

Regional and Source Variations in Vancomycin-resistant Enterococci (VRE) Rates in US Hospitals 2015

Kullar R, PharmD, M.P.H.¹; Merchant S, PhD¹; Tabak YP, PhD²; DeRyke CA, PharmD ¹; Johannes RS, MD, MS^{2,3}; Sarpong EM, PhD¹; and Gupta V, PharmD, BCPS²

¹Merck & Co., Inc., Kenilworth, NJ USA; ²Becton, Dickinson & Company, Franklin Lakes, NJ USA; ³Harvard Medical School, Boston, MA USA

andrew.deryke@merck.com, vikas.gupta@bd.com

Abstract

Background: We sought to evaluate the regional differences on vancomycin-resistant enterococci (VRE) across blood, urine, and wound sources.

Methods: We analyzed an electronic research dataset of Becton, Dickinson & Company from 346 USA hospitals in 2015. All non-duplicate enterococci isolates (first isolate of a species per 30 day period) from blood, urine, and wound were categorized as VRE if confirmed as intermediate/resistant to vancomycin. Positive isolates were categorized by specimen collection location as: a) Ambulatory: if collected in non-inpatient setting; b) Inpatient: if collected during an inpatient stay. Geographic regions were classified into 10 NHSN categories.² Region 1, 7, and 8 were grouped into "Other" due to small numbers of hospitals. We conducted pairwise comparisons with Bonferroni correction (p<0.007) between regions within each clinical setting, using the region with the overall lowest VRE rate as the reference group.

Results: The overall VRE rate was 15.2% (19,650/129,407). The setting-specific VRE rates were 9.7% (7,116/73,732), and 22.5% (12,534/55,675) for ambulatory and inpatient, respectively. For regional differences in the ambulatory setting, all were significant when compared to Region 10, except for wound source Regions 5 and Other. For regional differences in the inpatient setting all were significant except for blood Regions 3, 4, and Other.

Conclusions: The VRE rate was more than twice as high in the inpatient setting as in ambulatory setting. The majority of regions showed significant differences within sources.

Introduction

- Enterococci currently represent the second most common pathogen isolated healthcare-associated infections (HAIs) in the USA, and are associated with high morbidity and mortality.¹⁻³ In particular, vancomycin resistant enterococci (VRE) infections, predominantly due to *Enterococcus faecium*, have been increasing in the United States.²
- Limited data exists evaluating the variability of VRE infection rates across both infection source and regions of the United States.

Purpose

We, therefore, sought to evaluate the regional differences on VRE across blood, urine, and wound sources.

Methods

- We analyzed an electronic research dataset of Becton, Dickinson & Company from 346 USA hospitals in 2015.
- All non-duplicate enterococci isolates (first isolate of a species per 30 day period) from blood, urine, and wound were categorized as VRE if confirmed as intermediate or resistant to vancomycin.
- Positive isolates were categorized by specimen collection location as:
 - Ambulatory: if collected in non-inpatient setting;
 - Inpatient: if collected during an inpatient stay.
- Geographic regions were classified into 10 National Healthcare Safety Network (NHSN) categories.² Region 1, 7, and 8 were grouped into "Other" due to small numbers of hospitals.
- We conducted pairwise comparisons with Bonferroni correction (p<0.007) between regions within each clinical setting, using the region with the overall lowest VRE rate as the reference group.

Results

- The overall VRE rate was 15.2% (19,650/129,407). The setting-specific VRE rates were 9.7% (7,116/73,732) and 22.5% (12,534/55,675) for ambulatory and inpatient, respectively.
- For regional differences in the ambulatory setting all were significant when compared to Region 10, except for ambulatory wounds Regions 4 and 5.
- For regional differences in the inpatient setting all were significant except for blood Regions 3, 4, and Other.

Limitations

- These data were collected from the laboratory information system feeds provided by participating hospitals and relied on interpretive results at each facility.
- These data were collected and analyzed from the perspective of unique non-duplicate collected cultures and not from the perspective of unique patients. The goal was to understand the volume and frequency of these organisms that were seen at the level of the hospital/microbiology laboratory across a large number of geographical diverse institutions.

Conclusions

The VRE rate was more than twice as high in the inpatient setting as in ambulatory setting. The majority of regions showed significant differences within and across sources.

Table 1: Hospital characteristics

Region	States	Hospital N (%)
2	NJ, NY, PR, VI	30 (8.7%)
3	DE, DC, MD, PA, VA, WV	13 (3.8%)
4	AL, FL, GA, KY, MS, NC, SC, TN	98 (28.3%)
5	IL, IN, MI, MN, OH, WI	85 (24.6%)
6	AR, LA, NM, OK, TX	59 (17.1%)
9	AZ, CA, HI, Pacific Islands	28 (8.1%)
10	AK, ID, OR, WA	22 (6.3%)
1, 7, 8*	Other	11 (3.1%)
Overall		346
Urban/Rural		
Urban		75.1%
Rural		24.9%
Medical School Affiliation		
Major		12.0%
Limited		17.3%
Graduate		4.7%
No Affiliation		66.1%
Bed size		
<100		24.6%
100-300		42.4%
>300		33.0%

* Regions were combined due to insufficient facility count within each individual region (CT, ME, MA, NH, RI, VT, IA, KS, MO, NE, CO, MT, ND, SD, UT, and WY).

Table 2: VRE rates for blood, urine, and wound by setting

Region (# of Hospitals)	% VRE Ambulatory			% VRE Inpatient		
	Blood	Urine	Wound	Blood	Urine	Wound
Region 2 (30)	16.6% (45/271)	10.3% (516/5,017)	13.6% (203/1,488)	39.4% (201/510)	27.1% (984/3,637)	22.6% (449/1,985)
Region 3 (13)	20.2% (20/99)	11.5% (294/2,547)	11.1% (74/668)	27.5% (49/178)	24.4% (321/1316)	19.7% (103/524)
Region 4 (98)	13.0% (89/685)	8.1% (1,143/14,190)	6.1% (232/3,807)	23.5% (328/1,395)	18.1% (1,786/9,885)	17.2% (838/4,881)
Region 5 (85)	19.6% (133/679)	11.3% (1,620/14,388)	9.9% (361/3,631)	39.7% (471/1,186)	27.3% (2,397/8,770)	25.7% (1,030/4,008)
Region 6 (59)	19.9% (121/609)	10.9% (1,219/11,174)	10.7% (343/3,209)	26.9% (235/874)	20.9% (1,188/5,671)	17.5% (491/2,802)
Region 9 (28)	13.1% (34/259)	8.6% (295/3,434)	10.4% (94/907)	40.1% (208/519)	24.0% (654/2,726)	25.2% (354/1,403)
Region 10 (22)	0.7% (1/141)	3.2% (92/2,855)	4.6% (18/392)	13.9% (17/122)	9.0% (101/1,128)	8.3% (28/337)
Other (11)	13.6% (9/66)	5.4% (137/2,526)	3.3% (23/690)	23.0% (29/126)	16.5% (195/1,185)	15.2% (77/507)
All Regions (346)	16.1% (452/2,809)	9.5% (5,316/56,131)	9.1% (1,348/14,792)	31.3% (1,538/4,910)	22.2% (7,626/34,318)	20.5% (3,370/16,447)

* P < 0.007 for all sources compared to Region 10 except for ambulatory wound Regions 4, 5 and inpatient blood Regions 3, 4 and Other

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Figure 1: Distribution of all non-duplicate VRE isolates by source and setting

