Healthcare-Associated Infections in Veterans Affairs Acute and Long-Term Healthcare Facilities During the Coronavirus Disease 2019 (COVID-19) Pandemic

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Abstract

Objective: To assess the impact of the coronavirus disease 2019 (COVID-19) pandemic on healthcare-associated infections (HAIs) reported from 128 acute care and 132 long-term care Veterans Affairs (VA) facilities.

Methods: Central line-associated bloodstream infections (CLABSIs), ventilator-associated events (VAEs), catheter-associated urinary tract infections (CAUTIs), and methicillin-resistant Staphylococcus aureus (MRSA) and Clostridioides difficile infections and rates reported from each facility monthly to a centralized database before the pandemic (February 2019 through January 2020) and during the pandemic (July 2020 through June 2021) were compared.

Results: Nationwide VA COVID-19 admissions peaked in January 2021. Significant increases in the rates of CLABSIs, VAEs, and MRSA all-site HAIs (but not MRSA CLABSIs) were observed during the pandemic period in acute care facilities. There was no significant change in CAUTI rates and C. difficile rates significantly decreased. There were no significant increases in HAIs in long-term care facilities.

Conclusions: The COVID-19 pandemic had a differential impact on HAIs of various types in VA acute care with many rates increasing. The decrease in CDI HAIs may be due, in part, to evolving diagnostic testing. The minimal impact of COVID-19 in VA long-term facilities may reflect differences in patient numbers and acuity and early recognition of the impact the pandemic had on nursing home residents leading to increased vigilance and optimization of infection prevention and control practices in that setting. These data support the need for building and sustaining conventional infection prevention and control strategies before and during a pandemic.

Keywords: COVID-19, pandemic, healthcare-associated infections
Introduction

Recently the United States (U.S.) Centers for Disease Control and Prevention reported data collected by the National Healthcare Safety Network (NHSN) on the impact of the coronavirus disease 2019 (COVID-19) pandemic on healthcare-associated infections (HAIs) in acute care hospitals in the U.S.\textsuperscript{1} They noted an increase in the standardized infection ratios (SIRs) for central-line bloodstream infections (CLABSIs), ventilator-associated events (VAEs), catheter-associated urinary tract infections (CAUTIs), and methicillin-resistant \textit{Staphylococcus aureus} (MRSA) bacteremia, but no change in the \textit{Clostridioides difficile} infection (CDI) SIR. Few data from the U.S. Department of Veterans Affairs Health Administration (VA) were included in that report since <20\% of VA facilities voluntarily report to NHSN and there were no data from long-term care facilities. We are unaware of any report to date analyzing the impact of the pandemic on HAIs in long-term care facilities. Here we compare CLABSI, VAE, CAUTI, and MRSA and \textit{C. difficile} rates before the pandemic to those during the COVID-19 pandemic in VA’s 128 acute care and 132 long-term care facilities which are part of the largest integrated healthcare system in the nation.

Methods

Monthly HAI data entered by Infection Prevention and Control Professionals and dedicated Multidrug Resistant Organism (MDRO) Prevention Coordinators (MPCs) at each acute care and long-term care facility (the latter called “Community Living Centers” or CLCs in VA) into the centralized VA Inpatient Evaluation Center (IPEC) database were analyzed.\textsuperscript{2} Data from February 2019 through January 2020 served as the pre-COVID-19 pandemic 12-month baseline. The requirement for entering HAI data into IPEC was suspended for five months from
February 2020 through June 2020 because of the COVID-19 pandemic but reinstated in July 2020 like the suspension of Centers for Medicare and Medicaid Services reporting requirements for HAIs. Data from July 2020 through June 2021 (designated herein as the “pandemic period”) were compared to the pre-pandemic baseline. Facility data for CLABSIs, VAEs, and CAUTIs were normalized per 1,000 device-days, MRSA HAIs per 1,000 patient- or resident-days, CDI HAIs per 10,000 patient- or resident-days, and device utilization (DU) ratios were calculated as the number of device-days/number of patient- or resident-days. Mean HAI rates and DU ratios per month were compared using Student’s t test. VAEs were subcategorized as ventilator-associated conditions (VACs), infection-related ventilator-associated complications (IVACs), and possible ventilator-associated pneumonias (PVAPs) and rates of each subcategory were compared for the pre- and pandemic periods using Student’s t test and the overall distribution of events in each subcategory between analysis periods was compared using the Chi-square test. Because CDI reporting may be influenced by the testing algorithm (e.g., toxin immunoassays (toxin EIA) typically have lower sensitivity than nucleic amplification tests (NAAT) and potentially result in lower rates), the type of CDI diagnostic test was included in the analyses and compared using Chi-square. Numbers of CDI complications (colectomies, intensive care unit admissions, and deaths) pre- and during the pandemic were compared using the Fisher exact test. Definitions for HAIs were those described previously.

COVID-19 data were extracted from the VA COVID-19 National Surveillance Tool, which draws and processes data from the VA Corporate Data Warehouse. The monthly COVID-19 admission prevalence per acute care facility per month was calculated and compared to the monthly facility HAI incidence using linear regression.
This work was done under the University of Cincinnati IRB submission 2016-9502, which determined that the analysis of deidentified national VA operational data is a Quality Improvement/Quality Assurance activity and does not meet regulatory criteria for research involving human subjects.

Results

All VA acute care facilities and CLCs nationwide reported data into the IPEC database each month for all HAIs for both 12-month reporting periods.

Acute Care Facilities

In the 128 VA acute care facilities, there was an aggregate of 987,720 admissions during the two periods (530,231 pre- and 457,489 pandemic) and 5,246,582 patient-days (2,693,347 pre- and 2,553,235 pandemic). The mean number of facility admissions per month decreased 14% from 44,186 (± 1,819) before the pandemic to 38,124 (± 2,586) during the pandemic ($P < .0001$), and the average length of stay increased 10% from 5.08 (± 0.13) days to 5.60 (± 0.35) days ($P = .0002$). The mean number of monthly COVID-19 admissions to VA acute care facilities nationwide from July 2020 through June 2021 was 3,417 with a range of 790 to 6,999 admissions per month nationwide. The prevalence of monthly facility admissions that were COVID-19 infected ranged from 0.35% to 96.72% (59/61 admissions in one facility in January), however there was no correlation between the facility monthly COVID-19 admission prevalence and the monthly facility HAI incidence ($r = 0.08$). There were no significant trends in HAI rates during the 12-month pre-pandemic period (CLABSIs $P = .31$, CAUTIs $P = .99$, VAEs $P = .17$, MRSA HAIs $P = 0.86$, linear regression), nor in the two-year period from February 2018
through January 2020, except for decreasing trends in CDI rates during the pre-pandemic period ($P=0.05$) and the two-year period ($P < 0.0001$).

There was a total of 660,416 central line-days and 678 CLABSIs (which included MRSA CLABSIs) during the two analysis periods. The average monthly CLABSI rates increased significantly by 31% and the central-line catheter utilization ratios increased significantly by 3% during the pandemic (Table 1 and Figure 1).

There were 137,412 ventilator-days and 903 VAEs during the two analysis periods. Monthly mean VAE rates increased significantly as did ventilator utilization ratios during the pandemic (Table 1 and Figure 2). Of note, 73% of the 282 pre-pandemic VAEs were VACs, 23% IVACs, and 4% PVAPs, while 69% of the 621 pandemic VAEs were VACs, 23% IVACs, and 8% PVAPs. Although the rate of each increased significantly during the pandemic period (VACs ($P = 0.001$), IVACs ($P = 0.001$), PVAPs ($P = 0.004$)), the distribution of events in these VAE subcategories did not differ statistically ($P > 0.05$) between analysis periods.

There were 951,135 urinary catheter-days and 926 CAUTIs during the two analysis periods. The mean monthly rate did not increase significantly during the pandemic although the urinary catheter utilization ratios increased significantly (Table 1).

Five-hundred and eighteen MRSA HAIs of all body sites were reported during the two analysis periods. The mean rates of these HAIs increased significantly by 51% during the pandemic (Table 1 and Figure 3). The most common MRSA HAIs were bloodstream infections (BSIs) which accounted for approximately 30% of all MRSA HAIs during both analysis periods. Approximately 65% of BSIs were non-device associated. Of note, the average monthly rate of MRSA CLABSIs did not increase significantly during the pandemic (Table 1). Pre-pandemic, BSIs were followed in incidence by skin and soft tissue MRSA infections and non-device-
associated pneumonias. During the pandemic, non-device-associated pneumonias were the most common MRSA HAIs after BSIs.

Approximately 1,500 tests for the diagnosis of CDI were done in the pre-pandemic period with a similar number done during the pandemic (Table 2). There was a significant shift ($P < .0001$) from using NAAT alone for the diagnosis of CDI to using two-step testing (NAAT followed by toxin EIA with results of the last test done reported in the patient record) during the pandemic. In this context, the mean monthly CDI rates decreased significantly during the pandemic (Table 1). There were 4 colectomies, 14 intensive care unit admissions and 2 deaths attributable to CDI in the pre-pandemic period, and 5 colectomies, 12 intensive care unit admissions and 8 deaths attributable to CDI in the pandemic period (none of which had a COVID-19 diagnosis). The distribution of complications between the two analysis periods was not statistically significantly different for colectomies or intensive care unit admissions but was significant for deaths.

**Community Living Centers**

In the 132 VA long-term care facilities, there was an aggregate of 76,331 admissions in the two 12-month periods (49,459 pre-pandemic and 26,872 during the pandemic) and 5,717,132 resident-days (3,210,571 pre-pandemic and 2,506,561 during the pandemic). The mean number of facility admissions per month decreased 46% from 4,122 ($±$ 469) before the pandemic to 2,239 ($±$ 152) during the pandemic ($P < .0001$), and the average length of stay increased 43% from 65.56 ($±$ 6.32) days to 93.57 ($±$ 5.51) days ($P < .0001$) between these periods. The mean number of monthly COVID-19 admissions to the CLCs nationwide from July 2020 through June 2021 was 2,115 with a range of 1,863 to 2,391 admissions per month. There were no significant
trends in HAI rates during the 12-month pre-pandemic period (CLABSIs $P = .24$, CAUTIs $P = .53$, MRSA HAIs $P = .37$, linear regression) nor in the two-year period from February 2018 through January 2020, except for decreasing trends in CDI rates during the pre-pandemic period ($P = .0005$) and the two-year period ($P = .0001$).

A total of 262,736 central line-days and 67 CLABSIs (including MRSA CLABSIs) were reported in the CLCs nationwide during the two analysis periods. The average monthly CLABSI rates decreased non-significantly by 21% during the pandemic (Table 3). The central-line catheter utilization ratio decreased significantly by 17% during the pandemic.

There were 582,442 urinary catheter-days and 831 CAUTIs during the two analysis periods. As in acute care facilities, monthly CAUTI rates in the CLCs did not change significantly during the pandemic although urinary catheter utilization ratios increased significantly during the pandemic (Table 3).

There were 496 MRSA HAIs of all body sites reported during the two analysis periods. The monthly mean MRSA HAI rate did not change significantly during these periods (Table 3). The mean monthly rate of MRSA BSIs (device and non-device associated) increased 17% but this was not significant (Table 3). The monthly mean rates of MRSA CLABSIs increased 120% but this difference was also not statistically significant.

There were almost 1,600 tests done for CDI in both the pre-pandemic and pandemic periods (Table 2), and the shift in diagnostic testing from NAAT alone to two-step testing during the two analysis periods was similar to that in acute care (Table 2). The average monthly CDI rates during the pandemic decreased significantly by 26% from that of the pre-pandemic period.
Discussion

These findings for HAI rates in the national VA healthcare system during the pandemic compared to the immediate pre-pandemic period add to observations on the impact the pandemic has had on patient safety and healthcare operations. Early reports suggested that from 3% to 50% of patients with COVID-19 died of a secondary infection, but many of these studies were not from the U.S. and did not adequately describe the timing of the infections making it difficult to distinguish community from health care-associated infections. In a large study from the United Kingdom, clinically significant respiratory or bloodstream culture results were obtained from only 1,107 of 48,902 (2.3%) patients hospitalized with COVID-19 but 71% of these were defined as healthcare-associated. In one U.S. hospital, microbiologically confirmed HAIs occurred in 12% of 3,028 COVID-19 patients.

The most relevant report to our study is the data recently reported from the NHSN. Like VA data, these are nationwide data rather than single center reports and are not likely to be influenced by local or regional trends. Recently, NHSN reported increases in CLABSI SIRs of 47%, VAEs of 44.8%, CAUTIs of 18.8% and MRSA BSIs of 33.8% when comparing fourth quarter data for 2019 and 2020. CDI SIRs decreased by 5.5%. Many of these changes mirror those seen in VA acute care hospitals. Although we evaluated HAI rates rather than SIRs, we found increases in CLABSI rates of 31%, VAEs of 73% and MRSA BSIs of 56% when comparing pre-pandemic and pandemic periods. The lack of a significant difference in MRSA CLABSI rates in the two analysis periods in the face of a significant difference in total MRSA BSI rates may have been due the relatively small number of MRSA CLABSI reported (2.00 ± 1.21 per month pre- vs. 2.67 ± 1.44 during the pandemic). In contrast to NHSN, there were no significant changes in CAUTI rates in VA, and like NHSN, CDI rates decreased. A lack of an impact of the COVID-19 pandemic on CDI HAIs has been reported by others and has been
postulated to be due to less antibiotic use or the ordering of fewer tests. In VA, antibiotic utilization during the pandemic period did decrease to levels below those of the pre-pandemic period, but there was little difference in the number of CDI diagnostic tests performed (Table 2). Pre-pandemic there was a significant decreasing trend in CDI rates nationwide both acute and long-term care. This may have been the result of improved infection control. Our data do show, however, when the two periods are compared there was a significant shift from using NAAT alone to NAAT followed by toxin EIA with the results of the last test being used for surveillance reporting. This may have had an effect of masking any CDI HAI increases, since we previously showed that adoption of two-step testing in VA decreased the laboratory-reported incidence of CDI by more than 60%.

The VA has had formal nationwide MDRO prevention programs in place in all patient/resident care venues for MRSA beginning in 2007 and CDI since 2012. These programs are managed by dedicated personnel at each facility and have been continuously monitored by the VA National Infectious Diseases Service with infection control guidelines updated periodically. The programs have been associated with significant decreases in MDRO HAIs in acute care, spinal cord injury units, and the CLCs and have been associated with decreases in gram-negative bacteremias. In addition, VA has had comprehensive bundle-based prevention initiatives for device-associated HAIs starting with CLABSIs in 2005 and expanding to CAUTIs and VAP/VAEs in all patient/resident care venues by 2010. This has been coordinated nationally through IPEC supplying support for infection prevention and control personnel working to implement the prevention bundles. In this context, VA Central Office promulgated a comprehensive pandemic response and operations plan to protect veterans, their families, and the workforce in March 2020. This plan proactively addressed screening and management of
patients, infection control, laboratory resources, logistics, communications, pharmacy, and other key activities within outpatient venues and acute and long-term care inpatient facilities.\textsuperscript{23} However, the COVID-19 pandemic has stressed healthcare systems in the U.S. extensively and may have resulted in marginalized or altered routine infection prevention and control practices at some acute care VA facilities to focus on more emergent problems. This may have resulted in the atypical use of PPE (e.g., extended wear and reuse), foregoing hand hygiene at indicated times and alterations to recommended cleaning and disinfection needed to prevent transmission of other pathogens as has been described in other, non-VA, settings during the pandemic\textsuperscript{24} and may account for the increased CLABSI, VAE, and MRSA HAI\textsuperscript{s} observed in some VA acute care facilities.

It is also possible that changes in healthcare utilization in VA facilities led to an inpatient population that was systematically at higher risk of an HAI due to underlying severity of illness and that the increase in some HAI\textsuperscript{s} was not due to lapses in infection control. Elective admissions were often postponed as shown by a 19\% decrease in completed surgeries, and the increased LOS and device utilization during the pandemic are consistent with patients being more acutely ill. Although healthcare personnel numbers (medical doctor, registered nurse, pharmacist, medical support assistant) increased 3 to 8\% during the pandemic and healthcare worker absenteeism peaked at only slightly more than 1.6\% in December 2020\textsuperscript{25}, data on healthcare worker to patient/resident ratios are not available, nor are data readily available on Case Mix Indices or other factors that might help explain the increase in HAI\textsuperscript{s} observed.

The limited effect of the COVID-19 pandemic on HAI\textsuperscript{s} in VA long-term care facilities may be the result of several interventions. Rigorous protocols were implemented for symptom monitoring, diagnostic testing and screening, resident and staff isolation, and quarantine. CLC
staff were restricted to working only in a CLC (often specific units) and non-essential staff were restricted from access thereby limiting the potential for introduction of the virus by staff who had been in other environments. Some facilities restricted new admissions or required new admissions to quarantine prior to being admitted to the main facility. Restrictions were placed on visitors; visits by residents outside the CLCs were postponed, and respite care was put on pause. These policies and an emphasis on the threat of COVID-19 to nursing home residents may have made staff more acutely aware of healthcare-associated infections in general and reinforced the need to practice good infection control.26,27

Strengths of this report include the large number of facilities from across the U.S., inclusion of long-term care data, reporting of MRSA HAIs in addition to BSIs, breakdown of VAEs by subcategory, reporting of CDI complications, and offering potential reasons CDI HAIs decreased during the pandemic. Evaluation of a vulnerable population of predominantly elderly patients/residents with respiratory, cardiovascular, and endocrinologic co-morbidities predisposing them to adverse outcomes of SARS-CoV-2 infection may also be a strength.9

Limitations include our inability to determine the relative risk of bacterial or fungal HAIs in SARS-CoV-2 infected patients since our data were collected in aggregate and not on a patient-level basis. Of note, this determination was not reported in the review of NHSN data even though patient-level data were collected.1 As with NHSN, VA HAI data were hand-entered into a national database by personnel at each facility potentially allowing errors in reporting. We are unaware of any current large national databases for HAIs that operates using solely in silico data extraction. Finally, the apparent success of limiting HAIs in VA long-term care facilities may not be generalizable to non-VA nursing homes that may have fewer resources and be less able to implement the stringent admission and isolation protocols used in VA.
We observed increases in some HAIs in acute care but not in long-term care facilities during the pandemic. Additional study for the reasons behind this, and continued surveillance for HAIs in both settings, is needed during crises such as the COVID-19 pandemic to clarify what can be improved for building and sustaining infection control programs to withstand future pandemics.

**Acknowledgements.** We wish to thank the VA Under Secretary for Health, the Deputy Under Secretary for Health for Policy and Services, the VA MRSA/MDRO Taskforce, the MRSA/MDRO Prevention Coordinators, Infection Prevention and Control Professionals, Infectious Diseases specialists, and clinical laboratory personnel at each facility for support of the MDRO Prevention Initiatives and their hard work and dedication toward improving the healthcare of America’s Veterans.

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**Potential conflicts of interest.** All authors report no conflicts of interest relevant to this article.
References


<table>
<thead>
<tr>
<th>Healthcare-associated infection*</th>
<th>Mean rate§ pre-</th>
<th>Mean rate§ during</th>
<th>P-value</th>
<th>% change</th>
<th>Mean DU† ratio pre-</th>
<th>Mean DU† ratio during</th>
<th>P-value</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI</td>
<td>0.887 (± 0.157)</td>
<td>1.163 (± 0.321)</td>
<td><strong>0.0165</strong></td>
<td>↑31</td>
<td>0.124 (± 0.003)</td>
<td>0.128 (± 0.006)</td>
<td><strong>0.0284</strong></td>
<td>↑3</td>
</tr>
<tr>
<td>VAE</td>
<td>4.501 (± 1.114)</td>
<td>7.808 (± 2.538)</td>
<td><strong>0.0009</strong></td>
<td>↑73</td>
<td>0.023 (± 0.001)</td>
<td>0.029 (± 0.006)</td>
<td><strong>0.0044</strong></td>
<td>↑26</td>
</tr>
<tr>
<td>CAUTI</td>
<td>0.932 (± 0.151)</td>
<td>1.018 (± 0.182)</td>
<td>0.2213</td>
<td>↑9</td>
<td>0.176 (± 0.005)</td>
<td>0.187 (± 0.006)</td>
<td>&lt;.0001</td>
<td>↑6</td>
</tr>
<tr>
<td>All MRSA infections</td>
<td>0.079 (± 0.026)</td>
<td>0.120 (± 0.037)</td>
<td><strong>0.0058</strong></td>
<td>↑51</td>
<td></td>
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</tr>
<tr>
<td>MRSA BSI</td>
<td>0.024 (± 0.009)</td>
<td>0.037 (± 0.014)</td>
<td><strong>0.0156</strong></td>
<td>↑56</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MRSA CLABSI</td>
<td>0.072 (± 0.043)</td>
<td>0.098 (± 0.053)</td>
<td>0.2019</td>
<td>↑36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDI</td>
<td>4.325 (± 0.637)</td>
<td>3.606 (± 0.397)</td>
<td><strong>0.0038</strong></td>
<td>↓17</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*MRSA = methicillin-resistant *Staphylococcus aureus*, BSI = bloodstream infection, CLABSI = central line-associated bloodstream infection, VAE = ventilator-associated event, CAUTI = catheter-associated urinary tract infection, CDI = *Clostridioides difficile* infection, §per 1,000 patient-days or device-days except CDI which was per 10,000 patient-days, †DU = device utilization
Table 2. Number of tests for *Clostridioides difficile* infection in VA acute care (AC) and long-term (LT) care facilities pre- and during the COVID-19 pandemic

<table>
<thead>
<tr>
<th>Period</th>
<th>NAAT*</th>
<th>NAAT + Toxin</th>
<th>GDH + Toxin EIA</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arbritrated by</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>GDH + EIA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NAAT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-pandemic AC</td>
<td>930 (60.2%)</td>
<td>313 (20.3%)</td>
<td>133 (8.6%)</td>
<td>168 (10.9%)</td>
<td>1,544 (100%)</td>
</tr>
<tr>
<td>During pandemic AC</td>
<td>728 (47.7%)</td>
<td>504 (33.0%)</td>
<td>144 (9.5%)</td>
<td>150 (9.8%)</td>
<td>1,526 (100%)</td>
</tr>
<tr>
<td>Pre-pandemic LT</td>
<td>966 (60.4%)</td>
<td>263 (16.4%)</td>
<td>111 (6.9%)</td>
<td>259 (16.2%)</td>
<td>1,599 (100%)</td>
</tr>
<tr>
<td>During pandemic LT</td>
<td>800 (50.6%)</td>
<td>425 (26.9%)</td>
<td>116 (7.3%)</td>
<td>240 (15.2%)</td>
<td>1,581 (100%)</td>
</tr>
</tbody>
</table>

*NAAT = nucleic acid amplification test, Toxin EIA = *C. difficile* toxin immunoassay, GDH = glutamate dehydrogenase, Others = GDH + NAAT, GDH + toxin EIA, or toxin EIA alone, *P < .0001 Chi-square pre- vs during for both acute and long-term care.
Table 3. Monthly healthcare-associated infection rates in VA long-term care facilities pre- and during COVID-19 pandemic

<table>
<thead>
<tr>
<th>Healthcare- associated infection*</th>
<th>Mean rate§ pre</th>
<th>Mean rate§ during</th>
<th>P-value</th>
<th>% change</th>
<th>Mean DU† pre</th>
<th>Mean DU† during</th>
<th>P-value</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI</td>
<td>0.281 (± 0.148)</td>
<td>0.219 (± 0.182)</td>
<td>0.3664</td>
<td>↓21</td>
<td>0.060 (± 0.003)</td>
<td>0.050 (± 0.006)</td>
<td>0.0001</td>
<td>↓17</td>
</tr>
<tr>
<td>CAUTI</td>
<td>1.386 (± 0.221)</td>
<td>1.473 (± 0.355)</td>
<td>0.4758</td>
<td>↑6</td>
<td>0.120 (± 0.005)</td>
<td>0.128 (± 0.005)</td>
<td>0.0012</td>
<td>↑6</td>
</tr>
<tr>
<td>All MRSA infections</td>
<td>0.087 (± 0.023)</td>
<td>0.086 (± 0.029)</td>
<td>0.9555</td>
<td>↓1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRSA BSI</td>
<td>0.012 (± 0.006)</td>
<td>0.014 (± 0.012)</td>
<td>0.5921</td>
<td>↑17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRSA CLABSI</td>
<td>0.030 (± 0.038)</td>
<td>0.066 (± 0.093)</td>
<td>0.2383</td>
<td>↑120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDI</td>
<td>0.943 (± 0.314)</td>
<td>0.694 (± 0.187)</td>
<td><strong>0.0299</strong></td>
<td>↓26</td>
<td></td>
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</tr>
</tbody>
</table>

*MRSA = methicillin-resistant *Staphylococcus aureus*, BSI = bloodstream infection, CLABSI = central line-associated bloodstream infection, CAUTI = catheter-associated urinary tract infection, CDI = *Clostridioides difficile* infection, §per 1,000 resident-days or device-days except CDI which was per 10,000 resident-days, †DU = device utilization
Figure Legends

Figure 1. Nationwide central-line associated bloodstream infections (CLABSIs) and rates in acute care facilities one year before (baseline) and one year during the COVID-19 pandemic (data were not required to be reported from February - June 2020).

Figure 2. Nationwide ventilator-associated events (VAEs) and rates in acute care facilities one year before (baseline) and one year during the COVID-19 pandemic (data were not required to be reported from February - June 2020).

Figure 3. Nationwide methicillin-resistant *Staphylococcus aureus* (MRSA) healthcare-associated infections and rates/1,000 patient-days in acute care facilities one year before (baseline) and one year during the COVID-19 pandemic (data were not required to be reported from February - June 2020).
Figure 1