KEY FINDINGS AND PUBLIC HEALTH ACTIONS
Methicillin-Resistant *Staphylococcus Aureus* and Vancomycin-Resistant Enterococci Bloodstream Infections in California Hospitals, 2011

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 (HAIs), resulting in increased lengths of hospital stay, higher hospital costs, and risk of death. This release, for the period of January 1, 2011 through December 31, 2011, is the third on MRSA and VRE BSIs developed by the California Department of Public Health (CDPH), and the second [1] using data submitted by hospitals to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN). NHSN requires only laboratory test results performed by the hospitals for MRSA and VRE in blood specimen to be submitted. The rates in this release are for hospital onset infections, in which the first positive test occurred after the third day of hospitalization.

As in prior releases, we present hospital specific MRSA/VRE BSI incidence rates, case mix indices (CMI), when available, and a California pooled mean (average) rate for each of the 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 MRSA/VRE BSI rates by hospital type makes rates more comparable, it cannot control for all individual patient factors that can affect MRSA/VRE rates. New to this release is the addition of three hospital categories: rehabilitation, critical access, and prison hospitals. The three additional categories were previously represented in the community hospital category and were separated out to further refine risk stratification of hospitals into categories providing similar levels of care. These three new categories are defined by NHSN and/or the federal Center for Medicare and Medicaid Services (CMS), have MRSA/VRE BSI rates that are generally lower (except for prison hospitals) than the remaining community hospitals, and provide types of care to specific patient populations (e.g. rehabilitation) or are in locations (e.g., critical access hospitals in rural areas) that are distinct from general community hospitals, and are therefore more appropriately compared to each other.

Also, new in this release, we provide the percentile distribution of the hospital-specific rates for each hospital category. This enables an additional degree of comparison among the facility categories, for example the distribution of rates for critical access hospitals is quite different from that for community hospitals, and among individual hospitals, as users can identify the percentile in which each hospital's rate of infection occur.

Readers should consider the overall context of these rates. A low MRSA/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, a high rate may reflect lapses in infection prevention practices or inaccurate entry of laboratory testing data. Comparison of the data in this release to the data in the last reporting period of April 1, 2010 through March 31, 2011 should be made with caution because of the overlapping data of one quarter of reporting, and as more time is needed to determine if changes will be sustained, and therefore, more meaningful. Changes in hospital categories or in reporting compliance may have also affected the comparison in rates, but these were taken into consideration in the presentation of key findings.

Key Findings

- During January 1, 2011 through December 31, 2011, among 386 reporting hospitals, 296 (76.6%) were identified as community, 20 (5.2%) as major teaching, 11 (2.8%) as pediatric, 23 (5.9%) as LTAC, 7 (1.8%) as rehabilitation, 26 (6.7%) as critical access, and 3 (<1%) as prison hospitals.

- 367 (95.1%) of 386 California licensed general acute care hospitals reported complete MRSA and VRE BSI data compared to 94% during the previous reporting period, despite raising the threshold for complete reporting from 10 to 12 months. 13 hospitals reported less than 12 months of data and 6 reported no data. All rates were calculated using data from these 367 hospitals with complete reporting.

MRSA BSI

- The 367 hospitals reported 869 MRSA BSIs over 16,102,453 patient days, for an average rate of 0.54 per 10,000 patient days. This compares to 908 MRSA BSIs for a rate of 0.56 among 361 hospitals in the previous reporting period. Of the 367 hospitals in the current reporting period, 152 (41.4%) reported no MRSA BSIs while 155 (42.9%) reported no MRSA BSIs in the previous reporting period. These slight changes among all California hospitals do not appear to be significant.

- Among 279 community hospitals, the MRSA BSI average rate was 0.46 MRSA BSI per 10,000 patient days, similar to the average rate of 0.48 from the last reporting period. Of the 279, 12 (4.3%) had rates significantly above the average rate, 7 (2.5%) hospitals had rates below the pooled mean rate, and 112 (40.1%) reported no MRSA BSIs, compared to15 (4.8%), 9 (2.9%), and 141 (45.7%) in the previous reporting period. The hospitals excluded from the community hospital category, rehabilitation, critical access, and prison hospitals, with the exception of 2 small prison hospitals, had lower average rates than the remaining community hospitals. Their inclusion would have resulted in a lower average rate and more hospitals with zero infections.

- The average MRSA BSI rate among 20 major teaching hospitals was 0.80 per 10,000 patient days, the second highest rate after LTACs, and lower than 0.96 reported in the last reporting period. Of the 20, 3 (15%) had rates significantly above the average rate, while 1 (5%) had a rate below the average rate, compared to 1(5.3%) and 2 (10.5%) in the last release. In the current release no major teaching hospital reported zero MRSA BSIs, compared to 1 in the previous release. With the exception of reclassification of one community hospital to major teaching (rate of 1.04), this category of hospitals did not change. Overall, 15 of the 20 (75%) hospitals in this category demonstrated a reduction in their BSI rate compared to the previous release. The decrease in MRSA BSI rates in this category may be significant.

- The average MRSA BSI rate among 11 pediatric hospitals was 0.07 per 10,000 patient days, the lowest average rate among all the different hospital categories, and slightly lower than 0.11 in the last reporting period (based on 6 versus 4 cases). No pediatric hospitals in either report had significantly higher or lower rates, while 8 (72.7%) of the 11 hospitals reported a zero rate versus 6 (60%) in the last reporting period. One additional pediatric hospital (rate 0) had complete reporting this period.

- The average MRSA BSI rate among 22 LTAC hospitals was 1.64 per 10,000 patient days, the highest average rate among all the different hospital categories and higher than 1.08 per 10,000 reported in the previous release. This represented an increase from 47 to 72 cases with virtually the same total patient days, with an increase in 24 cases accounted for by 4 facilities, including the 2 of 22 (9.0%) with rates significantly above the average rate. Of the 22, 3 (13.6%) had rates below the average rate, and 5 (22.7%) reported no BSI, compared to 1 (4.8%), 1(4.8%) and 7 (33.3%) in the previous release. One hospital (rate 0.72) was reclassified from LTAC to rehabilitation. The increase in MRSA BSIs among LTAC hospitals appears to be significant and accounted for by 4 facilities.

- The average MRSA BSI rates among rehabilitation, critical access, and prison hospitals were 0.30, 0.37, and 0.80 per 10,000 patient days, respectively. There were 3 (50%), 23 (88.5%), and 1 (33.3%) hospital(s) with zero rate(s) in each category, respectively. MRSA BSIs are unusual events in rehabilitation and critical access hospitals.

- In summary, MRSA BSI rates decreased or did not change among community, major teaching, and pediatric hospitals, offset by an increase among 4 LTAC hospitals.

VRE BSI

- The 367 hospitals reported 831 VRE BSIs over 16,102,453 patient days, for an average rate of 0.52 per 10,000 patient days. This compares to 788 VRE BSIs for a rate of 0.49 per 10,000 patient days among 361 hospitals in the previous reporting period. Of the 367 hospitals in the current reporting period, 176

(48.0%) reported no VRE BSI while 194 (53.7%) reported no VRE BSIs in the previous reporting period. These changes are consistent with a slight increase in VRE BSIs among all California hospitals across the two reporting periods.

- The average VRE BSI rate among 279 community hospitals was 0.35 VRE BSI per 10,000 patient days, approximately equal to the average rate of 0.34 from the last reporting period. Of the 279, 16 (5.7%) had rates significantly above the average rate, while 3 (1.1%) hospitals had rates below the pooled mean rate, and 132 (47.3%) reported no VRE BSIs, compared to12 (3.9%), 0 (0%)and 180 (57.9%) in the previous reporting period. A decrease in the VRE BSI average rate may have been obscured by exclusion from this category of rehabilitation, critical access, and prison hospitals, all with very low rates of VRE BSIs.

- The average VRE BSI rate among 20 major teaching hospitals was 1.11 per 10,000 patient days, the second highest rate after LTACs, and approximately equal to 1.15 in the last reporting period. Of the 20, 2 (10.0%) had rates significantly above the average rate, while 3 (15.0%) had a rate below the average rate, similar to the 15.8% for both in the last reporting period. No major teaching hospital reported zero VRE BSIs in either period.

- The average VRE BSI rate among 11 pediatric hospitals was 0.2 per 10,000 patient days, the lowest average rate among all the other hospital categories except for rehabilitation, critical access, and prison, and the same as in the last reporting period. No pediatric hospitals in either report had significantly higher or lower rates, while 54.6% (6 of 11) reported a zero rate, similar to the 60% (6 of 10) in the last reporting period.

- The average VRE BSI rate among 22 LTACs was 1.94 per 10,000 patient days, the highest average rate among all the different hospital categories and higher than 1.17 in the previous release. This represented an increase from 51 to 85 cases with virtually the same total patient days, with an increase in 21 cases accounted for by 5 facilities, including the 2 (9.0%) of 22 with rates significantly above the average rate. Of these 5, 2 also had increases in MRSA BSI while 1 was an incomplete reporter in the previous release. Of the 22, 3 (13.6%) had rates below the average rate, and 5 (22.7%) reported no BSIs, compared to 1 (4.8%) high, 2 (9.5%) below, and 7 (38.1%) no BSIs in the previous period. The increase in VRE BSIs among LTAC hospitals appears to be significant even taking into account the reclassification of one hospital (rate 0) to rehabilitation, and accounted for by 5 facilities.

- The average VRE BSI rates among rehabilitation, critical access, and prison hospitals were 0.07, 0.12, and 0 per 10,000 patient days, respectively. Prison hospitals, followed by rehabilitation, and critical access hospitals had the lowest rates among all hospital categories. There were 5 (83.3%), 25 (96.1%), and 3 (100%) hospital(s) with zero rate(s) in each category, respectively. VRE BSIs are unusual events in these facilities.

- In summary, VRE BSI rates remained stable except for an increase among 5 LTAC hospitals.

For MRSA and VRE BSI, major teaching and LTAC hospitals had higher incidence rates than other categories with the exception of MRSA BSI in prison hospitals; MRSA skin and soft tissue infections are well known to be prevalent in prisons, and these can become BSIs. Pediatric, rehabilitation, and critical access hospitals had lower rates for both, while community hospital rates were between the others. The higher rates in major teaching and LTAC hospitals likely reflect the increased severity of illness in patients in these compared to community and critical access hospitals. The lower rates of these BSIs in pediatric hospitals presumably result from factors specific to the age of pediatric patients rather than the measure of severity of illness , as the case mix index in pediatric hospital patients appeared to be similar to major teaching hospitals.

While MRSA BSI rates decreased and VRE BSI rates remained the same among community, major teaching, and pediatric hospitals, both increased among LTAC hospitals compared to the previous reporting period. There are no reports of MRSA/VRE BSI incidence rates from NHSN or comparable data for comparison with this report. MRSA/VRE rates could be affected by differences in severity of illness in patients in hospitals, as reflected by their different case-mix indices (CMIs) for each hospital. The rates could also vary because of different clinical and infection control practices, and reporting completeness.

Public Health Actions

In follow-up to this report, CDPH will:

- Encourage hospitals to continue reporting complete MRSA and VRE BSI data into NHSN.
- Participate, as appropriate, in a working group with state, national, and public health stakeholders to identify appropriate risk factors for adjusting MRSA and VRE BSI data.
- Engage with LTAC hospital personnel to explore opportunities to prevent MRSA and VRE BSIs.

All hospitals should review these data and consider:

- Examining their MRSA and VRE BSI rates relative to hospitals in their facility category, and consider 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

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