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Inter-hospital Variation in Time Required for Hospital Room Ultraviolet (UV)-C Irradiation

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Abstract

Background: "No touch" room decontamination techniques such as UV-C irradiation are used increasingly to improve the effectiveness of room cleaning but pose implementation challenges. We herein describe preliminary experience from the use of UV-C emitting devices in an ongoing multicenter interventional study.

Methods: Eight hospitals used 1-4 automated UV-C emitting devices (Tru-D SmartUVCÔ; Lumalier Corporation) from 5/1/12-4/1/13. Trained environmental services (EVS) personnel at each hospital followed specific protocols to operate the UV-C devices. One of two UV-C dose cycles was used: 12,000 µWs/cm^2 for vegetative bacteria or 22,000 µWs/cm^2 for spores (i.e., *C. difficile*). Automated UV-C devices measured the delivered doses of UV-irradiation before automatically turning off. EVS personnel recorded irradiation run times and whether or not the cycle was interrupted. Differences in run times across hospitals were compared using factorial ANOVA.

Results: A total of 9,935 rooms were irradiated using the UV-C emitting devices during the 11-month study period. The median run time per room was 33 minutes (IQR 25-44). Run times varied significantly among study hospitals (p<0.001, Figure 1). 7,709 (78%) rooms were irradiated using the vegetative bacteria cycle; 1,309 (13%) rooms were irradiated using the spore cycle. Cycle type was not recorded for 917 (9%) rooms. The median run time for the vegetative bacteria cycle was 31 minutes (IQR 24.5-41). The median time for the spore cycle was 52 minutes (IQR 39-66). Run times varied significantly among study hospitals for both vegetative (p<0.001) and spore cycles (p<0.001).

Conclusion: The cycle time to complete UV-C decontamination varied between hospitals. Time variation was likely related to differences in the amount and type of materials in rooms and room design, layout, and size. These data illustrate that UV-C emitters without built-in programs to measure the total dose of irradiation may either under or overestimate the time necessary to adequately disinfect patient rooms.

Background

- Current strategies for room cleaning are inadequate
- "No touch" strategies such as UV-C irradiation are used increasingly to improve room cleaning
- UV-C irradiation poses an implementation challenge
  - UV-C adds time to room turnover
  - Identifying rooms that require UV-C irradiation can be difficult
- **OBJECTIVE**: To describe our preliminary experience with using UV-C emitting devices in an ongoing multi-center, cluster randomized trial

Methods

- UV-C emitting device: Tru-D SmartUVC™ (Lumalier, Memphis, TN)
- Setting: 8 hospitals
- Study period: 5/1/12 – 4/1/13
- Trained EVS personnel followed trained protocols
  - Cleaning contact precaution rooms
  - Use and placement of Tru-D machines
- One of two cycles used:
  - 12,000 µWs/cm^2 for rooms on contact precautions because of MRSA, VRE, or MDR-*Acinetobacter*
  - 22,000 µWs/cm^2 for rooms on contact precautions because of *C. difficile*
- Differences in run times across hospitals compared using factorial ANOVA

Results

- 9,935 rooms irradiated during 11 month time period
  - Median run time = 33 minutes (IQR 22-44)
- Run times varied significantly by hospital (Figure 1)
  - Hospital D median run time = 20 min (IQR 9-50)
  - Hospital E median run time = 47 min (IQR 33-65)
- 7,709 (78%) rooms irradiated using vegetative bacteria cycle
  - Median run time=31 min (IQR 24.5-41)
- 1,309 (13%) rooms were irradiated using the spore cycle.
  - Median run time=52 min (IQR 39-66)

Figure 1. Run times* for an automated UV-C emitting device in 8 hospitals – all cycles (n=9,935)

p<0.001
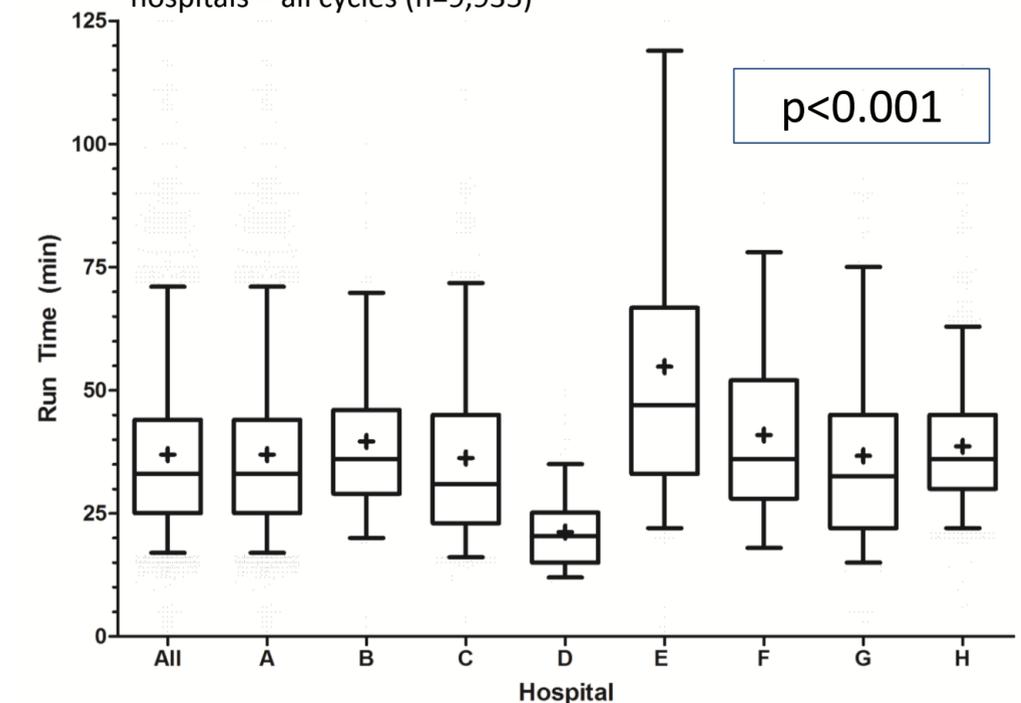
*Box and whisker plot shows median, IQR, 95% CI and mean (+)

Conclusions

- The Tru-D SmartUV C™ prolonged terminal room cleaning times more than 30 minutes
- The cycle time to complete the UV-C light treatment varied significantly between hospitals.
- Time variation may have been related to differences in the amount and type of materials in rooms; room design, layout, and size; and/or reflectivity due to differences in paint and size/location of windows.
- UV-C light emitters without built-in programs to measure the total dose of irradiation are likely to either under or overestimate the time necessary to adequately disinfect patient rooms.