Brief Report

Reducing environmental surface contamination in healthcare settings: A statewide collaborative

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To help reduce healthcare-associated infection (HAI) rates across the state, the Maryland Patient Safety Center's Clean Collaborative (Collaborative) supported 17 acute care hospitals, 3 long-term care facilities, and 4 ambulatory surgical centers in improving environmental surface cleaning, with the goal of reducing rates of *Clostridium difficile* infection, which the Collaborative team selected as a proxy for HAIs. Eighty-eight percent of participating facilities achieved the program goal of a 10% reduction in relative light units from the baseline month to the final month of the Collaborative. In addition, participating facilities achieved a 14.2% decrease in *C. difficile* rates compared to only a 5.9% decrease among non-participating facilities (in Maryland).

To help reduce healthcare-associated infection (HAI) rates across the state, the Maryland Patient Safety Center's Clean Collaborative (Collaborative) supported 17 acute care hospitals, 3 long-term care facilities, and 4 ambulatory surgical centers in improving environmental surface cleaning, with the goal of reducing rates of *Clostridium difficile* infection (CDI), which the Collaborative team selected as a proxy for HAIs.[1-3] Facilities collected and reported data for the 12-month period of April 2016 through March 2017. The Collaborative goals were to achieve a minimum of 10% improvement in cleanliness and to simultaneously decrease CDI rates.

METHODS

The Collaborative team took the following steps:

1. Selected an adenosine triphosphate (ATP) monitoring validation technology system to measure cleaning effectiveness.[4,5]
2. Created a web-based portal for inputting participant data and for distributing forms, educational materials, and fact sheets.

3. Created an advisory board that included representatives from the Maryland state health department, Maryland hospital systems, and industry.
4. Developed a list of sampling locations and protocols for collecting samples in patient rooms and public areas, based on industry guidelines.[6] Acute care hospitals and long-term care facilities collected 100 swabs per month, and ambulatory surgical centers collected 25 swabs per month.
5. Trained participants using ATP monitoring validation technology and conducted bi-monthly webinars on topics such as surface cleaning, surface disinfection, and product selection.
6. Analyzed 12 months of facility data. CDI rates were determined by National Healthcare Safety Network definitions.[7] ATP monitoring validation technology results were reported as relative light units (RLUs) to measure cleanliness of surfaces. RLU measurements were used as a proxy for the effectiveness of surface cleaning. Lower RLU results indicated less effective cleaning measures.

RESULTS

Twenty-one of the 24 participating facilities (88%) achieved a 10% reduction in RLUs from the baseline month to the final month of the Collaborative. Seventy-five percent of participating facilities exceeded this goal by reducing average RLUs by more than 50%.

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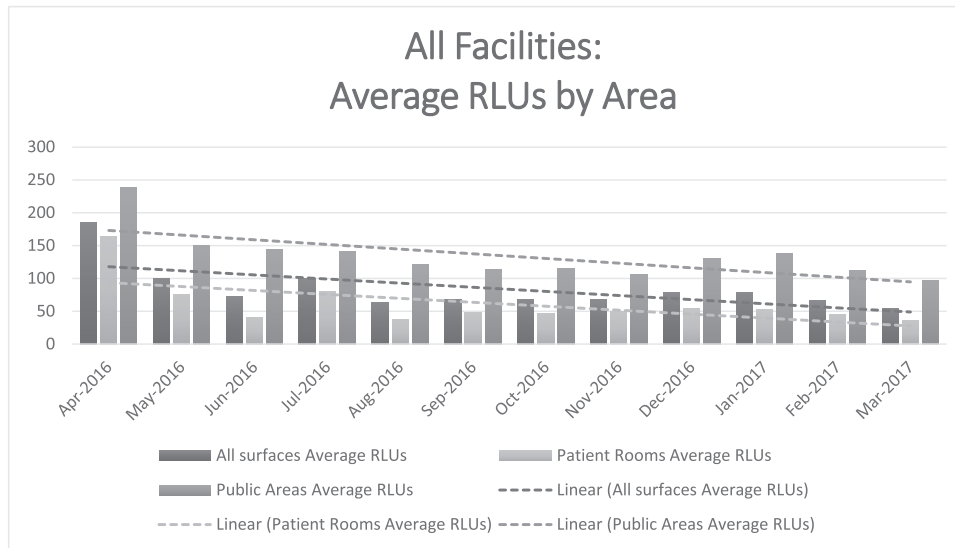Conflicts of interest: None to report.

Fig 1. Average RLUs for all surface and facility types from the baseline month to the final month.

As shown in Figure 1, from the baseline month to the final month of the Collaborative, for all facility types and all surface types, facilities achieved a 70% decrease in average RLUs; for patient room surfaces, facilities achieved a 79% decrease in average RLUs; and for public surfaces, facilities achieved a 59% decrease. When assessing average RLUs for patient room surfaces across the different types of facilities, acute care hospitals, ambulatory surgical centers, and long-term care facilities decreased average RLUs by 69%, 84%, and 88%, respectively.

As shown in Figure 2, the Collaborative team ranked average RLUs by surface type. Observations included: (1) public surfaces had higher RLUs than those of patient rooms; (2) in patient rooms, window sills had the highest average RLUs; (3) surfaces closer to the patient frequently had higher RLU measurements than those farther away from the patient; (4) the call box/button had higher RLUs than bathroom surfaces; and (5) public cafeteria tables had higher average RLU measurements than public restroom door handles.

The Collaborative team compared the CDI rates of participating acute care facilities with the CDI rates of facilities in Maryland that did not participate in the Collaborative. They found that, from the baseline month to the final month, participants in the Collaborative achieved a 14.2% decrease in CDI rates compared to only a 5.9% decrease among non-participating facilities. However, study design limitations prevented a sufficiently powered statistical analysis to detect a relationship between RLUs and CDI.

DISCUSSION

The most improvement in average RLUs from the baseline month to the final month of the Collaborative was observed in patient room surfaces as compared to public area surfaces. The Collaborative team recognizes that the Hawthorne effect[8] may have played a role in the reduction of RLUs. Another plausible reason for the reduction of RLUs may have resulted from participants sharing ideas in educational sessions regarding different best practices. In addition, facilities that provided immediate feedback to environmental services professionals were able to revise and enhance existing processes in their facilities in a timely manner. Many participating facilities employed engineering controls, such as automatic doors, more strategically placed hand sanitizers, and automatic flushers. Additionally, environmental services teams partnered with other

Surface	Average RLUs
Public café table	181
Public break room table	178
Public elevator button	155
Public bathroom door handle	151
Public lobby seating	134
Public break room seat	125
Public information desk	110
Window sill	106
Public café seating	102
Public bathroom faucet	85
Public soap dispenser	84
Call box/button	81
Room in door knob	77
Chair	76
Telephone	74
Toilet seat	73
Bathroom in door knob	63
Toilet flush handle	60
Bathroom sink	59
Bed rails/controls	57
Blood pressure cuff	57
Room sink	56
Room outer door knob	49
Bathroom light switch	48
Bathroom hand rails	48
Tray table	46
Monitor	46
Bed rails/stretcher	44
Room/bath sink	41
Bedside table handle	40
IV pole (grab area)	35
Overhead pull-down light	25
Room light switch	20

Fig 2. Average RLUs by surface type: April 2016-March 2017, all facility types.

departments, such as the security department, to have lobby desk workers clean public surfaces at the beginning of their shift.

Overall, the program goal of a 10% reduction in RLUs from the baseline was achieved. Participants in the Collaborative achieved a 14.2% decrease in CDI rates compared to only a 5.9% decrease among non-participating facilities. Moreover, the collaborative process was an excellent tool for fostering teamwork between environmental services professionals and infection preventionists.

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