culture results by hand. You will want to record the culture information for every culture result in the timeframe of interest. If you have some record (e.g., billing or laboratory) of all of the cultures that were ordered during that timeframe, you should review all of the patient charts noted in that record. You will need the culture results for each culture that was ordered during your time period. If this information is located in individual charts, it may be easiest to photocopy the culture reports. You will then need to enter the information you collect into a spreadsheet before WHONET can be used. The information can be directly entered into a spreadsheet from the resident charts as well. A spreadsheet template is also available with the toolkit titled “Antibiogram Data Entry Form.” If you have to use this method, you may find it makes sense to collect this information prospectively or on a monthly basis. Then, after a period of 6 months to 1 year, you can create an antibiogram. You may also find it helpful to keep the culture reports in a binder in order of date.

How do you interpret your antibiogram?

Below is an example antibiogram that will be similar to how your facility's antibiogram may look.

Figure 1: Example Antibiogram

Gram (-)	# of patients	Aminoglycosides			B-Lactams			Cephalosporins				Quinolones		Others		
		Amikacin	Gentamicin	Tobramycin	Ampicillin	Impipnem	Piperacillin Tazobactam	Cefzolin	Cefoxitin	Ceftriaxone	Ceftazidime	Ciprofloxacin	Nitrofurantion	TMP/SMX		
Echerichia coli	4	100	100	100		100	100				100	75				
Klebsiella sp	13	100	84.6	92.3	38.5	100	92.3	84.6	100	100	100	38.5	92.3	38.5		
Proteus sp	7	71.4	57.1	71.4		85.7	85.7			57.1	57.1		28.6	71.4		
Pseudomonas aeruginosa	13	100	83.3	92.3	91.7		100		81.8	100	100	30.8		69.2		
Gram (-)	# of patients	Penicillins				Cephalosporins		Quinolones		Others						
		Penicillins	Ampicillin	Oxacillin	Nafcillin	Cephalothin	Ceftriaxone	Ciprofloxacin	Moxifloxacin	Gentamacin	Linezolid	Rifampin	Tetracycline	TMP/SMX	Vancomycin	Nitrofurantion
Staph aureus (all)	8	0		0	0			0	0	87.5	100	100	100	100	100	100
Methicillin Resistant (MRSA)	8	0		0	0				0	87.5	100	100	100	100	100	100
Methicillin Susceptible (MRSA)	0															
Enterococcus sp	4	100	100					50		75			25		100	100

The first column lists the organisms that were included, separated by Gram-positive and Gram-negative results. The second column shows the number of patients in your facility who had the organism and were included in the antibiogram. The tool only includes the first isolate per person, regardless of culture source within your timeframe. This ensures that each person contributes equally to the antibiogram. You may find that a resident is cultured multiple times in a year and his results consistently reveal *Staphylococcus aureus*. Only that person's first *Staphylococcus aureus* culture will be counted.

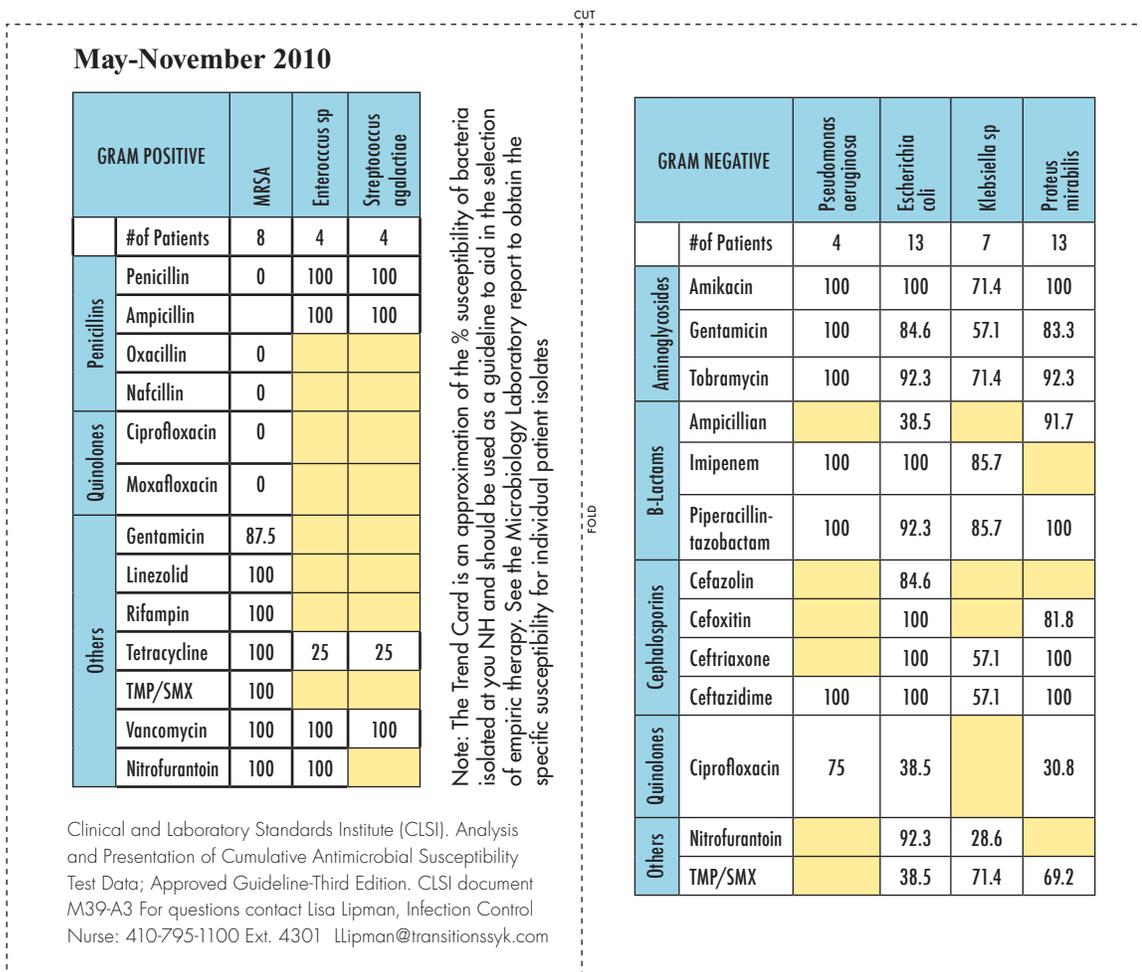
The remaining columns of the antibiogram are the antibiotics that were tested and the organisms' susceptibilities. For example, *Pseudomonas aeruginosa* was isolated in four people. It was tested against ciprofloxacin. Of the *Pseudomonas aeruginosa* cultures tested against ciprofloxacin, 75 percent were susceptible to the antibiotic.

The antibiogram should be used to guide empiric therapy and to monitor antibiotic susceptibility trends within your facility. Selection of empiric therapy in a particular patient should not be based solely on an antibiogram. A patient's particular infection history, including past antimicrobial use, must also be considered.

How will the tool be implemented in your facility?

Once your antibiogram has been created, you will need to decide how to distribute the results to the physicians and other health care providers at your facility. The distribution of the antibiogram should be accompanied with instructions for use and interpretation. Printing the antibiogram on 3x5 or 4x6 index cards is one option for distributing the tool to practitioners. Below is an example of formatting for a 3x5 card. Gram-positive bacteria appear on one side and Gram-negative bacteria are on the other side.

Figure 2: Example Antibiogram for Distribution to Providers



You may also choose to post the antibiogram in a central location for easy reference.

When it is time to implement your facility's antibiogram, take special care to communicate the strengths and limitations of your tool as discussed in the background. Seminars and in-person presentations of the antibiogram can be the most direct and effective format to distribute the tool and explain its implications. Face-to-face communication is imperative for answering questions as well. One presentation may be all that is needed for your facility; however, you may want to plan for more than one in order to make sure that everyone who will be using your antibiogram has the pertinent information.

One additional goal of the presentation(s) may be to encourage clinicians to order more cultures for suspected infections when prescribing empiric antibiotics, especially if confidence in the antibiogram data is low due to infrequent testing.

How often will the antibiogram be updated?

You can choose how often to update your facility's antibiogram. In general, hospital antibiograms are updated annually. This is the suggested timeframe if your staffing allows for someone to update your antibiogram and disseminate the information.

It is also important to keep in mind the frequency at which culturing occurs within your facility. If you have a small number of cultures represented in your antibiogram, updating your antibiogram once a year may be sufficient. Remember, an antibiogram may not highlight emerging infection outbreaks, but it can monitor trends in antibiotic susceptibilities.