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State of the Science Review

Effect of hand hygiene on infectious diseases in the office workplace: A systematic review

Paul N. Zivich MPH^a, Abigail S. Gancz^b, Allison E. Aiello PhD, MS^{a,c,*}^a Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina Chapel Hill, NC^b Department of Biostatistics, Gillings School of Global Public Health, University of North Carolina Chapel Hill, NC^c Carolina Population Center, University of North Carolina Chapel Hill, NC**Key Words:**Office
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Background: Extensive data suggests that hand hygiene is a critical intervention for reducing infectious disease transmission in the clinical setting. However, it is unclear whether hand hygiene is effective at cutting down on infectious illnesses in non-clinical workplaces. The aim of this review is to assess the current literature concerning the effects of hand-washing interventions on infectious disease prevention among employees in nonclinical, office-based workplaces.

Methods: In compiling this review, PubMed, Scopus, and Business Source Premier were examined for studies published from 1960 through 2016.

Results: Eleven studies (eight experimental, two observational, one a simulation) were identified as eligible for inclusion. Hand-hygiene interventions at various levels of rigor were shown to reduce self-reported illness symptoms.

Conclusions: Hand hygiene is thought to be more effective against gastrointestinal illness than it is against respiratory illness, but no clear consensus has been reached on this point. Minimal hand-hygiene interventions seem to be effective at reducing the incidence of employee illness. Along with reducing infections among employees, hand-hygiene programs in the workplace may provide additional benefits to employers by reducing the number of employee health insurance claims and improving employee morale. Future research should use objective measures of hand hygiene and illness, and explore economic impacts on employers more fully.

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Prevention of infectious disease in the office-based workplace is a vital objective because such settings hold high potential for contact between healthy and ill individuals, and they harbor numerous contaminated fomites. Further, businesses with such workplaces may suffer substantial economic losses due to preventable illness. In the Occupational Safety and Health Administration guidelines on workplace influenza pandemic preparedness, hand hygiene plays a central role in mitigating risk in all types of workplaces.¹ Aside from their potential as pandemic sites, workplaces are key locations for exposure to seasonal infectious diseases.

Almost 20% of known contacts with visibly ill individuals occurs in the workplace,² and each year, 50% of workers develop a respiratory ailment.³ Furthermore, these contacts in the workplace were associated with 11 times the risk of gastrointestinal (GI) illness and four times the risk of respiratory illness among those exposed, compared with those who were not exposed during that week or the previous week.

These studies suggest that the workplace is an important location for infectious disease propagation. Dynamics of infectious disease transmission are also affected by office design and equipment sharing. Office spaces with an open floor plan have higher numbers of disease-related absences,⁴ and employees with shared offices have more episodes of the common cold compared to employees in private offices.⁵ Structural factors, such as ventilation systems, influence transmission, but much remains to be determined.⁶ Certain shared items at worksites have the potential to be important fomites, such as phones, keyboards, and desks. These have been recognized as key sources for the spread of infection in clinical settings^{7,8} and have been shown to be contaminated in nonclinical settings.^{9,10}

* Address correspondence to Allison E. Aiello, PhD, 135 Dauer Dr, 2101C McGavran-Greenberg Hall, Chapel Hill, NC 27599.

E-mail address: aaello@unc.edu (A.E. Aiello).

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The economic loss at the employee level due to infectious diseases is a function of two factors—absenteeism and presenteeism. Absenteeism, in this context, means missing work due to illness. Influenza-like illness causes an estimated <1–4.3 days of missed work per individual.¹¹ Influenza is estimated to cost the United States \$16.3 billion in lost productivity and loss of life annually,¹² and influenza accounts for only 5%–20% of all illness-related absences,¹³ so the overall impact of infectious diseases is likely substantial. Less is known about the impact of GI illness, but evidence indicates that it is associated with higher rates of work absence.^{14,15} Presenteeism, or attending work while ill, has been observed to have negative impacts on employee mood and productivity,^{16–19} but strategies to reduce this practice are under-studied.²⁰ A cross-sectional study found that 50% of all participants reported always attending work while symptomatic for a cold, in 2008.²¹ A decrease to 40.9% was observed after a hygiene campaign was conducted in response to the 2009 H1N1 pandemic. Another study found that less than one third of employees with respiratory infections take sick leave.^{3,15} In addition to effects on the individual, presenteeism increases the potential for transmission of infections to coworkers.²² In total, presenteeism has been estimated to account for up to 66.4% of a \$25 billion of annual economic loss in the United States, due to the common cold alone.²³ Clearly, reductions in absenteeism and presenteeism are likely to have substantial economic benefits and lead to improvements in population health. One way to potentially reduce infection rates and minimize their spread is through increased hand hygiene.

Hand hygiene has been shown to be an important means of preventing respiratory and GI illness in both clinical^{24–26} and community settings such as schools and households.²⁷ Less is known about the impact of hand hygiene in the office-based workplace. This setting is a promising arena in which to employ hand-hygiene interventions because employed adults spend about 7.6 hours each day doing work-related activities, and 82% of employees complete at least some of their work at the workplace.²⁸ Moreover, employees are often a captive audience during work hours, and employers have an economic stake in the health of their employees.

The primary objective of this systematic review was to assess the impact of hand hygiene on infectious disease risk among employees in nonclinical, office-based workplaces. We discuss types of hand-hygiene interventions that are effective and the potential economic impact of such interventions on employers. The purpose of this review is to inform infection-control policies, identify effective strategies to influence hand hygiene, and highlight gaps in the literature.

METHODS

We searched PubMed, Scopus, and Business Source Premier (BSP), using title/abstract/MeSH (medical subject heading)/other term fields, including publications up to September 2016. Articles published after that date, up to July 27, 2017, were evaluated for additional studies that met the criteria and were published after the start of the review. The protocol and study process were registered with the International Prospective Register of Systematic Reviews (PROSPERO: CRD42016050285) on October 26, 2016. The PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) guidelines for literature search and presentation of results were followed.²⁹

Search strategy

The primary search strategy included any search terms from categories 1, 2, or 3 (Table 1, Column 1). No restrictions were placed on publication date or language. Since BSP is a database of predominantly business, not medical, publications, a secondary search strategy was used to minimize the potential to miss articles. The second search of BSP used general illness terms (Table 1, Column 2), rather than the more-specific terms used in the primary search. The secondary BSP search added 11 additional articles to our search results. A manual search of references of included studies was performed to identify any articles missed by our search.

Eligibility criteria

To be included, studies had to meet three criteria: (1) be located in an office-based (nonclinical, non-food industry) workplace; (2) include a hand-hygiene measure; and (3) explore infectious disease outcomes. Studies examining food industry employees were excluded from the systematic review because these businesses have different regulations regarding hand hygiene than do office-based workplaces. Additionally, studies without a focus on employee hand hygiene and risk of infection (e.g., school-based studies focusing on students) were excluded. Only nonclinical workplaces were included, since risk of exposure to infectious illness and hand-hygiene requirements differ from those in clinical settings. Clinical workplaces included hospitals, medical schools, and doctor and dentist offices. The infectious outcomes included disease rates and economic cost-benefit related to infectious disease. No exclusions were made based on study design, hand-hygiene measure, or outcome measure.

Table 1
Terms used for database searches

	PubMed/Scopus/Business Source Premier (1)	Business Source Premier (2)
Category 1: hand hygiene	"hand washing" OR "hand hygiene" OR "hand rub" OR "hand sanitizer" OR "hand cleaner" OR "hand wash" OR "hand disinfection" OR "hand sanitation" OR "hand soap" OR "alcohol" OR "alcohol rub" OR "alcohol sanitizer" OR "antiseptic" OR "hygiene education"	"hand washing" OR "hand hygiene" OR "hand rub" OR "hand sanitizer" OR "hand cleaner" OR "hand wash" OR "hand disinfection" OR "hand sanitation" OR "hand soap" OR "alcohol" OR "alcohol rub" OR "alcohol sanitizer" OR "antiseptic" OR "hygiene education"
Category 2: workplace	"workplace" OR "work" OR "office" OR "occupation" OR "offices" OR "work site" OR "work place" OR "job site" OR "worksite"	"workplace" OR "work" OR "office" OR "occupation" OR "offices" OR "work site" OR "work place" OR "job site" OR "worksite"
Category 3: infectious disease	"cold" OR "diarrhea" OR "diarrhoea" OR "respiratory" OR "infectious disease" OR "infectious illness" OR "infection" OR "infect" OR "prevent" OR "prevention" OR "morbidity" OR "communicable disease" OR "vomiting"	"health" OR "illness" OR "disease"

NOTE. Searches were constructed by including any of the options from category 1 with any option from category 2 and category 3 ([hand hygiene search terms] AND [workplace search terms] AND [infectious disease search terms]). Search 2 for Business Source Premier included an additional 11 studies for review.

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