Table B.36: MDRO, Environmental Cleaning—Systematic Reviews

Note: Full references are available in the [Section 5.4 reference list](#Section5point4refs).

| **Author, Year** | **Description of Patient Safety Practice** | **Setting/s, Population/s** | **Summary of Systematic Review Findings** | **Implementation Themes/Findings** | **Notes** |
| --- | --- | --- | --- | --- | --- |
| **Marra et al., 201829** | Use of no-touch disinfection methods, including: ultraviolet light (UVL), hydrogen peroxide mist, hydrogen peroxide vapor (HPV), and traditional environmental cleaning methods | Healthcare settings, multidrug-resistant organism (MDRO) healthcare-associated infections (HAIs), United States and United Kingdom | When the results of the UVL studies were pooled, statistically significant reduction in *C. difficile* infection (CDI) (pooled risk ratio, 0.64; 95% confidence interval [CI], 0.49 to 0.84) and vancomycin-resistant *Enterococci* (VRE) infection rates (pooled risk ratio, 0.42; 95% CI 0.28 to 0.65) were observed. No differences were found in rates of methicillin-resistant *Staphylococcus aureus* (MRSA), or Gram-negative multidrug-resistant pathogens.  UVL and hydrogen peroxide mist or vapor should be used to augment traditional cleaning methods. Using UVL no-touch technology to enhance environmental hygiene can decrease HAIs for specific pathogens, specifically CDIs and VRE infections. For CDI prevention, there seems to be a benefit for hospitals with high baseline CDI rates. There was some evidence of a decrease in VRE infection with HPV disinfection, but more studies are needed to confirm these results. | Two studies on UVL performed a cost-effectiveness evaluation of using no-touch technology after terminal cleaning, with annual costs for the first year estimated to be nearly $300,000 (including personnel and equipment acquisition), and approximately $200,000 for the next year. The authors determined that randomized trials and cost-effectiveness studies are needed. | Organisms/Outcomes:  *C. difficile,* MRSA, VRE, other MDROs  Systematic review included many studies that were before-and-after quasi-experimental studies, which are subject to multiple biases. |
| **Nikitovic-Jokic et al., 201861** | Use of no-touch disinfection method: portable UVL surface-disinfecting devices | Hospitals, United States | The researchers were not certain of the effectiveness of UVL disinfection in reducing HAIs, given the very low to low quality of evidence, using the GRADE rating system. The intervention was effective in reducing the rate of the composite outcome of HAIs (combined) and colonization (but quality of evidence was low). The authors estimated that the typical cost for a hospital that purchased two portable devices would be $586,023 over 5 years for devices that use pulsed xenon technology and $634,255 over 5 years for devices that use mercury technology. | More rigorous evidence is needed to support the use of portable UVL surface disinfecting technologies in reducing HAIs and environmental MDRO contamination to justify the high cost. | Organisms/Outcomes:  *C. difficile* and “combined HAIs” that varied per reviewed article but included MRSA, carbapenem-resistant Enterobacteriaceae(CRE), VRE, multidrug-resistant *Acinetobacter* (MDR-A), *Acinetobacter baumannii, Klebsiella pneumonia*e, MDR Gram-negative bacteria, extended-spectrum beta lactamase-producing Enterobacteriaceae(ESBL-E), MDR *Pseudomonas aerigunosa,* and *Stenotrophomonas maltophilia* |
| **Tacconelli et al., 20141** | Use of environmental screening during outbreaks, use of education, monitoring (e.g., fluorescent gel markers), feedback to improve quality of environmental cleaning, use of antimicrobial surfaces, reduction of shared equipment, and use of disinfectants versus detergents | Hospitalized patients, International | Environmental cleaning is often assessed as a bundle of interventions in an endemic situation and thus does not have strong studies assessing its efficacy. The authors recommend environmental screening when infection control practices fail to stem an outbreak. Cleaning inspections, education, monitoring and feedback, and observation of staff can also improve performance and thoroughness.  Bacteria within biofilms may display greater capacity for antimicrobial resistance and can tolerate chlorine and other disinfectants. Disinfectants are more effective at killing pathogens than detergents, but some hospital pathogens can resist the bactericidal effect of particular agents. Disinfectant solutions themselves can become contaminated with bacteria, so containers used should also be cleaned. There is ambiguous support for antimicrobial surfaces (i.e., silver surfaces).  Epidemic settings: Vacate rooms and monitor cleaning and adherence to policies; reduce sharing of equipment if a patient is colonized or infected.  Endemic settings: Have cleaning procedures and policies; reduce sharing of equipment if a patient is colonized or infected. | Methods for assessing cleanliness are needed, both for scientific studies and to reassure staff and patients. Such methods can be defined within two main categories: process evaluation, where the cleaning process is monitored by visual inspection or with a fluorescent gel marker; and outcome evaluation, where cleanliness is evaluated with the use of adenosine triphosphate (ATP) bioluminescence systems or microbial cultures. | Organisms/Outcomes:  MDR Gram-negative bacteria |
| **Teerawattana-pong et al., 201747** | Multicomponent interventions including environmental cleaning, antimicrobial stewardship, decolonization methods, source control, and combinations of the above | Adult ICU patients, Belgium, Brazil, Canada, China, Europe, France, Germany, Hungary, Israel, Italy, Netherlands, Spain, South Korea, Thailand, Vietnam, United States | Of 3,805 publications retrieved, 42 met inclusion criteria (5 randomized controlled trials and 37 observational studies). These 42 studies included 62,068 patients (median age, 58.8 years). Environmental cleaning bundled with antimicrobial stewardship, evaluation of standard care, and source control was the most effective intervention for reducing MDR *A. baumanii* (MDR-AB), ESBL-E, and CRE acquisitions. Compared with standard care, a four-component strategy composed of the same standard care combined with antimicrobial stewardship, environmental cleaning, and source control was the most effective intervention (rate ratio [RR], 0.05; [95% CI, 0.01 to 0.38]).  When environmental cleaning was added to a program of standard care with antimicrobial stewardship, or when source control was added to standard care with environmental cleaning, there was a significant reduction in the acquisition of MDR-AB (RR, 0.28 [95% CI 0.18 to 0.43] and 0.48 [95% CI 0.35 to 0.66], respectively). | Environmental cleaning bundled with antimicrobial stewardship, evaluation of standard care, and source control was the most effective intervention for reducing MDR-AB, ESBL, and CRE acquisitions. | Organisms/Outcomes:  MDR-AB, CRE, and ESBL-Enterobacteriaceae |