

Reducing Healthcare- Associated Infections with Protecta[®] – An Updated Analysis of Data

Brooke Hossfeld, MPH, CIC, MLS (ASCP)^{CM}

Hospitals and patients are concerned with healthcare-associated infections (HAIs). To reduce the rates of HAIs, Sodexo created a radically different, integrated approach to infection prevention, named Protecta®, in hospitals across the US. The Protecta approach to environmental disinfection has had a statistically significant impact on the level of healthcare-associated infections in participating hospitals. The hospitals studied comprised a diverse set of facilities, including academic and community hospitals with diverse patient populations, as well as hospitals treating multiple levels of acuity. When all hospital HAI data was collected and analyzed, there was a continual reduction in the incidence of healthcare-associated *C. difficile* after implementation of Protecta. Protecta is an integrated approach to infection prevention, blending art and science to provide a unique combination of cleaning and disinfecting chemicals, materials, tools, processes, training, and IT applications focused on reducing infections. Protecta is a scalable solution built around a risk framework and governance processes.

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The Opportunity – Save Lives, Reduce Costs

Healthcare-associated infections (HAIs) impact patient morbidity and mortality and cost hospitals significant sums. These infections kill 75,000 people annually in the US alone, are increasingly resistant to the antibiotics used to treat them, and are “learning” from each other to resist established environmental disinfection strategies. Infection prevention has risen to the forefront of both hospital and patient concerns, but even with the increased spending and effort to combat these pathogens, the pathogens are gaining more ground.

With Protecta, Sodexo offers a proven, outcomes-based and integrated program that demonstrably reduces HAIs. Our data show the effectiveness of Protecta at reducing both healthcare-associated *C. difficile* and MRSA in the United States.



HAIs infections kill 75,000 people annually in the US alone.

The Solution – Protecta Environmental Infection Prevention

Protecta is built around an appreciation of risk – the risk of infection, and the understanding that practical actions need to be taken in different ways at different times. Infection risk



Our data show the proven effectiveness of Protecta.

varies depending not only on a particular environment or specific surface, but also on what activities are being performed in that environment, what type of patients are present, and what equipment or assets are being used. This requires a careful, multi-layered approach, enhancing standard operating procedures with the materials, training, and chemicals specific to the task at hand in addition to a governance regime to ensure that then right steps are being taken in the right way, in the right place, at the right time.

Protecta is an integrated approach, utilizing a proprietary approach combining infection prevention training, processes,



IT support, and state-of-the-art disinfecting chemicals and tools. Evidence-based, it focuses on hiring and training the right People in what can be a challenging role, ensuring the right Processes are put in place and adhered to, and providing the right Technology solutions – solutions that are effective and can be practically used by environmental services staff.

Mounting evidence suggests that pathogenic contamination on hospital surfaces, including floors, contributes to the transmission of HAIs. Studies have shown that contact with the environment is just as likely to contribute to HAI transmission as direct contact with a patient infected with a pathogen^{i,ii}. Furthermore, it has been shown that cleaning interventions alone do not reduce pathogenic load on surfaces – but they are reduced with an intensive effort to improve environmental disinfection .

Risk Framework

Sodexo has developed an operational and risk framework for cleaning and infection prevention in hospitals. At the core are scoring methodologies for microbiological risk. Environmental services teams work with the hospital infection prevention team to develop a specific risk profile for individual areas within the hospital (and all the assets within them) and use this profile to design a set of frequencies, methods, materials and chemicals unique to that location.

Attached to the operational risk framework are governance processes. A cleanliness and infection prevention policy is agreed to with the healthcare provider. This ensures clarity on areas of responsibility, how often reporting systems and

processes are to be employed, what audit and quality protocols are to be established, and, most importantly, how Sodexo adds value to the day-to-day operations of complex organizations. The policy can be designed at hospital system level, and implemented in each hospital as required.

Standard Operating Procedures

Standard Operating Procedures (SOPs) support the risk framework: they cover every type of location and asset, as well as current infection status. This means that the environmental services labor model is designed around the SOPs for a given level of activity and risk, giving predictable outcomes and the flexibility to adjust things quickly (and in a controlled way) when the need arises. Leveraging data from its 3,000 healthcare sites across the globe, Sodexo has established a comprehensive knowledge base, geared to the effective management of healthcare environments.

Routine Auditing

Published audit and inspection methodologies and frequencies ensure hospitals can have confidence that the right action is being performed in the appropriate way to the correct standard. From daily to monthly scheduling, each area of a hospital and every asset within is inspected for cleaning effectiveness. To ensure day-to-day management of risk, activity and outcomes, Sodexo uses proprietary IT solutions. These not only manage assignment of tasks and activities, they also capture hospital reporting on both visual and microbiological standards, with links to track the level, type, and location of any healthcare-



associated infections. Labor management systems and processes link to Sodexo's IT dashboard and assist with the efficient deployment and utilization of monitoring solutions.

Protecta Reduces Infection Rates

Since the launch of Protecta, Sodexo has been actively expanding the program across the United States and has fully implemented it at 67 hospitals. Looking at the outcomes data from all the hospitals combined, there has been a continual reduction in the incidence of healthcare-associated *C. difficile*. The addition of further healthcare facilities to the Protecta program in the last four years has elevated the number healthcare-associated MRSA infections; however, this is an artifact of the increase in cases seen in the numerator and declines over time. There were 24 facilities in 2017; 31 additional hospitals brought the total to 55 facilities in 2018 with full data available comparing the 12 months prior to the 12 months post implementation. Twelve hospitals added in 2019 do not have 12 months post implementation data available at this time for analytic comparisons. Data was collected quarterly from Centers for Medicare and Medicaid Services (CMS) published data; number of cases data was incomplete for 2017. Summary statistics can be found in Tables 1 and 2.

Protecta is built around an appreciation of risk – the risk of infection, and the understanding that practical actions need to be taken in different ways at different times. Infection risk varies depending not only on a particular environment or Data Data extracted from CMS on Hospital Compareⁱⁱⁱ showed that in the 24 healthcare facilities implemented in 2017, the average *C. diff* rate per 1,000 patient days was 0.555 (standard deviation

0.45). As more data was collected throughout 2018 and 2019, the average rate continued to fall to 0.500 (standard deviation 0.33) and 0.336 (standard deviation 0.30). When comparing all 55 sites, the average *C. diff* rate per 1,000 patient days was 0.567 (standard deviation 0.41). This rate fell further to 0.551 in 2018 (standard deviation 0.36) and 0.477 in 2019 (standard deviation 0.29).

For the 24 hospitals implemented in 2017, the average MRSA rate per 1,000 patient days was 0.048 (standard deviation 0.80). As more data was collected throughout 2018 and 2019, the average rate increased to 0.055 (standard deviation 0.62) and 0.065 (standard deviation 0.54). When comparing all 55 hospitals, the average MRSA rate per 1,000 patient days was 0.044 (standard deviation 0.85). This rate increased, again, as more hospitals were added to the data set, to 0.048 in 2018 (standard deviation 0.56) and 0.051 in 2019 (standard deviation 0.67).

Since the launch of Protecta, Sodexo has been actively expanding the program across the United States and has fully implemented it at 67 hospitals. These hospitals saw a 40% decrease in *C. diff* SIR.



40% decrease

Table 1: Summary Infection Statistics for United States hospitals implementing the Protecta program in 2017 (n=24).

	2017	2018	2019
MRSA			
# of MRSA Patient Days	2,248,945	1,868,166	2,057,933
# MRSA Infections	108	103	133
MRSA Infection Rate per 1,000 Patient Days	0.048	0.055	0.065
MRSA SIR	0.902	0.798	0.783
C. diff			
# of C. diff Patient Days	1,693,004	1,708,523	1,886,178
# C. diff Infections	940	855	633
C. diff Infection Rate per 1,000 Patient Days	0.555	0.500	0.336
C. diff SIR	0.763	0.625	0.443

All US Protecta hospital infection data is published by CMS for the full study period (2017-2019). The average reduction in standardized infection ratio (SIR) for the 24 hospitals implemented in 2018 was 13.19% ($p > 0.05$) for MRSA and 41.91% ($p < 0.01$) for *C. diff*. In 2017, the pooled SIR across the 24 hospitals was 0.902 for MRSA and 0.763 for *C. diff*. In 2018, pooled MRSA SIR dropped to 0.798 and pooled *C. diff* SIR dropped to 0.625. These rates continued to drop again in 2019, with pooled MRSA SIR at 0.783 and pooled *C. diff* SIR at 0.443. The average reduction in standardized infection ratio (SIR) for the 55 hospitals implemented in 2018 was -1.85% ($p > 0.05$) for MRSA and 38.291% ($p < 0.01$) for *C. diff*. In 2017, the pooled SIR across the 24 hospitals was 0.812 for MRSA and 0.773 for *C. diff*. In 2018, pooled MRSA SIR dropped to 0.698 and pooled *C. diff* SIR dropped to 0.702. In 2019, the pooled MRSA SIR increased to 0.824 while the pooled *C. diff* SIR continued to decrease to 0.477. Summary statistics can be found in Tables 3 & 4.

Table 2: Summary Infection Statistics for All United States hospitals implementing the Protecta program (n=55).

	2017	2018	2019
MRSA			
# of MRSA Patient Days	4,196,456	3,888,346	4,099,012
# MRSA Infections	184	186	208
MRSA Infection Rate per 1,000 Patient Days	0.044	0.048	0.051
MRSA SIR	0.812	0.698	0.827
C. diff			
# of C. diff Patient Days	3,491,941	3,289,282	3,791,569
# C. diff Infections	1979	1813	1198
C. diff Infection Rate per 1,000 Patient Days	0.567	0.551	0.316
C. diff SIR	0.773	0.702	0.477

This pooled SIR divides the total number of infections across all hospitals and the total number of infections predicted across those hospitals, thereby proposing a weighted average that adjusts infection ratios to account for the increased impact of larger facilities or those with more predicted infections. Therefore, although CMS data uses a slightly different success measure (standardized infection ratios), the data support the impact of the program on reducing infections.

Taking into consideration the adjusted total number of patient days across the hospitals post deployment, this amounts to an avoidance of 29 MRSA infections and 1,723 *C. diff* infections across 24 facilities from 2017-2019, and an avoidance of 119 MRSA and 2,240 *C. diff* infections across 55 facilities from 2017-2019, as seen in Tables 7 & 8. In calculating cost savings, a generalized HAI amount of \$36,259 per infection is used.



The reduction in infection rates at sites in this study can therefore be reasonably attributed to Protecta.

Table 3: Reduction in Infection Rates (SIR) Over Time for United States hospitals implementing the Protecta program in 2017 (n=24).

Reduction In Infection

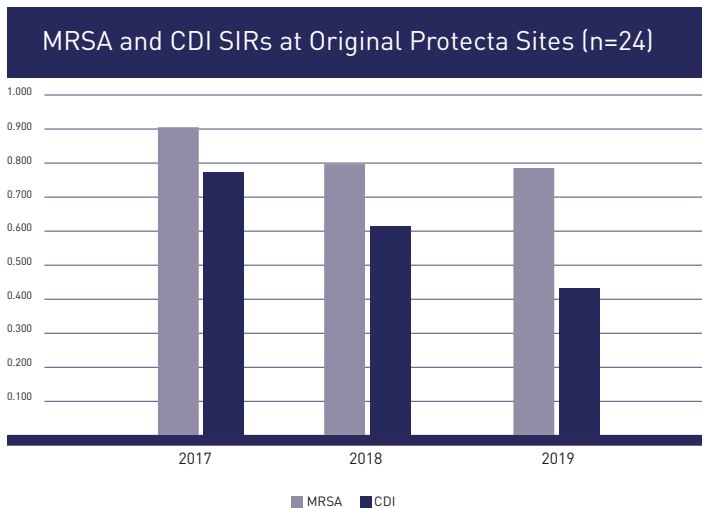
Rates (SIR)	2017-2018	2018-2019	2017-2019
MRSA	11.52% (p>0.05)	1.88% (p>0.05)	13.19% (p>0.05)
C. diff	18.09% (p<0.05)	29.12% (p<0.01)	41.94% (p<0.01)

Table 4: Reduction in Infection Rates (SIR) Over Time for All United States hospitals implementing the Protecta program (n=55).

Reduction In Infection

Rates (SIR)	2017-2018	2018-2019	2017-2019
MRSA	14.04% (p<0.01)	-18.48% (p>0.05)	-1.85% (p>0.05)
C. diff	9.18% (p>0.05)	32.05% (p<0.01)	38.29% (p<0.01)

Table 5: Graphic Representation of Reduction in Infection Rates (SIR) Over Time for United States hospitals implementing the Protecta program in 2017 (n=24).



This equates to a total of \$63,525,768 in cost savings from 1,752 avoided infections (24 facilities, 2017-2019) and \$85,534,981 in cost savings from 2,359 avoided infections (55 facilities, 2017-2019).

The data analysis completed is representative of a diverse set of facilities, including hospitals with large and small patient populations (as seen by the number of patient days statistics) as well as hospitals with severe and less severe infection problems. The data analysis has not explicitly controlled for whether hospitals simultaneously put in place additional infection prevention measures, such as their own hand hygiene or surgical infection prevention protocols, but anecdotally it can be shown that this was not the case. Nor had the hospitals under study experienced any systematic influx of patients with community-acquired *C. difficile* that increased the bioburden at a single facility. The reduction in infection rates at sites in this study can therefore be reasonably attributed to Protecta.

How Have Reduced Infection Rates Been Achieved?

The solution is for environmental services teams to adopt a multi-disciplinary, multi-pronged, multi-tiered approach,

Table 6: Graphic Representation of Reduction in Infection Rates (SIR) Over Time for All United States hospitals implementing the Protecta program (n=55).

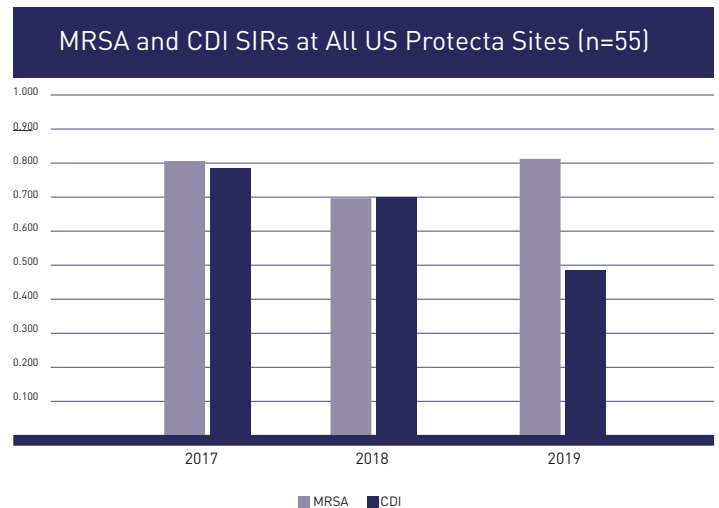


Table 7: Infections Avoided Over Time for All United States hospitals implementing the Protecta program in 2017 (n=24)

	MRSA	C. diff
Expected Number of Infections in 2017	117	1235
Actual Number of Infections in 2017	108	940
# Infections Avoided	9	295
Expected Number of Infections in 2018	118	1169
Actual Number of Infections in 2018	103	855
# Infections Avoided	15	314
Expected Number of Infections in 2019	138	1206
Actual Number of Infections in 2019	133	633
# Infections Avoided	5	573

Note: Expected infections are calculated based on facility-specific data reported to CMS in the previous calendar year.

Table 8: Infections Avoided Over Time for All United States hospitals implementing the Protecta program (n=55)

	MRSA	C. diff
Expected Number of Infections in 2017	225	2419
Actual Number of Infections in 2017	184	1979
# Infections Avoided	41	440
Expected Number of Infections in 2018	227	2440
Actual Number of Infections in 2018	186	1813
# Infections Avoided	41	627
Expected Number of Infections in 2019	245	2371
Actual Number of Infections in 2019	208	1198
# Infections Avoided	37	1173

Note: Expected infections are calculated based on facility-specific data reported to CMS in the previous calendar year.

In calculating cost savings, a generalized HAI amount of \$36,259 per infection is used. This equates to a total of \$63,525,768 in cost savings from 1,752 avoided infections (24 facilities, 2017-2019) and \$85,534,981 in cost savings from 2,359 avoided infections (55 facilities, 2017-2019).

working closely with hospital infection prevention teams. While hospitals do what they must to reduce HAIs – hand hygiene programs, antibiotic stewardship and patient isolation (amongst others) - we can demonstrate that the introduction of a radically different approach to environmental disinfection has a statistically significant impact on the level of healthcare-associated infections in hospitals.

Sodexo has effectively created a safety net, a defensive strategy, for provider organizations for reducing and controlling infections. Protecta® is a foundational program, focusing on the patient environment, that is practical and pays considerable dividends. By using experience from

cleaning over 3,000 hospitals around the world, by working closely with clinicians, by undertaking lengthy pilot studies, and by understanding the literature - Sodexo has created a practical, evidence-based solution which demonstrably reduces patient harm.

References

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ⁱⁱDonskey, C.J. (2013). Does improving surface cleaning and disinfection reduce health care-associated infections? *American Journal of Infection Control*, 41(5), S12-S19. doi:10.1016/j.ajic.2012.12.010

ⁱⁱⁱCMS Hospital Compare <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalCompare>

