

Trends in Antibiotic Sensitivity *

Zahidul Islam, MD, MPH

Introduction

Antibiotic resistance is an increasing problem. The ‘Antibiotic Sensitivity Active Surveillance System’ began in Louisiana with the collection of aggregate data in 2000 to track the emergence of antibiotic resistant organisms. This surveillance program, which allows the state to track and evaluate antibiotic resistance trends, monitors three pathogens: Drug resistant *Streptococcus pneumoniae* (DRSP), Methicillin resistant *Staphylococcus aureus* (MRSA) and Vancomycin resistant enterococcus (VRE). The primary goal of the surveillance system is to estimate the proportion of selected bacteria in the state that are resistant to antibiotics by the reporting of laboratory aggregate data.

Methods

Over the past three years, forty-three hospitals have been a part of the surveillance system at some point in time. Currently, twenty-seven hospitals provide information to the surveillance system each month on a brief reporting form. Each hospital reports the total number of *S. pneumoniae*, *S. aureus* and enterococcus species isolated in their lab for each month. In addition, they also report the total number of drug resistant or drug intermediate resistant isolates for each of those organisms. As duplicates are not

reported, the forms contain counts on one isolate of DRSP, MRSA, or VRE per patient per hospital visit. Each report is entered into an Access database and from this database, quarterly and annual summary reports are generated for the participating hospitals.

The purpose of this analysis is primarily to determine if the rates of antibiotic resistance for *S. pneumoniae*, *S. aureus* and enterococcus were significantly different over the four quarters in 2004 and secondarily to determine if there is a significant trend in the rates of antibiotic resistance for these organisms from 2000 to 2004. Since interest was in resistance as either present or not present, the resistance and intermediately resistant variables were combined to get one variable for resistance.

For each organism of interest, using the annual rates, a test for trend was conducted using the Cochran-Armitage Trend test. The analyses were conducted using SAS (Version 9.1; Cary, NC).

Results

The percentages of drug resistant *S. pneumoniae* vary from quarter to quarter. Such variations are commonly observed and are not important. The rates for Methicillin resistant *S. aureus* ranged from 59.78% to 62.24%. The percentages of Vancomycin resistant enterococcus (VRE) ranged from 6.42% to 8.09% in 2004. The results of the analysis of 2004 quarterly counts of antibiotic susceptible and resistant isolates can be seen in Table 1.

Table 1: Analysis of antibiotic resistance by quarter for *S. pneumoniae*, *S. aureus*, and Enterococcus species from the Louisiana Antibiotic Sensitivity Active Surveillance System, 2004

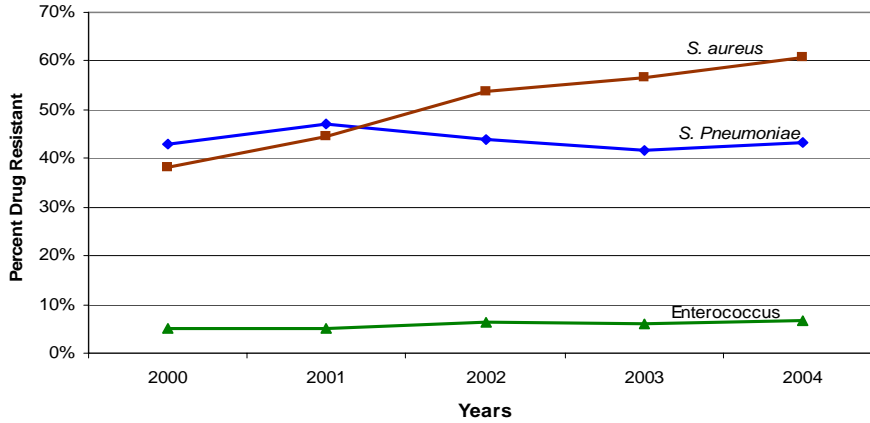
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
<i>S. Pneumoniae</i>	Resistant	122	84	76	89
	Susceptible	170	118	55	142
	% Resistant	41.78%	41.58%	58.07%	38.53%
<i>S. aureus</i>	Resistant	2045	2344	2781	2344
	Susceptible	1359	1577	1687	1557
	% Resistant	60.08%	59.78%	62.24%	60.09%
Enterococcus	Resistant	177	155	127	141
	Susceptible	2012	2014	1852	1868
	% Resistant	8.09%	7.15%	6.42%	7.02%

A trend analysis was conducted to determine if the rates of resistance were increasing over the past five years (2000, 2001, 2002, 2003 and 2004). The results can be seen in Table 2 and Figure 1.

Table 1: Trend analysis of resistance for *S. pneumoniae*, *S. aureus*, Enterococcus species Louisiana, 2000-2004

		2000	2001	2002	2003	2004	Z (C-A trend test)	p-value
<i>S. Pneumoniae</i>	Resistant	547	662	548	432	371	-0.9648	0.3346
	Susceptible	729	744	696	604	485		
	% Resistant	42.87%	47.08%	44.05%	41.70%	43.34%		
<i>S. aureus</i>	Resistant	4560	6682	9489	9711	9514	42.4123	<.0001
	Susceptible	7377	8347	8152	7425	6180		
	% Resistant	38.20%	44.46%	53.79%	56.67%	60.62%		
Enterococcus	Resistant	451	496	647	288	600	6.3074	<.0001
	Susceptible	8577	10013	9327	4446	8346		
	% Resistant	5.00%	4.95%	6.49%	6.08%	6.71%		

Figure 1: Percent Drug Resistant *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Enterococcus* Louisiana, 2000-2004



A Cochran-Armitage Trend test was calculated for each organism. The rates of drug resistant *S. pneumoniae* have not been increasing over the past five years (Z for trend = -0.9648, p=0.3346). The rates of methicillin-resistant *S. aureus* have increased from 2000 to 2004. These increases were highly significant (Z for trend = 42.4123, p<0.0001). Rates of Vancomycin resistant *Enterococcus* appeared to be significantly different over the past five years (Z for trend = 6.3074, p<0.0001). However, this may be attributed to underreporting in 2003 that was due to the change in VRE's case definition in September, 2002.

* Based on 'Trends in Antibiotic Sensitivity' pg 4 July-August 2004 Louisiana Morbidity Report Vol. 15, No.4