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Enhanced terminal room disinfection and acquisition and infection caused by multidrug-resistant organisms and *Clostridium difficile* (the Benefits of Enhanced Terminal Room Disinfection study): a cluster-randomised, multicentre, crossover study

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Background

Patients admitted to hospital can acquire multidrug-resistant organisms and *Clostridium difficile* from inadequately disinfected environmental surfaces. We determined the effect of three enhanced strategies for terminal room disinfection (disinfection of a room between occupying patients) on acquisition and infection due to meticillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci, *C difficile*, and multidrug-resistant *Acinetobacter*.

Methods

We did a pragmatic, cluster-randomised, crossover trial at nine hospitals in the southeastern USA. Rooms from which a patient with infection or colonisation with a target organism was discharged were terminally disinfected with one of four strategies: reference (quaternary ammonium disinfectant except for *C difficile*, for which bleach was used); UV (quaternary ammonium disinfectant and disinfecting ultraviolet [UV-C] light except for *C difficile*, for which bleach and UV-C were used); bleach; and bleach and UV-C. The next patient admitted to the targeted room was considered exposed. Every strategy was used at each hospital in four consecutive 7-month periods. We randomly assigned the sequence of strategies for each hospital (1:1:1:1). The primary outcomes were the incidence of infection or colonisation with all target organisms among exposed patients and the incidence of *C difficile* infection among exposed patients in the intention-to-treat population. This trial is registered with [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01579370), NCT01579370.

Findings

31 226 patients were exposed; 21 395 (69%) met all inclusion criteria, including 4916 in the reference group, 5178 in the UV group, 5438 in the bleach group, and 5863 in the bleach and UV group. 115 patients had the primary outcome during 22 426 exposure days in the reference group (51.3 per 10 000 exposure days). The incidence of target organisms among exposed patients was significantly lower after adding UV to standard cleaning strategies (n=76; 33.9 cases per 10 000 exposure days; relative risk [RR] 0.70, 95% CI 0.50–0.98; p=0.036). The primary outcome was not statistically lower with bleach (n=101; 41.6 cases per 10 000 exposure days; RR 0.85, 95% CI 0.69–1.04; p=0.116), or bleach and UV (n=131; 45.6 cases per 10 000 exposure days; RR 0.91, 95% CI 0.76–1.09; p=0.303) among exposed patients. Similarly, the incidence of *C difficile* infection among exposed patients was not changed after adding UV to cleaning with bleach (n=38 vs 36; 30.4 cases vs 31.6 cases per 10 000 exposure days; RR 1.0, 95% CI 0.57–1.75; p=0.997).

Interpretation

A contaminated health-care environment is an important source for acquisition of pathogens; enhanced terminal room disinfection decreases this risk.

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