Reducing Clostridium difficile Infection among Hematology-Oncology Patients Using Ultraviolet Germicidal Irradiation for Terminal Room Disinfection

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Background:
- Clostridium difficile forms spores that are resistant to many disinfectants and can persist in the hospital environment for months.
- During 2013 (baseline period, Jan.-Dec. 2013), there were 87 cases of hospital onset C. difficile infection (CDI) among patients on three Hematology/Oncology units—a rate 5 times higher than that for all other inpatient units combined.
- Cases of CDI continued to occur despite targeted evidence-based interventions and EVS process improvements, including use of bleach for daily and terminal room cleaning of CDI rooms, process monitoring and feedback of cleaning effectiveness.
- We performed a 12-month pre/post evaluation of electronic tracking of UVGI deployment.

Methods:
Setting: Three adult hematology-oncology units with a total of 75 private and 7 semiprivate rooms in a 695-bed tertiary care hospital.

UVGI deployment:
- Targeted CDI or contact precautions rooms for UVGI using an electronic patient flow system (Navicare, Hill-Rom).
- Following terminal room cleaning with bleach, UVGI (Optimum-UV, Clorox Healthcare) was deployed for two 8-minute cycles on either side of the patient bed with the bathroom door left open.
- Two UVGI units and no additional Environmental Service personnel or resources were utilized for this evaluation.

Measurements:
- C. difficile detected by toxin A/B and GDH immunoassay; indeterminate results confirmed by PCR for toxin gene; NHSN GIT definition.
- Compared rates of healthcare onset CDI on study units and non-study units:
- Calculated rate ratios and a mixed-effects Poisson regression model with random effects for unit and time in months.

Results—Impact of UVGI on C. difficile Infection:
- During a 52-week intervention period, UVGI was deployed for 21.1% (542/2569) of all patient discharges on the three study units (mean, 10.4 deployments/week; Figure 2).
- Rates of CDI declined 25% on the study units and increased 16% on non-study units during the intervention vs. baseline period.
- There was a significant association between UVGI use and decline in CDI incidence (Table 1, Figure 3).
  - Study Units: incidence rate ratio [IRR] 0.49; 95% CI, 0.26-0.94 (P=0.03)
  - Non-study units: IRR = 0.63, 95% CI: 0.38-1.06 (P=0.08)
- Impact on CDI driven primarily by one study unit with the highest UVGI deployment:
  - Unit 1: IRR = 0.34, 95% CI 0.12-0.99 (P=0.049)

Process Improvement:
- Weekly reporting of UVGI deployment and room cleaning metrics
- Redeployment of additional Environmental Services associates to second shift (3-11 pm) and cross-training to improve UVGI deployment during peak discharge times.
- Deployment of a second UVGI unit during Sep. 2014.
- Feedback and recognition of associates deploying UVGI.

Conclusions:
- UVGI deployment was associated with a 25% reduction in CDI incidence among high-risk Hematology/Oncology patients over a 12-month evaluation period.
- Reflecting the targeted deployment and short cycle times, UVGI had no negative impact room turn-around time.
- Without additional environmental services staff for the evaluation, innovative administrative and technical solutions were required.
- Spreading deployment of UVGI to other patient-care areas required hiring dedicated environmental service staff.

References:

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