

Clinical surveillance measuring Hospital Acquired Infection (HAI) rates pre- and post- novel silver textile intervention

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BACKGROUND

Hospital-acquired infections represent a substantial health and economic burden, and continue to be one of the leading causes of death in the United States. A growing body of evidence suggests healthcare textiles often get contaminated with microorganisms or pathogens implicated in infections and illnesses.¹⁻⁴ Consequently, healthcare textiles are increasingly being identified as epidemiologically important environmental surface. In fact, healthcare textiles have been implicated in hospital outbreaks of fungal and bacterial pathogens.^{2,3,4} Textile based antimicrobial interventions have been previously shown to reduce infection rates.⁵

The antibacterial activity of silver is well documented with a number of applications and its toxicity to human cells is considerably lower than to bacteria. The most widely documented uses are prophylactic treatment of burns and water disinfection. We have previously demonstrated that treating gowns and sheets with silver ion solution results in 89% and 88% reduction of total microbial counts respectively.⁶ In this study, we evaluated the impact of silver ion –based textile treatment at three hospitals with a shared laundry provider on HAI rates, specifically for CAUTI, CLABSI, SSI and *Clostridium difficile* infection types. Silver-ion treatment was included as part of the hospitals' horizontal interventions bundle implemented to reduce infection rates.

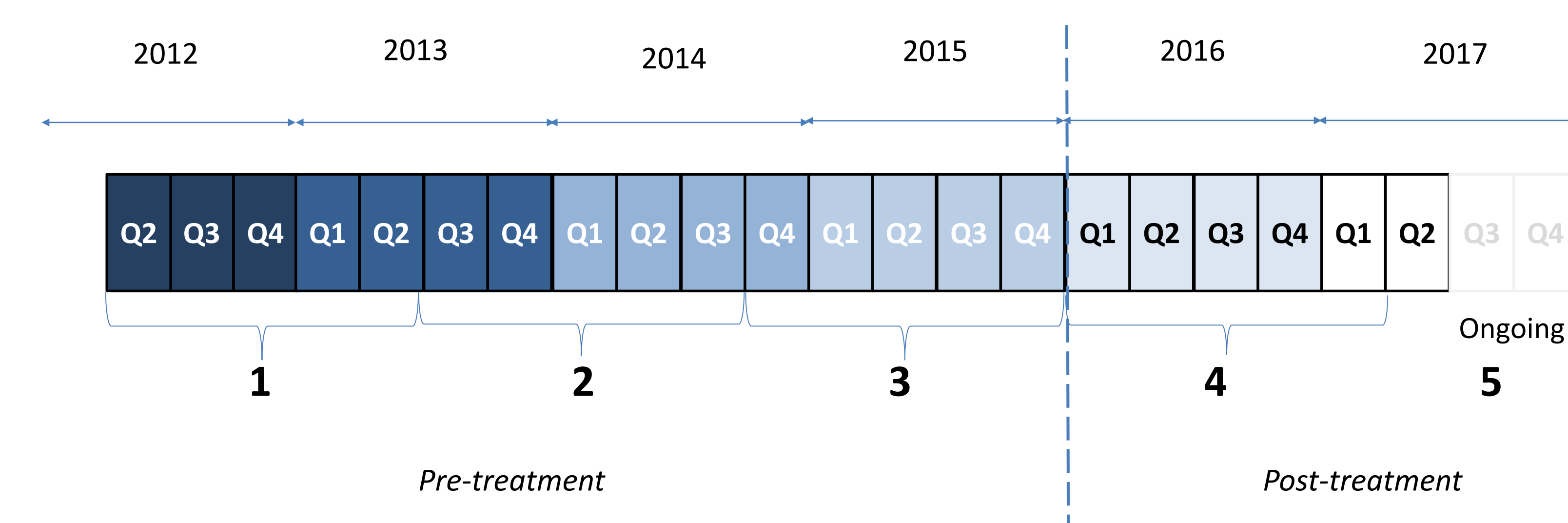
METHODS

- The study was conducted at three community hospitals sharing a common Healthcare Laundry Accreditation Council accredited laundry facility where the silver-ion textile treatment was implemented.
- Treatment was implemented for flats, pillowcases and gowns
- Data was collected as part of NHSN reporting process.
- Data was analyzed using two methods:

Method 1: HAI rates were determined for each infection type at each hospital over the time period of data collection. Data sets were compared as pre- versus post-silver ion treatment. For analyses, data sets were grouped as by hospital and infection type (All data), by hospital and by infection type. Percent reduction in infection rates were determined. Infection rates were normalized per 10,000 patient days. When applicable, a significant change was defined as a p value < 0.05 (t test).

Method 2: Data sets were separated into 4 time frames of 5 quarters each to account for seasonality : 1 (2012Q2-2013Q2), 2(2013Q3-2014Q3), 3(2014Q4-2015Q4) and 4 (2016Q1-2017Q1). Data from sets 1-3 (Pre-treatment) were compared to data from set 4 (Post-treatment) as Pre-treatment versus post-treatment to determine statistically relevant outcomes, i.e. increase, decrease or no change of Infection Rates . A significant change is defined by a p value < 0.05 (Fisher exact test)

Figure 1: Collection of infection data over quarters



RESULTS

Fig. 2: A 43% reduction in total HAI rates was observed post-treatment implementation across all hospitals and all infection types

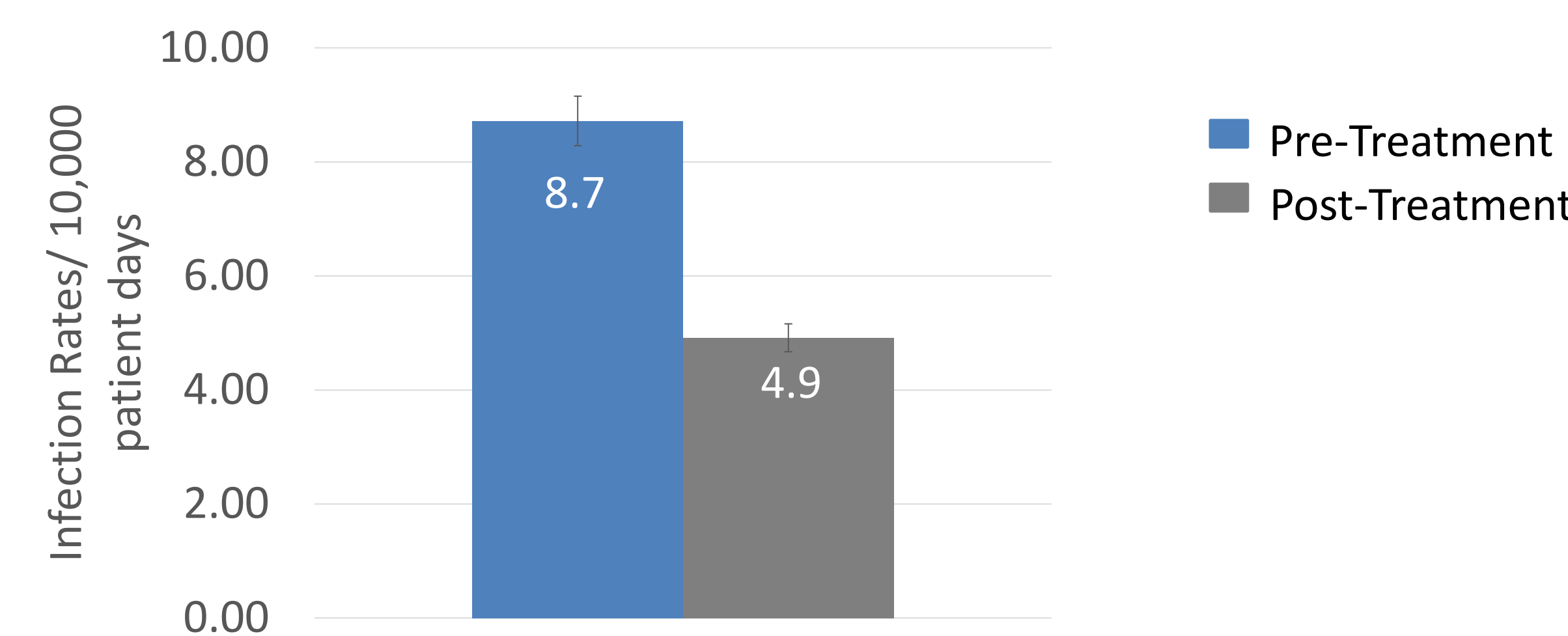


Fig.2: Data from all different hospitals and all different infection types were combined as pre-treatment and post-treatment HAI rates and analyzed using Method 1.

Fig.3: Downward trends were observed for all infection types studied across all hospitals

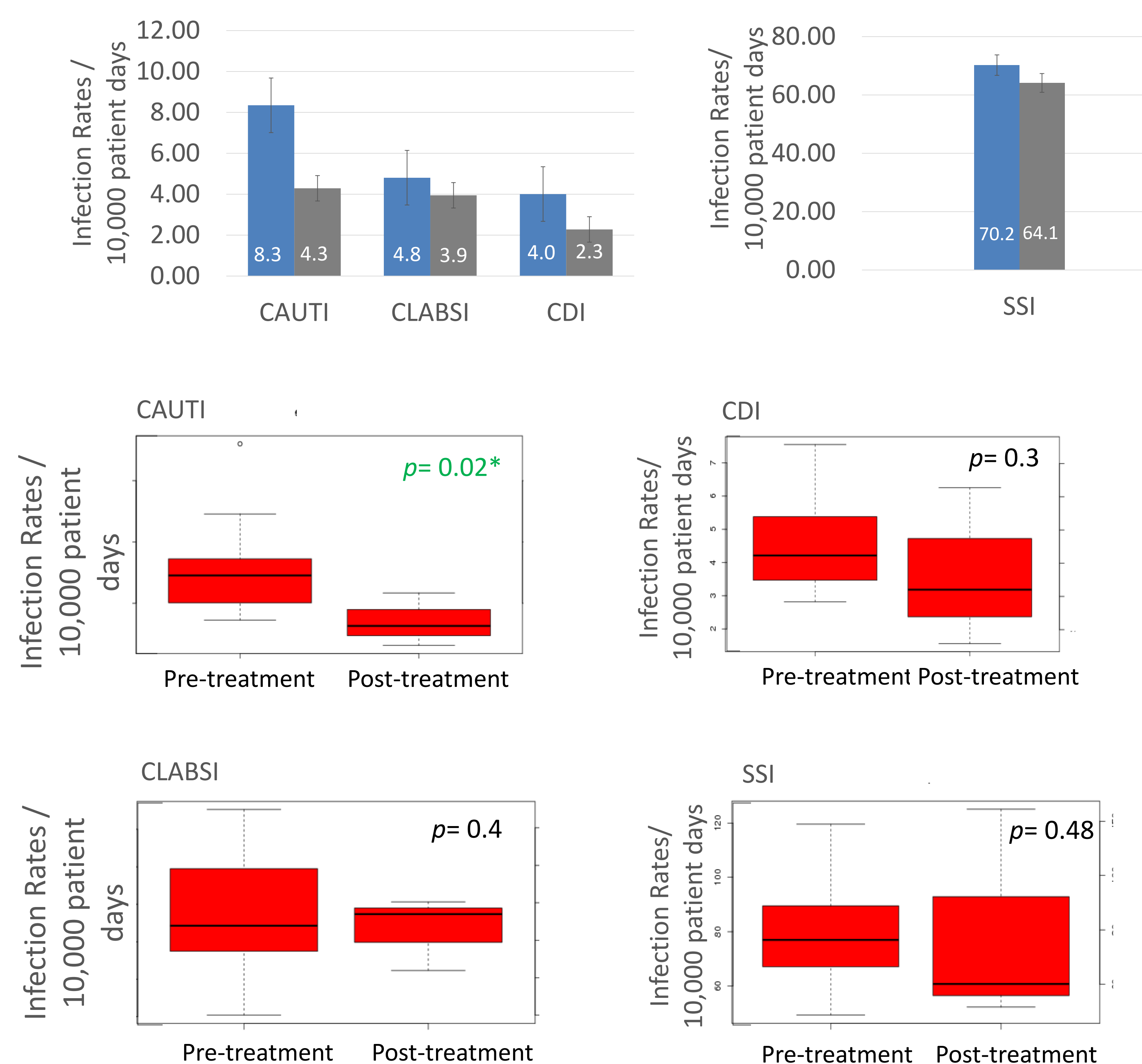


Fig.3: Data for individual infection types were analyzed across the three hospitals. t-test was used to evaluate the statistical significance of the data sets. Post-treatment data for CAUTI shows significant difference when compared to pre-treatment data

Figure 4: Downward trends were observed for all infection types studied across all hospitals

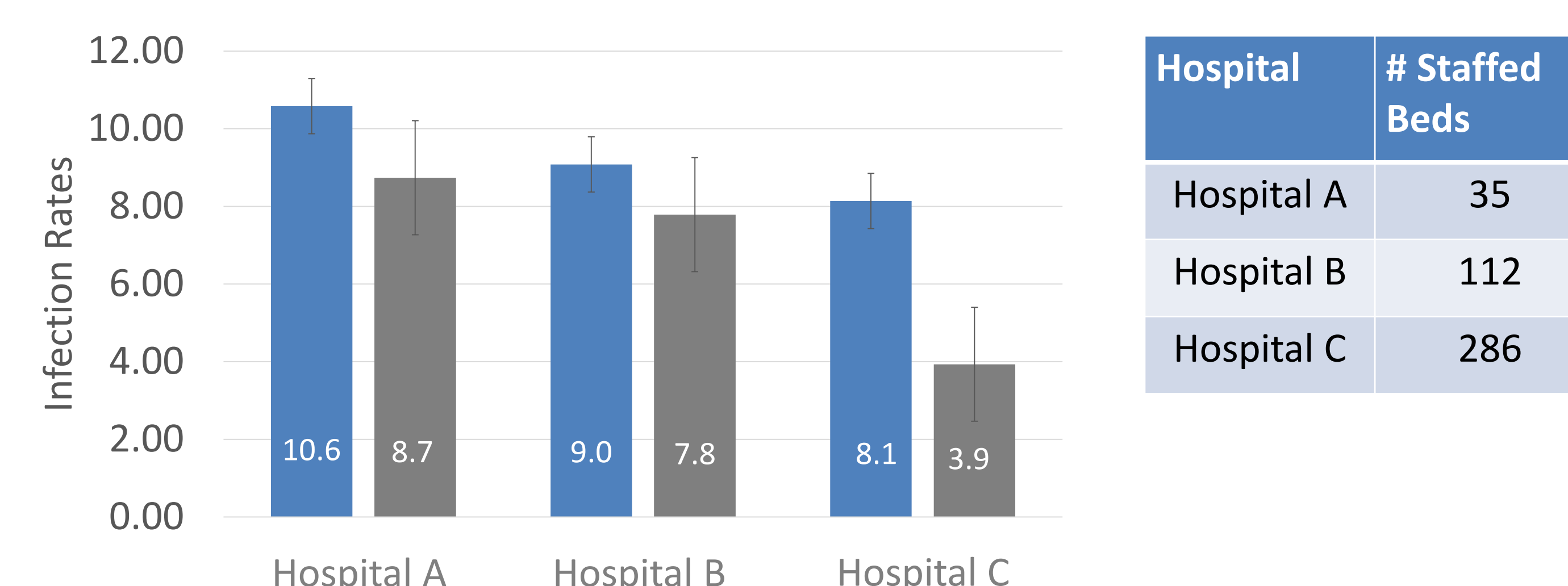


Fig.4: Data for individual hospitals were analyzed across all infection types for pre- and post-silver ion treatment. Hospital C with the most number of beds had the biggest decline in HAI rates at 52%.

Fig. 5: Downward trends were observed for all infection types across all hospitals

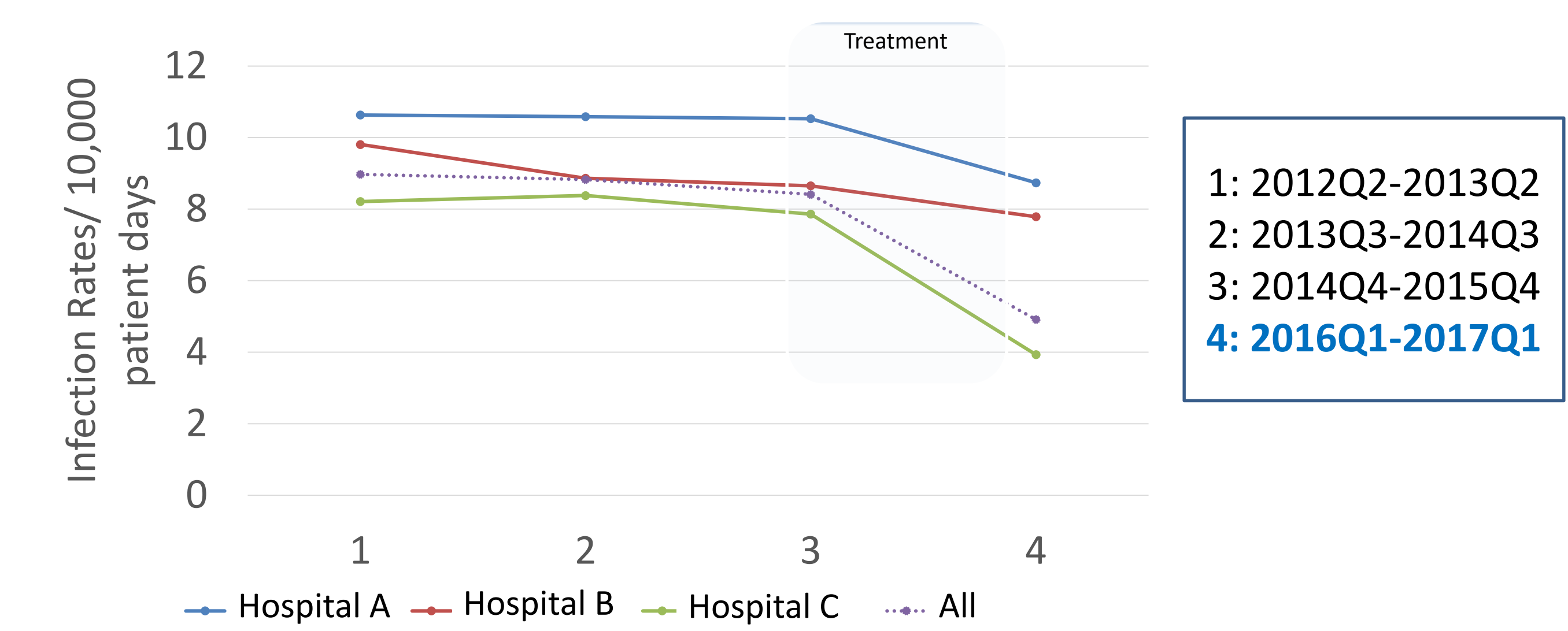


Fig.5: Data was analyzed using Method 2 in groups of 5 quarters and plotted as trends. All infection types at each hospital was combined for each time point.

Figure 6: Average CFU/plate of MRSA Colonies Before (Control) and After Silver Treatment

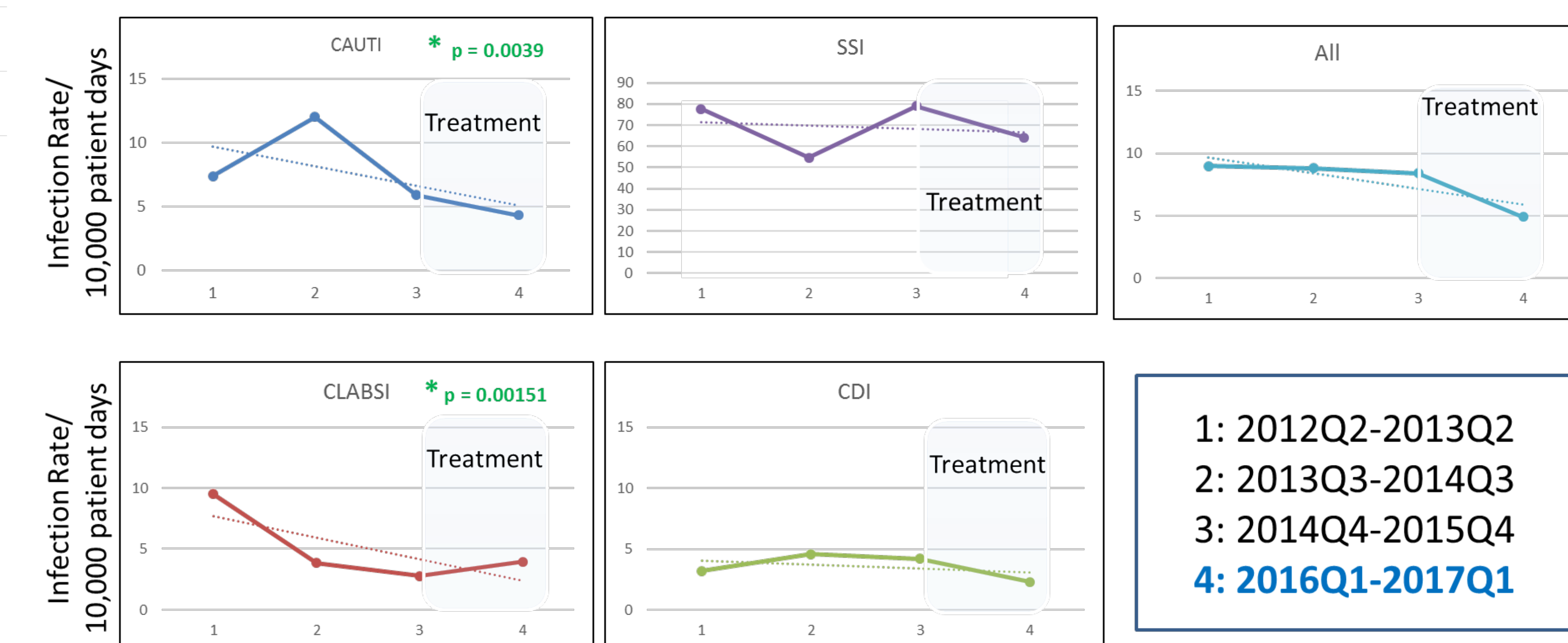


Fig.6: Data was analyzed using Method 2 in groups of 5 quarters and plotted as trends. Data for each infection type was grouped together across all hospitals.

CONCLUSIONS

- A 43% reduction in HAI rates was observed when all the data from the hospitals were compared Pre- and Post- treatment/10,000 patient days
- Results are clinically relevant as demonstrated by the overall reduction in HAI rates
- When rates for individual HAIs were analyzed across hospitals, a downward trend was observed for every Infection Type analyzed
- Infection rates for CAUTI across all hospitals were significantly different as demonstrated by t-test
- Significant decreases in HAI rates (5-quarter trends) for CAUTI and CDI were observed (passed Fisher exact test)
- This study shows that an infection prevention bundle strategy, which included silver ion laundry technology, reduced hospital acquired infection rates. Additional studies will be required to measure the specific impact of silver ions versus the other interventions employed.

Acknowledgements & Disclosures

The authors would like to thank Dr. Leopold Selker (California Polytechnic State University), Dr. Trees Ritter (Central Coast Infectious Disease Consultants), Sue Barnes (National Infection Prevention Consultant), Elizabeth Hutt Pollard (Applied Silver, Hayward, CA) and Sean Morham (Applied Silver, Hayward, CA) for their insightful input.

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