

The Benefits of Enhanced Terminal Room (BETR) Disinfection Study: A Cluster Randomized, Multicenter Crossover Study with 2x2 Factorial Design to Evaluate the Impact of Enhanced Terminal Room Disinfection on Acquisition and Infection Caused by Multidrug-Resistant Organisms (MDRO)

Background:

Enhanced terminal disinfection may decrease the risk of acquiring MDROs from the environment, but these strategies have not been evaluated in a large, randomized trial.

Methods:

The BETR-Disinfection study was performed over 28 months in 9 study hospitals from 4/2012 to 7/2014. Each hospital used four strategies for terminal room disinfection in a randomized sequence. Each strategy was used for 7-month study arms, including a 1 month wash-in period. Two of these strategies used a UV-C emitting device. Standard cleaning involved the use of a quaternary ammonium (reference group A). Three enhanced cleaning strategies were evaluated and compared to the reference: quaternary ammonium + UV-C (B), bleach (C), and bleach + UV-C (D). Of note, bleach was used for daily and terminal disinfection of all known *C. difficile* rooms, regardless of study arm. Study cleaning strategies were employed in seed rooms, defined as a room containing a patient on contact precautions for infection or colonization due to the following 4 target MDROs was discharged: MRSA, VRE, *C. difficile*, or MDR *Acinetobacter*. The next patient in the room was considered an exposed patient. Our primary outcome was the clinical incidence of all target MDROs in patients exposed for at least 24 hours, defined as the first positive culture of a MDRO a) during exposure to the seed room, if positivity occurred ≥ 48 hr post-admission to the seed room, or b) in the 90 days following seed room exposure for MRSA, VRE, and MDR-*Acinetobacter* and 28 days for *C. difficile*. Rates were calculated as outcome/10,000 exposure days using intention-to-treat and per protocol principles. Models controlled for time period, hospital, and correlation between different study phases within the same hospital.

Results:

A total of 311,407 patients had 606,828 unique room stays in the study hospitals during the study; 24,589 eligible patients were exposed resulting in 122,873 exposure days (Figure 1). The clinical incidence of all target MDROs was 37% lower in Group B ($p=0.03$) and 32% lower in Group D ($p=0.01$) compared to Group A in ITT analyses (Figures 2 and 3). Results from PP analyses were largely similar.

Conclusion:

Enhanced terminal room disinfection strategies that utilized UV-C emitters reduced the risk of acquisition and infection caused by target MDRO.

Figure 1. Patient enrollment and eligibility for BETR-Disinfection study outcomes

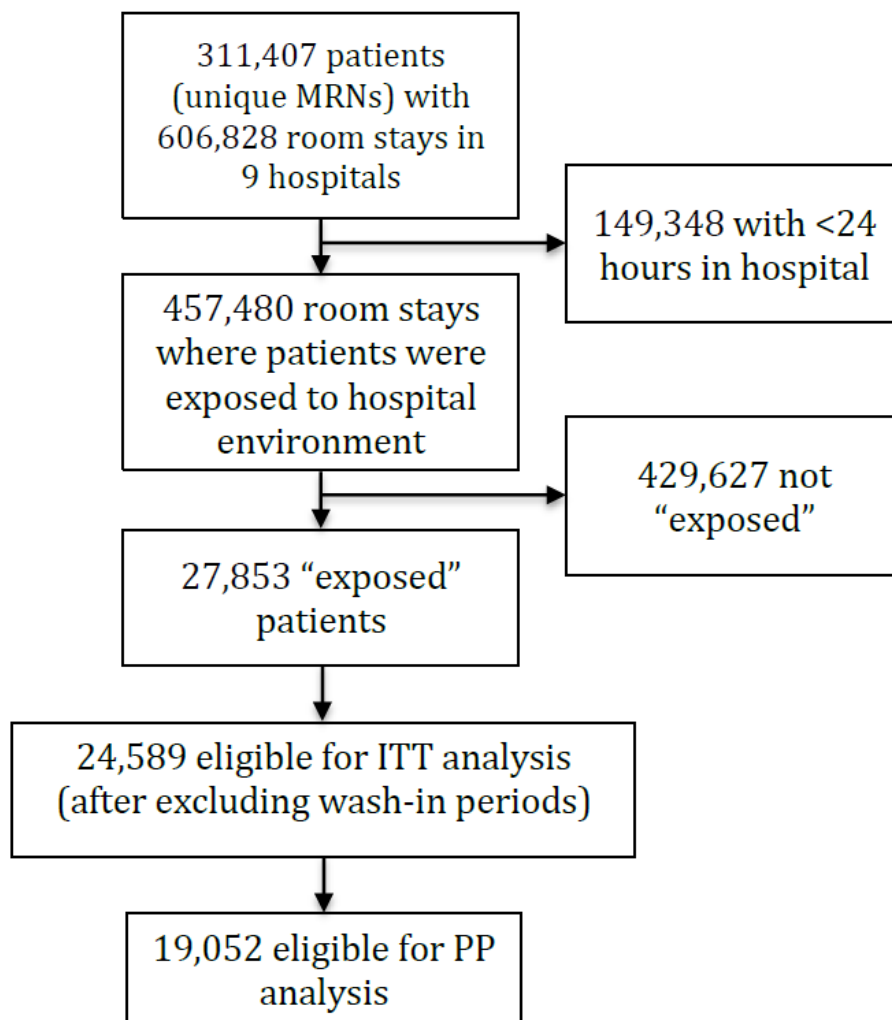
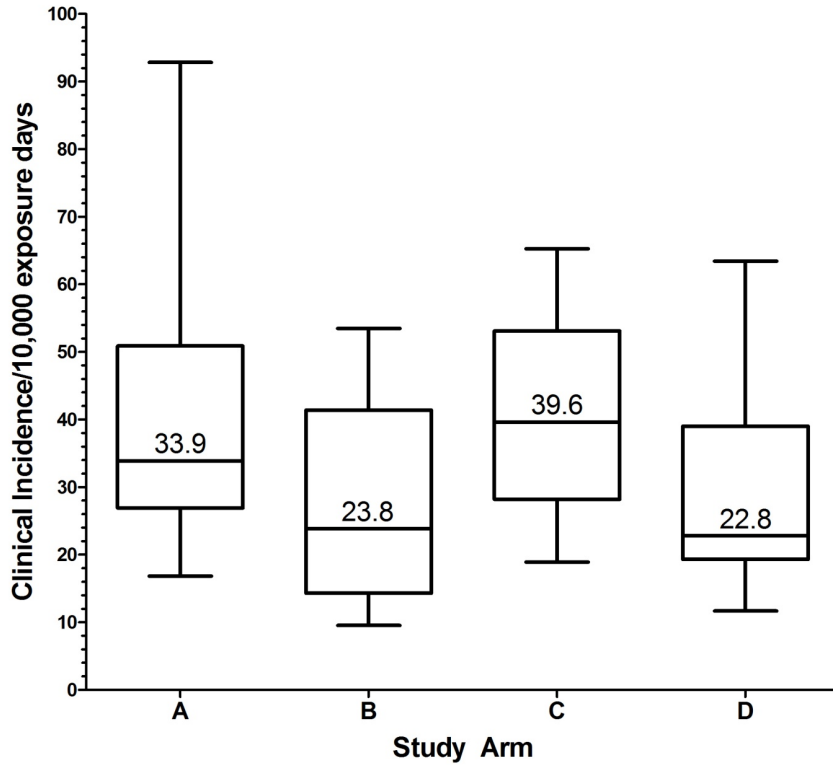
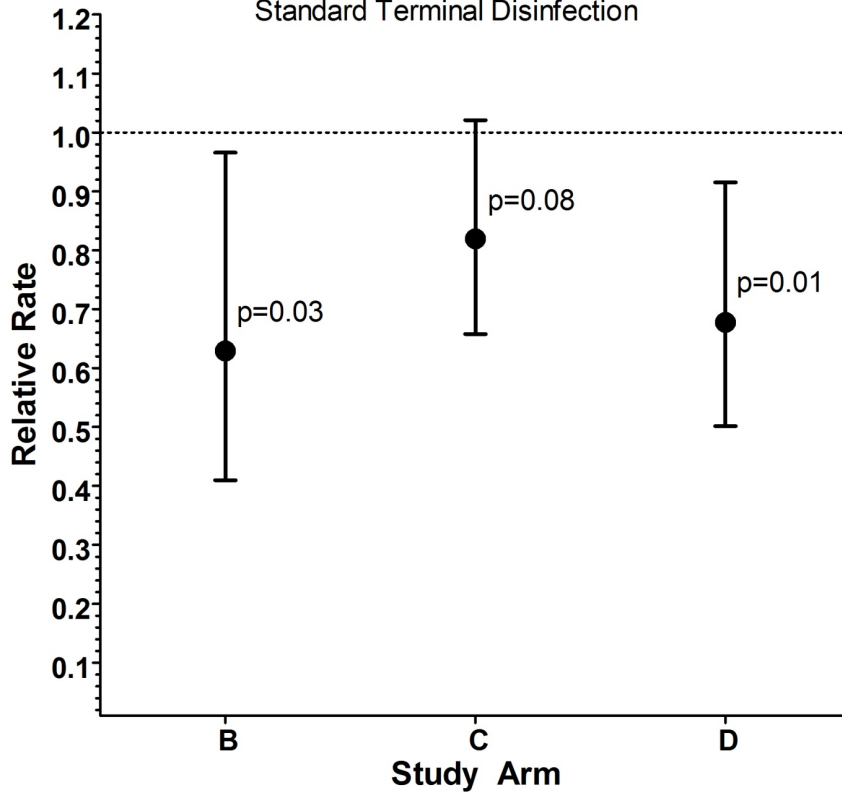


Figure 2. ITT Analysis - Clinical Incidence of All Target MDROs following 4 Terminal Room Disinfection Strategies in 9 Hospitals



Study Arm Description: A-quaternary ammonium (reference); B-quaternary ammonium+UV-C emitter; C-bleach; D-bleach+UV-C emitter

Figure 3. ITT Analysis - Relative Clinical Incidence of All Target MDROs following Enhanced Terminal Room Disinfection Strategies* in 9 Hospitals Compared to Standard Terminal Disinfection



*Study Arms B (quaternary ammonium+UV-C emitter), C (bleach), and D (bleach+UV-C emitter) were compared to Study Arm A (quaternary ammonium). Model controlled for time period, hospital, and correlation between different study phases within the same hospital

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