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Major Article

Impact of a multicomponent hand hygiene–related intervention on the infectious risk in nursing homes: A cluster randomized trial

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Background: The aim of this study was to assess the impact of a multifaceted hand hygiene (HH) program on the infectious risk in nursing homes (NHs).
Methods: This was a 2-arm cluster randomized trial; French NHs were allocated randomly to the intervention (13 NHs) or control (13 NHs) groups. The intervention consisted of implementing a bundle of HH-related measures over 1 year, including increased availability of alcohol-based handrub, HH promotion, staff education, and local work groups. The primary end point was the incidence rate of acute respiratory infections and gastroenteritis reported in the context of clustered cases episodes. Secondary end points were mortality, hospitalization, and antibiotic prescription rates.
Results: Baseline characteristics did not differ between groups. The overall handrub consumption was higher in the intervention group over the 1-year intervention period. Because of underreporting, data on the primary end points were of insufficient quality for analysis. Hospitalizations did not differ between the 2 groups. However, the intervention group showed significantly lower mortality (2.10 vs 2.65 per 100 residents per month, respectively; $P = .003$) and antibiotic prescriptions (5.0 vs 5.8 defined daily doses per 100 resident days, respectively; $P < .001$). These results were confirmed by the longitudinal multivariate analysis adjusted for NH and resident characteristics and for seasonality (mortality rate ratio, 0.76).
Conclusions: A multifaceted HH intervention may have a short-term impact on mortality in NHs. Nevertheless, other strategies may remain necessary to reduce morbidity.
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BACKGROUND

Nursing homes (NHs) are both care facilities and home to many older adults in developed countries worldwide. This combination leads to a unique situation in which the infection risk is difficult to control.[1] Indeed, in addition to the effect of aging, NH residents often have multiple comorbidities, physical disabilities, and cognitive impairment, which all contribute to make them highly vulnerable to infection.[2] Additionally, because NHs are living places, they offer a wide range of opportunities for socialization, including shared meals, recreational activities, and rehabilitation exercises, therefore increasing the probability of person-to-person transmission of pathogens.[1]

This translates to a high prevalence of infections in NHs, estimated in France at 11.2% (95% CI, 4.4%-16.2%).[3] In the United States, the total number of infections occurring in NHs was estimated at 1.6-3 million per year, figures similar to those observed for nosocomial infections in acute care settings.[1] Respiratory infections and gastroenteritis are the most frequent infections leading to outbreaks in NH settings, with respiratory viruses and norovirus as the most common etiologic agents.[2,4]

These infections account for a large share of NH mortality, with the rate of death associated with infections in NHs estimated at 0.6 per 1,000 resident days (range, 0.04-0.71).[5] They are also associated with frequent hospital transfers and increased antimicrobial use and with high costs, that may exceed $1 billion per year in the United States.[6]

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For all these reasons, infection prevention and control is a major focus of NH attention. In particular, hand hygiene (HH) is recognized as one of the simplest and most cost-effective tools for infection control in health care settings.[7] However, there are several barriers to the implementation of efficient HH policies in NH settings. First, these policies may seem too costly for NHs, for instance because of increased handrub solution expenditures.[8] Second, staff education is complicated by a high turnover, making frequent training sessions mandatory.[9] Third, most available HH recommendations were originally designed for acute care settings. Hence, a reluctance to apply these recommendations in NHs is often reported because staff members feel that they are not adapted to long-term care and tend to overmedicalize resident-staff interactions.[10,11]

Consequently, compliance with international HH recommendations is low in NH staff: it was reported as 14.7% in Canada,[12] 17% in Italy,[13] and 11.3% in Taiwan.[14] A recent review of the evidence on HH in NHs underlined the importance of adapting HH recommendations and programs to NH settings to improve this compliance rate.[15] This review also showed that the current evidence on HH impact in long-term care settings is lacking and mostly based on small-scale observational studies.

In this context, the objective of this study was to assess, through a randomized controlled trial, the effectiveness of a participative multicomponent HH intervention specifically designed for NHs. This intervention aimed at overcoming most of the aforementioned barriers to HH in NHs, notably by associating the staff to the design of local guidelines, and by increasing their awareness of the infectious risk.

METHODS

Study design

This study was a 2-arm cluster randomized controlled trial, complying with the Consolidated Standards of Reporting Trials guidelines.[16] Each participating NH constituted 1 cluster. The intervention was implemented in intervention NHs for a period of 12 months, from April 1, 2014-April 1, 2015, whereas usual practice continued in control NHs.

Directors of the included NHs agreed to participate in the study and be randomly allocated to either the intervention group or control group before the beginning of the data collection process. Individual written consent was not required from the residents or their relatives. However, in all intervention NHs, information letters about the study were posted near the entry and sent to doctors, and meetings were organized to inform residents and families. The trial was registered in the ISRCTN Registry (study no. ISRCTN16474757). No ethics approval was required for this study according to French legislation because no individual-level data were collected and the intervention did not involve any additional therapy or procedure for residents.

Participants

The study was performed in French NHs belonging to the Korian group, a privately held chain of NHs. After a call for participation, a total of 27 NHs distributed over France volunteered to take part in the study. We selected a NH in Paris for the pilot study, and included the remaining 26 NHs, assigning 13 NHs to the intervention group using simple randomization, whereas the other 13 NHs were assigned to the control group.

Usual and control practices

Usual HH practices continued in NHs allocated to the control group. This included general training on infection control offered to volunteer staff, access to handrub solution dispensers near resident rooms, and HH promotion on the annual World Hand Hygiene Day (May 5).

Intervention

The intervention was based on a bundle of HH-related measures aimed at NH staff, residents, visitors, and outside care providers. These measures included facilitated access to handrub solution using pocket-sized containers and new dispensers, a campaign to promote HH with posters and event organization, the formation of local work groups in each NH to work on HH guidelines, and staff education using e-learning on infection control and HH training performed by the same nurse for all NHs. Online quizzes were proposed at the end of the training program, and staff who did not achieve a high enough score were invited to go through the e-learning again at a later date. A detailed description of the intervention is available from the authors on request.

All aspects of the intervention started being implemented simultaneously in April 2014 in all intervention NHs. Based on success rates for online quizzes and personal communication with the nurse in charge of the training, 3-6 months were necessary for the program to take.

Study end point measures

The primary end point was the incidence rate of acute respiratory infections (ARI) and acute gastroenteritis (AGE) reported in the context of episodes of clustered cases, defined as at least 5 cases within 4 days among NH residents or staff. ARIs were defined as the combination of at least 1 respiratory symptom with 1 symptom of systemic infection. AGE was defined as the sudden onset of diarrhea or vomiting in the absence of a noninfectious etiology.

Secondary end points were the mortality rate, hospitalization rate, and antibiotic prescription rate (measured in defined daily doses [DDDs] per 100 resident days[17]).

Data collection

Data were collected monthly at the NH level in all participating NHs over the 3 months preceding the intervention (baseline period), during the 1-year intervention, and over the 3 months after the end of the intervention (follow-up period). Data collection was centralized by the NH group headquarters in Paris, and made use of existing computerized databases. No individual data were collected.

The collected data on NH characteristics and organization included location, number of beds (capacity and monthly occupancy rate), and staffing levels (monthly planned worked hours for each staff category and absenteeism data). Resident characteristics included age distribution, proportion of men, pathology, and dependency rates. The resident-level dependency rate was measured using the French GIR (iso-resource group) group, based on a scale corresponding to the length of assistance time required to help the individual accomplish daily living activities, with a score ranging from 1 for highly dependent individuals to 6 for independent individuals.[18,19] The mean weighted GIR (GMP) was collected at the NH level, as was the mean weighted pathology score (PMP) of residents. GMP and PMP are commonly used in French long-term care institutions.

In NHs from the intervention group, the average success rate for online quizzes on HH performed at the end of the education intervention was also collected.

ARI and AGE data came from a national surveillance system that was implemented in France in 2010 as part of a national plan to reduce the infection risk in long-term health care settings.[20] The

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