

KEY FINDINGS AND PUBLIC HEALTH ACTIONS

Methicillin-Resistant *Staphylococcus Aureus* and Vancomycin-Resistant Enterococci Bloodstream Infections in California Hospitals, 2012

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant Enterococci (VRE) are two of the most common organisms resistant to multiple antimicrobial drugs that cause infections in hospital patients. Bloodstream infections (BSIs) are among the most serious healthcare-associated infections, resulting in increased lengths of hospital stay, higher hospital costs, and risk of death. This report for the period of January 1, 2012 through December 31, 2012, is the fourth on MRSA and VRE BSIs developed by the California Department of Public Health (CDPH), and the third using data submitted by hospitals to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN)[1]. Only blood specimens that test positive for MRSA and VRE are reported. The rates and NHSN standardized infection ratios (SIRs) in this report are for hospital-onset (HO) infections, defined as the first positive blood test occurring after the third day of hospitalization.

Reporting MRSA Bloodstream Infections

New in this report, we present hospital-specific MRSA BSI SIRs for general acute care hospitals, other than long-term and rehabilitation acute care hospitals. The NHSN SIR compares the number of HO MRSA BSI cases that occurred in the hospital (observed) to the number predicted based on the national referent data. The MRSA SIR adjusts for significant risk factors, including hospital bed size, affiliation with a medical school, and the community burden of MRSA BSI as observed in patients admitted to the hospital. Adjusting for these factors provides for a more accurate comparison of hospitals' infections. For more precise comparisons, NHSN provides an SIR only when at least one infection is predicted. For hospitals in which a MRSA SIR could be calculated, we performed a statistical analysis to determine if the observed number of infections was significantly different than the predicted number of infections (Table 2). We labeled each SIR as indicating either:

- N - no difference in number of observed and predicted infections,
- H - high or more infections than predicted, or
- L - low or fewer infections than predicted.

For long term acute care (LTAC) and rehabilitation acute care hospitals, we present MRSA BSI rates, because LTAC and rehabilitation hospitals are currently excluded from NHSN SIR analyses.

Reporting VRE Bloodstream Infections

As in prior reports, we present hospital HO VRE BSI rates, hospital case mix indices (CMI), when available, and the California pooled mean (average) VRE BSI rate for seven hospital categories. The CMI provides a useful reference point when examining individual hospital BSI rates as it can indicate whether a hospital serves patients with higher or lower severity of illness. We sorted hospitals into categories that reflect their patients' severity of illness and other factors that can affect their risk of infection, such as age and length of hospitalization, and the type of care that they receive. While stratifying VRE BSI rates by hospital type makes rates more comparable, it cannot control for all individual patient factors that can affect VRE BSI rates. We also provide the percentile distribution of hospital-specific rates for each category (Table 5). This enables an additional degree of comparison among the hospital categories allowing users of this report to identify the percentile in which each hospital's rate of VRE BSI occurs.

Readers should consider the overall context of these rates. A low MRSA BSI or VRE BSI rate may reflect greater diligence with infection prevention practices or may reflect incomplete entry

of all laboratory testing data required by NHSN for these infections. Similarly, high rates may reflect lapses in infection prevention practices or more complete entry of laboratory testing data.

Key Findings

- During January through December 2012, among 388 reporting hospitals, 292 (75.0%) were identified as community hospitals, 20 (5.0%) as major teaching hospitals, 11 (3.0%) as pediatric hospitals, 32 (8.0%) as critical access hospitals, 23 (6.0%) as LTAC hospitals, 7 (2.0%) as rehabilitation acute care hospitals, and 3 (<1%) as prison hospitals.
- 386 (99.0%) of 388 California licensed general acute care hospitals reported MRSA and VRE BSI data for all 12 months of 2012 compared to (95.1%) during 2011. Two hospitals, including one LTAC, reported less than 12 months of data.
- 386 hospitals reported 817 MRSA BSIs and 16,095,471 patient days in 2012, compared to 869 MRSA BSIs and 16,102,453 patient days in 2011. 174 (45.0 %) hospitals reported no HO MRSA BSIs in 2012 versus 152 (41.4%) in 2011.

MRSA BSI

- 219 of 357 (61%) general acute care hospitals, excluding LTAC and rehabilitation acute care hospitals, were predicted to have one or more HO MRSA BSI based on national referent data and had a risk-adjusted SIR calculated. Of these, 12 hospitals had significantly lower numbers of HO MRSA BSIs than predicted (lower SIRs). No hospitals had significantly higher numbers than predicted.
- 138 of 357 (39%) hospitals had no SIRs calculated due to having an NHSN-predicted number of HO MRSA BSI cases less than one.
- 357 hospitals reported 728 HO MRSA BSIs and 15,471,564 patient days, for an average SIR of 0.78, which is statistically lower than the national referent MRSA SIR of 1.0.
- The average HO MRSA BSI rate among 22 LTAC hospitals was 1.75 per 10,000 patient days in 2012, higher than 1.64 per 10,000 reported in 2011. One LTAC hospital had a rate significantly higher than predicted, and one had a rate significantly lower than predicted.
- Of 7 rehabilitation acute care hospitals, 6 (86%) reported no HO MRSA BSI. The average HO MRSA BSI rate in rehabilitation hospitals was 0.40 per 10,000 patient days in 2012. HO MRSA BSIs are unusual events in rehabilitation hospitals.

VRE BSI

- 386 hospitals with 12 months of data reported 825 HO VRE BSIs and 16,116,092 patient days, for an average rate of 0.52 per 10,000 patient days in 2012. This compares to 831 VRE BSIs over 16,102,453 for an average rate of 0.52 per 10,000 patient days among 367 hospitals in 2011.
- Of the 386 hospitals reporting in 2012, 207 (54%) reported no HO VRE BSI, compared to 176 (48.0%) hospitals that reported no HO VRE BSIs in 2011.
- The average HO VRE BSI rate among 292 community hospitals was 0.35 per 10,000 patient days in 2012, equal to the average rate of 0.35 in 2011. 19 (6.5%) community hospitals had

rates significantly higher than the average rate, and 6 (2.0%) hospitals had rates significantly lower than the average rate.

- 148 (51%) community hospitals reported no HO VRE BSIs in 2012 compared to 132 (47.3%) in 2011.
- The average HO VRE BSI rate among 20 major teaching hospitals was 0.98 per 10,000 patient days in 2012 compared to a rate of 1.11 in 2011. Three (15.0%) major teaching hospitals had rates significantly higher than the average rate, and 3 (15.0%) had rates significantly lower than the average rate. All major teaching hospitals reported HO VRE BSIs in 2012.
- The average HO VRE BSI rate among 11 pediatric hospitals was 0.17 per 10,000 patient days in 2012, the same rate as observed in 2011. No pediatric hospitals had significantly higher or lower rates than the average rate. Five (45.0%) reported no HO VRE BSIs.
- The average VRE BSI rate among 22 LTAC hospitals was 2.61 per 10,000 patient days in 2012, the highest average rate among all reported hospital categories, and higher than the rate of 1.94 in 2011. One (5.0%) LTAC hospital had a HO VRE BSI a rate significantly higher than the average rate, 3 (14.0%) LTAC hospitals had rates significantly lower than the average rate, and 3 (14.0%) reported no HO VRE BSIs. The increase in HO VRE BSIs among LTAC hospitals from 2011 to 2012 is statistically significant.
- No HO VRE BSI were reported by rehabilitation acute care hospitals, critical access hospitals, or prison hospitals. HO VRE BSIs are unusual events in these types of hospitals.
- The higher rates of VRE BSI in LTAC and major teaching hospitals likely reflect the increased severity of illness in patients in these hospitals compared to community hospitals and critical access hospitals. The lower rates of HO VRE BSIs in pediatric hospitals likely result from factors specific to age rather than the measure of severity of illness, as the case mix index in pediatric hospital patients is similar to major teaching hospitals.
- NHSN provides no risk adjustment method for comparison of HO VRE BSI. Variation in rates could be affected by differences in severity of illness in patients between hospitals, as reflected by the CMI for each hospital. The rates could also vary because of differences in adherence to clinical and infection control practices that reduce the risk of VRE BSI, and/or to differences in the completeness of reporting.

Public Health Actions

In follow-up to this report, CDPH will:

- Continue to monitor and engage in efforts to improve the accuracy and completeness of reported MRSA and VRE BSI data, including onsite data validation audits.
- Continue to explore the risk-adjustment procedures used by NHSN and offer recommendations for refinement.
- Participate, as appropriate, in a working group with state, national, and other public health stakeholders to identify appropriate risk factors for adjusting VRE BSI data.
- Continue our prevention collaborative efforts with LTAC hospital personnel to explore opportunities for preventing HO MRSA and VRE BSIs.

All hospitals should review these data and consider:

- Examining their MRSA BSI SIR and VRE BSI rates relative to hospitals in their hospital category.
- Taking measures to address MRSA and VRE prevention using the CDC [2], Society for Healthcare Epidemiology of America /Infectious Disease Society of America [3], and/or Association for Professionals in Infection Control and Epidemiology guidelines [4] for prevention of MRSA.
- Reviewing CDPH's quarterly quality control reports to confirm that CDPH has correct and complete data and to identify additional data errors.

The public and consumers should consider:

- Reviewing the information presented including the limitations and context for results.
- Asking your healthcare provider about the actions your hospital is taking to ensure patient safety, including MRSA and VRE prevention measures.
- Asking your healthcare provider about the actions you can take to ensure your safety in the hospital, including protecting against MRSA and VRE.
- Speaking up if you don't understand or have a question. Clear communication between you and your healthcare provider is one of the first steps you can take towards ensuring your own safety.

References

1. California Department of Public Health. Methicillin-Resistant *Staphylococcus Aureus* (MRSA) and Vancomycin-Resistant Enterococcus (VRE) Bloodstream Infections (BSI) in California Hospitals, 2011.
<http://cdphinternet/programs/hai/Pages/MRSAandVREBSlinCaliforniaHospitals,January2011-December2011.aspx>
2. Siegel JD, Rhinehart E, Jackson M, Chiarello L. Healthcare Infection Control Practices Advisory Committee. Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006. *Am J Infect Control.* 2007 Dec; 35(10 Suppl 2):S165-93.
http://cdc.gov/hicpac/mdro/mdro_toc.html. Accessed 26 June 2012
3. Klevens RM, Edwards JR, Richards CL Jr, Horan TC, Gaynes RP, Pollock DA, Cardo DM. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep.* 2007 Mar-Apr; 122(2):160-6.
4. APIC Guide to the Elimination of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Transmission in Hospital Settings California Supplement - April 3, 2009.
http://www.apic.org/Resource/_EliminationGuideForm/16c7a44f-55fe-4c7b-819a-b9c5907eca72/File/APIC-MRSA-California.pdf. Accessed 25 May 2012