JBI EVIDENCE SUMMARY

HOSPITAL ENVIRONMENTAL HYGIENE: CLEANING AND DISINFECTING ENVIRONMENTAL SURFACES

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Question

What is the best available evidence regarding hospital environmental hygiene practices and the efficacy of cleaning and disinfecting hospital environmental surfaces?

Clinical Bottom Line

Hospital environmental hygiene involves the appropriate cleaning and decontamination of surfaces and equipment within the hospital setting with items and surfaces categorized as critical, semi-critical and non-critical.[1] Critical items refer to those which come into direct contact with sterile tissues or the vascular system; semi-critical items are those which contact mucous membranes and non-intact skin and non-critical items may come into contact with skin but not the mucous membranes.[1,2] Environmental surfaces form part of the non-critical items and include surfaces and equipment such as furniture, floors, walls, chairs, intravenous poles, stethoscopes, bed pans, and blood pressure cuffs.[1-4] Environmental surfaces are also often grouped into low-touch and high-touch surface areas reflecting the frequency in which the surface is touched by hands. As an example, low touch surfaces refer to floor, ceilings, window curtains and high-touch surfaces include doorknobs, bed rails, light switches, and surfaces around the toilet. The cleaning of environmental surfaces to reduce surface contamination is considered an important strategy, alongside hand hygiene, to reduce the transmission and risk of infection and has been recently recognized as a key component of infection prevention and control.[2,4,5] The evidence informing this summary is based on expert consensus guidelines and findings from systematic reviews.

MULTI-MODAL STRATEGY

- Optimal cleaning practices are dependent upon five main variables: 1) the product applied, 2) the technique and equipment used to apply the product, 3) the type of surface, 4) the level of contamination of the environment and 5) the personnel performing the cleaning. A multi-modal strategy that considers these five variables is required in order to positively change cleaning practices[5] (Level 5)
- A bundle approach is further advocated and it is suggested that components of the approach include creating policies and procedures for cleaning, selecting appropriate cleaning and disinfecting products, educating staff to include environmental surfaces, monitoring compliance with feedback and implementing a ‘no touch’ room decontamination.[2] (Level 5)
- The findings from a study evaluating the implementation of a targeted multi-modal environmental hygiene bundle in a 400 bed public teaching hospital reported no statistically significant change in infection rates between pre and post implementation but significant improvement in cleaning performance as demonstrated by increased removal of ultraviolet markers (from 61.1% to 95.4%). Knowledge and attitudes were shown to improve after the intervention. The bundle comprised of multidisciplinary team (infection control, environmental services and a member of the research team); training and supportive education materials (two-hour long session including scenario based learning and hands on simulations, plus an instructional booklet); improved documentation (duty statements, policies and procedures); feedback of results (direct individual feedback on audit results, group feedback on aggregated results)engagement activities including local champions, hospital wide promotion of the importance of cleaning and individual, team and hospital recognition).[6] (Level 2)
- Environmental cleaning programs should be structured and facilitated at the facility level, and include cleaning schedules that specify frequency, methods, and staff responsibility.[3] (Level 5)

TYPE OF PRODUCT

- A variety of products (detergents and disinfectants) are available to assist with cleaning environmental surfaces. The selection of products for cleaning and disinfecting hospital environmental surfaces needs to consider the potential for patient contact, the degree and frequency of hand contact and the potential contamination of the surface.[2,3] (Level 5)
- A systematic review assessed the effects of routine disinfection of environmental surfaces through the combined use of a detergent and a disinfectant compared with the use of a detergent. Studied disinfectants included quaternary ammonium compound (QAC), 0.028% and 0.5% aldehyde, orthobenzyl parachlorophenol and 1:10 hypochlorite solution, which were mainly used to decontaminate floors, bathrooms, toilets, and furniture. Results did not show any lower infection rates associated with routine disinfection of surfaces, compared with cleaning with detergent only. A proper cleaning strategy and the targeted disinfection of environmental surfaces in hospitals is indispensable.[7] (Level 3)
- Another systematic review examined the application of sodium hypochlorite and its impact on the degree of colonization reduction, contamination or microorganism resistance, or prevention of hospital acquired infections (HAIs). Both invitro and in situ (rooms and equipment surfaces) settings were included. The findings demonstrated (with the exception of two studies) that sodium hypochlorite was effective in inactivation or inhibition of microbial growth, reduced infection and microbial resistance; however, the studies varied between time of exposure and concentration (ranging from 0.01% to 5.25%). The effect of sodium hypochlorite on HAIs remains questionable as no direct link was able to be established.[1] (Level 1)
- A systematic review investigated the effectiveness of various disinfection methods available for stethoscopes. Both physical and chemical contamination methods were found in the review: sodium hypochlorite (NaOCl); 70% and 90% isopropyl alcohol (IPA); 90% ethanol; benzalkonium chloride (BAK); 66% ethyl alcohol and ethanol-based hand sanitizer (EBHS); ultraviolet C (UVC) light through a light-emitting diode (LED); soap and water; and one study examined a putty compound with a malleable-elastic consistency (ethanol, water, guar, dyes, and odorants). All chemical disinfectants in various formulations (liquid, gel, foam, wipes, or putty) limited bacterial presence on the surfaces; a wearable device emitting UVC-LED was effective against common microorganisms involved in HAIs (e.g. Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Enterococcus faecalis). Authors concluded however, that success of disinfection methods did not seem to be due to the effectiveness of what was used, but rather to the regularity in which it was used.[8] (Level 1)
- Most general environmental cleaning can be performed with neutral detergents (with a pH between six and eight) that are easily soluble in cold or warm water. Specialized products may be used for bathrooms/toilets, floors, glass etc. and should be considered on a case by case basis.[3] (Level 5)
- Detergent and water alone are deemed adequate for cleaning non patients care areas such as administration offices, while a clean and disinfection process is required for all patient areas.[3] (Level 5)
- A thorough clean of the surface is required before it can be disinfected (unless the product is a combined detergent -disinfectant). However, it is recommended that for decontaminating surface with C. Difficile or spills blood and body fluids a two-step cleaning process is used.[2,3] (Level 5)

FREQUENCY OF CLEANING

- High-touch surfaces (those with frequent hand-contact) and sinks should be cleaned at least once daily, or as determined by local healthcare facility policy.[3] (Level 5)
- Low-touch surfaces (e.g. windowsills, tops of cupboards, vents, baseboards and corners) should be cleaned at least weekly, when a patient is discharged, or as determined by local healthcare facility policy.[3] (Level 5)
- Window blinds, bed curtains and walls should be cleaned at least monthly, when they are visibly soiled, or as determined by local healthcare facility policy.[3] (Level 5)
- Window curtains should be cleaned at least annually, or as determined by local healthcare facility policy.[3] (Level 5)

AUTOMATED CLEANING

- Machine automated or semi-automated disinfection may be a useful strategy, but its use requires further research to demonstrate efficacy and effectiveness and does not replace the need for thorough manual cleaning.[5] (Level 5)

Characteristics of the Evidence

This evidence summary is based on a structured search of the literature and selected evidence-based health care databases. The evidence in this summary comes from:

- A systematic review of 14 RCTs and controlled trials.[1]
- Consensus based expert opinion.[2,5]
- Clinical practice guidelines.[3,4]
- A prospective, before and after quasi experimental study.[6]
- A systematic review of four cohort studies.[7]
- A systematic review of 17 studies (three RCTs, three cross-sectional and 11 observational studies).[8]

Best Practice Recommendations

- Cleaning of hospital environmental surfaces should involve a multi-modal strategy that considers the type of product, how its applied, the level of contamination of the environment, the personnel responsible for cleaning. (Grade B)
- Organizations should have clear policies and procedures for the cleaning of hospital environmental surfaces; the frequency, methods and staff responsibility for cleaning should be outlined. (Grade B)
- Environmental surfaces in patient areas should be cleaned and disinfected; a combined detergent-disinfectant is suitable for use except for areas with infectious surfaces such as C. Difficile or spills blood and body fluids, in these circumstances a two-step clean and disinfectant process is required. (Grade B)
- No recommendation can be made for the use of specific products for cleaning and disinfecting surfaces; when selecting products for use consideration should be given to the potential for patient contact, the degree and frequency of hand contact and the potential contamination of the surface. (Grade B)
- High-touch surfaces (surface with frequent hand contact e.g. doorknobs, bed rails, light switches etc) and sinks should be cleaned daily or as determined by local healthcare facility policy. (Grade B)
- Low-touch surfaces (e.g. windowsills, tops of cupboards, vents etc) should be cleaned weekly or as determined by local healthcare facility policy. (Grade B)
- Window blinds, bed curtains and walls should be cleaned at least monthly, when they are visibly soiled, or as determined by local healthcare facility policy. (Grade B)
- Window curtains should be cleaned at least annually, or as determined by local healthcare facility policy. (Grade B)

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For details on the method for development see Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach. Worldviews Evid Based Nurs. 2015;12(3):131-8.