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Major Article

Changes in knowledge and attitudes of hospital environmental services staff: The Researching Effective Approaches to Cleaning in Hospitals (REACH) study

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Background: The Researching Effective Approaches to Cleaning in Hospitals (REACH) study tested a multimodal cleaning intervention in Australian hospitals. This article reports findings from a pre/post questionnaire, embedded into the REACH study, that was administered prior to the implementation of the intervention and at the conclusion of the study.

Methods: A cross-sectional questionnaire, nested within a stepped-wedge trial, was administered. The REACH intervention was a cleaning bundle comprising 5 interdependent components. The questionnaire explored the knowledge, reported practice, attitudes, roles, and perceived organizational support of environmental services staff members in the hospitals participating in the REACH study.

Results: Environmental services staff members in 11 participating hospitals completed 616 pre- and 307 post-test questionnaires (n = 923). Increases in knowledge and practice were seen between the pre-and post-test questionnaires. Minimal changes were observed in attitudes regarding the role of cleaning and in perceived organizational support.

Conclusion: To our knowledge, this is the first study to report changes in knowledge, attitudes, and perceived organizational support in environmental services staff members, in the context of a large multicenter clinical trial. In this underexplored group of hospital workers, findings suggest that environmental services staff members have a high level of knowledge related to cleaning practices and understand the importance of their role.

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BACKGROUND

Cleaning hospitals is replete with challenges. Roles and responsibilities for cleaning, decisions on what products to use and how to use them, and the cleaning processes are just some of these.[1] A report by the U.S. Agency for Healthcare Research and Quality highlighted facilitators and barriers to implementing improvements in environmental services cleaning, which included the organizational culture.[2] In an attempt to address these issues, the Researching Effective Approaches to Cleaning in Hospitals (REACH) study tested the effectiveness and cost-effectiveness of implementing a multimodal cleaning intervention in 11 Australian hospitals, facilitated by an implementation framework—the integrated Promoting Action on Research Implementation in Health Services framework.[3] The REACH study used a stepped-wedge randomized controlled study design, with sequential roll-out of an environmental cleaning bundle over a 62-week period. The intervention focused on environmental services staff members with a role in hospital ward cleaning.[3] The multimodal intervention had 5 interdependent components: training, technique, product, audit, and communication. Additional details regarding the components of the bundle are detailed in a protocol paper.[3]

Understanding the knowledge, attitudes, practice, role, and perceived organizational support of environmental services staff work and their organisztion was important in the context of the REACH study; and, more broadly, it is important when implementing any intervention in a clinical setting. Understanding the organizational context into which the bundle was being implemented, as well as understanding the baseline level of knowledge, reported practice, and role of cleaning, supported the tailoring of the REACH intervention at each hospital. Furthermore, it enabled an evaluation of whether changes in these areas were observed during the 62-week study.

Previous studies have evaluated the knowledge and reported practice of environmental services staff members. However, none has done so in the context of a large, multicenter, randomized controlled study aimed at improving cleaning practices and reducing the incidence of healthcare-associated infections.[4-8] This article reports selected findings from a pre/post questionnaire, embedded into the REACH study, that was administered prior to the implementation of the intervention and at the conclusion of the study. The purpose of this article is to report changes in knowledge, reported practice, attitudes, roles, and perceived organizational support of environmental services staff members in the hospitals participating in the REACH study.

METHODS

Design

We used a cross-sectional survey design, nested within a stepped-wedge trial (Fig 1).

Setting

Eleven acute public and private Australian hospitals were enrolled in the REACH study.[3]

Participants

Particpants were environmental services staff members who were employed in a role that included ward cleaning. Across the 11 hospitals, 807 environmental services staff members, comprising 47% of eligible staff, received training in facilitated workshops in week 1-2 of the intervention phase. The number of attendees varied at each session (ranging from 1 to 30), and multiple sessions were delivered at each site to maximize attendance.

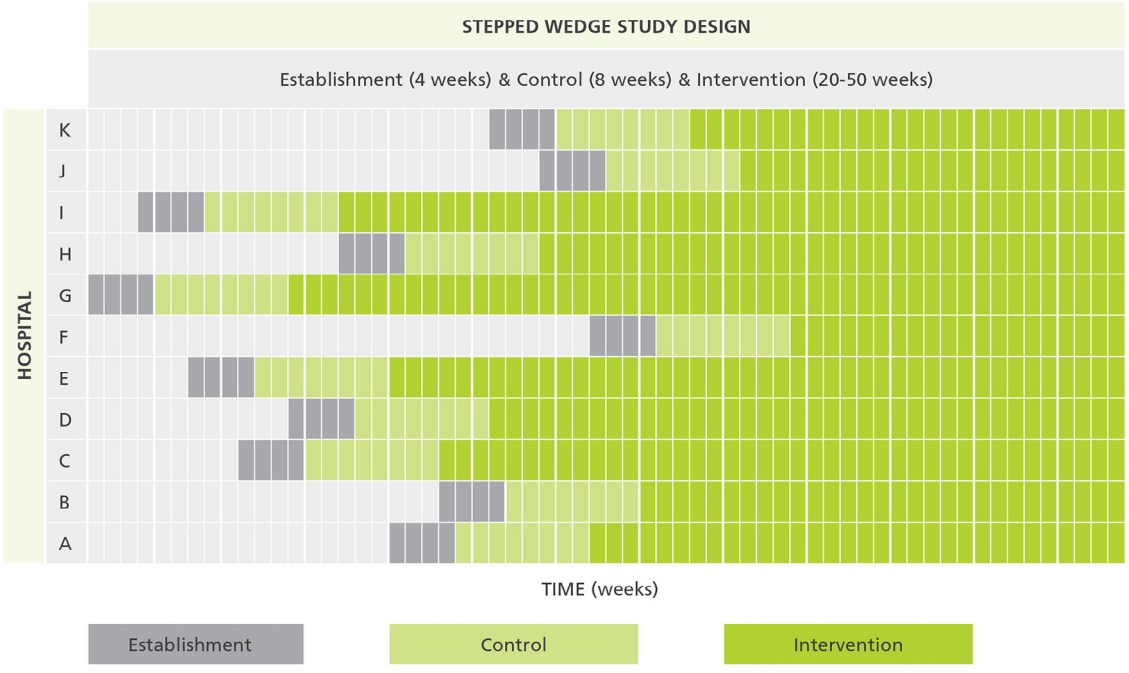


Fig 1. Stepped wedge study design.

Intervention

The REACH intervention was a multimodal cleaning bundle comprising 5 interdependent components: training, technique, product, audit, and communication.[3] Each component consisted of fixed and flexible elements to ensure consistency across hospitals, while allowing tailoring of the bundle to align with the local context. The study team worked with each hospital to develop a local cleaning bundle implementation plan that responded to the evidence-practice gap that was identified from a structured mapping exercise at baseline.[9] The mapping included data collection about the hospital's cleaning and infection control programs, including past and current education activities and information from environmental services staff activities (questionnaires and discussion groups).

Implementation of the bundle commenced with a REACH study team member delivering face-to-face education in the first 2 weeks of the intervention phase. Education included the contribution of the environment to healthcare-associated infections, practical cleaning technique activities, evidence for the REACH cleaning bundle, and how to use the bundle. The research team worked with each hospital to identify the optimum number and timing of the sessions to maximize the participation of environmental services staff members. Multiple sessions were provided at each hospital, including during the day and night. Attendance was encouraged by promotional materials, locally determined incentives (e.g., refreshments, pens), and by environmental services supervisors and managers.

Use of the product, cleaning techniques, and communication components of the bundle commenced immediately after training was completed. The audit component, which included feedback to environmental services staff members about the thoroughness of their cleaning, commenced from week 3 of the intervention phase. Refresher and feedback sessions and promotional materials were used throughout the trial to reinforce and support bundle implementation.

Data collection

During the control phase, environmental services staff members at each hospital who had a role in ward cleaning were encouraged to complete a paper-based questionnaire at an information session about the REACH study. This was repeated at the conclusion of the intervention phase. Figure 1 provides an overview of the study design. Participants were invited to the information sessions through posters placed in strategic areas of their hospital (e.g., environmental services office area). Participation was voluntary, and completion of the questionnaire indicated participant consent. Pre- and post-questionnaire responses were analysed using R 3.3.2 software.[10] Prior to analysis, a minimum of 10% of data entries were checked by a second member of the research team to ensure correct data entry.

Questionnaire development

The questionnaire was developed from pilot work and existing literature, using validated questions where available.[5,6,11,12] The questionnaire was designed to collect information about demographics, knowledge, reported practices, and attitudes, and also included questions from the 8-item Survey of Perceived Organizational Support.[11] For each participant, the following demographic data were collected: age, how long they had been a professional cleaner, whether English was their first language, and whether any other language was spoken at home. Participants were encouraged to use a unique identification code that would enable linkage of responses in both surveys. The knowledge- and practice-based questions, which consisted of 20 true/false and 1 multiple-choice question, explored the topics of organism transmission, application of contact precautions, and identification of frequent touch points (FTPs).[13] In addition, the questionnaire contained 5 questions about attitudes, 15 questions about the role of cleaning, and 8 questions about perceived organizational support—all of which used a 5-point Likert scale (strongly agree to strongly disagree).[5,6,11] The perceived organizational support questions included both positively and negatively worded items. The questions analyzed in this article, and the evidence base for the questions, are provided in Online Supplement A.

The questionnaire also included sections and questions not reported here, which were used to inform other elements of the REACH study. For example, in the pre-study questionnaire, participants were asked about their education experience and training in infection control and cleaning; in the post-questionnaire, participants were asked about their experience with the REACH study. Pre-test questions were used to tailor the intervention and for a gap analysis and context mapping. The full questionnaire contained 90 individual questions.

Data analysis

Continuous and binary demographic variables were summarized by sample means and percentages, respectively. Single-item knowledge questions were summarized by the percentages of correct responses in both pre- and post-test phases and were compared using a 2-proportion z-test. A 2-proportion z-test was used to compare overall knowledge of FTPs in the pre- and post-test phases. FTP knowledge in each phase was defined as the proportion of participants who responded correctly to all FTP questions. Pre- and post-test perceived organizational support scores were compared using a 2-sample t-test with independent samples (unequal variances assumed). To check scale reliability, Cronbach's alpha was conducted on both pre and post perceived organizational support scores. Responses to questions relating to the attitudes and role of cleaning were tabulated in terms of the percentages of disagree, agree, and neutral answers. Comparisons in the pre- versus post-test phases for these questions were made using Pearson's χ^2 test of homogeneity.

Ethics

This project received ethics approval from the Uniting Care Health Human Research Ethics Committee (approval number 1413) and the Queensland University of Technology Human Research Ethics Committee (approval number 1400000828). Local ethics and site-specific governance approvals were obtained for all participating hospitals. The REACH study is registered with the Australian and New Zealand Clinical Trial Registry (ACTRN12615000325505).

RESULTS

Envionmental services staff members from the 11 participating hospitals completed 616 pre-test questionnaires and 307 post-test questionnaires (n = 923). The number of respondents varied by trial site, ranging from 43 to 115 responses. In the pre-test questionnaire, the mean age of participants was 50 years, with an average of 8.7 years in their role. English was the primary language for 80% of respondents, with 86% of respondents speaking a language other than English at home. No statistical differences were observed between the 2 samples in mean age, experience, or language demographics of respondents. Of participants surveyed in the pre-implementation phase, 494 (80.2%) indicated that they had received some prior training. Most prior training appeared to be conducted on an annual basis, with 35% of participants indicating this.

Table 1
Pre- and post-test survey results for knowledge- and practice-based questions

Question	Pre	Post	% Difference (Pre/Post)	
	% correct (n)	% correct (n)	Estimate (95% CI)	Statistic (*P*-value)
Knowledge-based questions				
I can carry germs without getting sick and can infect other people with these germs	88.95 (588)	87.76 (294)	–0.01 (–5.71,3.33)	–0.52 (0.61)
Healthcare workers' hands often become contaminated with germs after touching. . .	95.79 (595)	97.94 (291)	0.02 (–0.15,4.43)	1.83 (0.07)
Participants who responded correctly to all FTP questions	8.01 (612)	20.60 (301)	12.59 (7.54,17.64)	4.89 (<0.01)
Gloves should be worn when. . .				
Removing waste	99.35 (612)	99.66 (296)	0.00 (–0.60,1.23)	0.67 (0.50)
Working in a room with contact precautions	99.67 (606)	99.32 (293)	0.00 (–1.40,0.70)	–0.66 (0.51)
Eating lunch	95.51 (557)	92.36 (275)	–0.03 (–6.73,0.43)	–1.72 (0.09)
Practice-based questions				
This sign on the door of a patient's room means a cleaner should:				
Not do anything different from any other room	90.11 (536)	87.23 (274)	–2.89 (–7.58,1.81)	–1.21 (0.23)
Check requirements with the nurse manager before I start	76.33 (545)	73.06 (271)	–3.27 (–9.64,3.12)	–1.00 (0.33)
Wear PPE according to the sign	99.48 (576)	100 (290)	0.52 (–0.07,1.11)	1.74 (0.08)

CI, confidence interval; *FTP*, frequent touch point; *PPE*, personal protective equipment.

Table 2
Pre- and post-test survey results exploring changes in attitudes and role as a cleaner

Question	Pre			Post			Statistic
	% disagree (n)	% agree (n)	% neutral (n)	% disagree (n)	% agree (n)	% neutral (n)	(*P*-value)
Patient safety is a high priority at this hospital	3.24 (19)	94.55 (555)	2.21 (13)	2.42 (7)	95.16 (275)	2.42 (7)	0.48 (0.79)
The hospital is always trying to find new ways to improve cleanliness	5.99 (35)	78.94 (461)	15.07 (88)	5.19 (15)	80.97 (234)	13.84 (40)	0.52 (0.77)
The hospital invests a lot of time into resources for cleaning staff	19.41 (111)	57.17 (327)	23.43 (134)	15.11 (42)	59.71 (166)	25.18 (70)	2.37 (0.31)
The hospital provides all the equipment I need	16.32 (95)	66.32 (386)	17.35 (101)	18.66 (53)	65.49 (186)	15.85 (45)	0.89 (0.64)
Environmental services staff are involved in making improvements to reduce infections	9.03 (50)	69.67 (386)	21.30 (118)	8.77 (25)	71.93 (205)	19.30 (55)	0.51 (0.77)
I find it easy to ask my supervisor for help	12.59 (73)	75.17 (436)	12.24 (71)	11.15 (31)	72.30 (201)	16.55 (46)	3.08 (0.21)
I know what is expected of me	1.55 (9)	94.65 (548)	3.80 (22)	1.08 (3)	95.31 (264)	3.61 (10)	0.32 (0.85)
My views on work practices are listened to	17.61 (100)	54.23 (308)	28.17 (160)	19.98 (52)	50.36 (138)	30.66 (84)	1.11 (0.58)
I feel supported at work by other staff on the wards	10.12 (58)	71.03 (407)	18.85 (108)	9.89 (27)	66.67 (182)	23.44 (64)	2.44 (0.30)
I have a say in my work speed	13.88 (79)	62.92 (358)	23.20 (132)	12.03 (32)	62.78 (167)	25.19 (67)	0.77 (0.68)
I usually have the equipment and supplies to clean well	12.11 (70)	74.57 (431)	13.32 (77)	11.31 (31)	69.34 (190)	19.34 (53)	5.21 (0.07)
I feel appreciated in my job	15.69 (91)	60.00 (348)	24.31 (141)	17.52 (48)	54.01 (148)	28.47 (78)	2.78 (0.25)
I feel overwhelmed by work demands	28.09 (159)	40.11 (227)	31.80 (180)	26.12 (70)	36.19 (97)	37.69 (101)	2.84 (0.24)
I get regular feedback on my work	28.90 (165)	42.56 (243)	28.55 (163)	23.90 (65)	39.34 (107)	36.76 (100)	6.14 (0.05)
I like getting feedback about my work	3.14 (18)	80.49 (462)	16.38 (94)	4.04 (11)	77.21 (210)	18.75 (51)	1.30 (0.52)
All things considered I am satisfied in my job	6.22 (36)	79.27 (459)	14.51 (84)	5.45 (15)	74.91 (206)	19.64 (54)	3.67 (0.16)
I have an impact on reducing infections	1.04 (6)	91.48 (526)	7.48 (43)	2.93 (8)	88.64 (242)	8.43 (23)	4.37 (0.11)
I do a good job with cleaning to please myself	4.69 (27)	88.89 (512)	6.42 (37)	6.64 (18)	82.29 (223)	11.07 (30)	7.28 (0.03)
Other cleaners expect me to do a good job cleaning	5.23 (30)	74.22 (426)	20.55 (118)	2.99 (8)	71.27 (191)	25.75 (69)	4.47 (0.11)
It matters to patients and families that I do a good job cleaning	0.35 (2)	94.97 (547)	4.69 (27)	2.21 (6)	91.54 (249)	6.25 (17)	7.87 (0.02)

Knowledge and reported practice

A statistically significant increase was observed in the identification of FTPs ($P < .01$) between the pre- and post-test questionnaire, and a positive trend was observed in the proportion of respondents who correctly answered questions related to hand hygiene ($P = .07$), glove use ($P = .09$), and the application of personal protective equipment when encountering a patient under contact precautions ($P = .09$) (Table 1). There was a high baseline (>95%, pre-test) of correct answers to several other questions, including those related to disease transmission, use of gloves when removing waste, and working in a room with a patient requiring contact precautions.

Attitudes, role as a cleaner, and perceived organizational support

The results indicated a limited change in attitudes about the role of cleaning, after the intervention (Table 2). A high level of agreement with several questions was identified at baseline, which remained consistently high after the intervention: "Patient safety is a high priority at this hospital," "I know what is expected of me," and "I have an impact on reducing infections." Overall, some indicators improved, whereas others did not. In both the pre/post test questionnaires, over 90% of respondents agreed that doing their job (cleaning) matters to patients and families; however, a statistically significant decrease was observed in the percentage of respondents who agreed with this (from 95% pre to 92% post, $P = .02$). Areas where the level of agreement remained low in both the pre- and post-test questionnaire included receiving regular feedback on their work, investment in resources for cleaning staff, and whether their views on work practices are listened to.

The perceived organizational support scale was reliable in both the pre and post samples: $\alpha = 0.82$ (95% confidence interval [CI] 0.80-0.84) and $\alpha = 0.79$ (95% CI 0.76-0.83), respectively. The mean for perceived organizational support was 25.8 (95% CI 25.3-26.3) in the pre sample and 25.2 (95% CI 24.5-25.9) in the post sample. No significant difference was observed between these 2 groups (95% CI -0.27-1.48; $P = .18$).

DISCUSSION

To our knowledge, this is the first study to quantitatively report changes in knowledge, attitudes, and perceived organizational support in environmental services staff members, in the context of a large, multicenter clinical trial. Furthermore, ours is the largest study to report on the knowledge, attitudes, role, and perceived organizational support of environmental services staff members in hospitals.[5,7,8] One focus of the education component of the REACH intervention was to improve knowledge and reported practice. Our results suggest that this was achieved and that high levels of baseline knowledge were sustained. We also observed improvement in the knowledge of environmental services staff members with respect to aspects of organism transmission, critical areas for cleaning (FTPs), and the application and/or use of personal protective equipment. Questions where no changes were found could be explained by the high baseline of correct responses in the pre-trial phase. For several questions, nearly 100% of participants answered correctly.

The improvements identified in knowledge and reported practice were also achieved in the context of considerable variation in cleaning practices, workforce structure, products used, and staff training, prior to introducing the intervention.[9] Studies examining the level of knowledge and application of infection control principles and cleaning practices of environmental services staff members are largely absent in the literature, with comparisons not possible.

Little change was observed in the aggregate results in attitudes, the role of cleaning, and perceived organizational support. Notably, the vast majority of respondents agreed that cleaning matters to patients and families. This theme is similar to that identified in a study conducted in a Canadian hospital, which found that cleaners take pride in their work and are committed to patients and families.[5] Similarly, respondents indicated a high level of agreement to questions about cleaning having an impact on infections, knowing what is expected of them, and indicating a high priority for patient safety in their organization. A study conducted in 5 hospitals in the United States also identified that environmental services staff members believed their work was important to keep patients safe.[8] Interestingly, in our study, most respondents indicated that they would like feedback on their performance, despite most indicating that they did not receive regular feedback. This presents an opportunity for further engagement with environmental services staff members.

These results provide important contextual details for the analysis of the REACH study. The efficacy of the bundle on the incidence of healthcare-associated infections and its cost-effectiveness are published. Since the findings suggest little change in attitudes or perceived organizational support, any changes observed in the incidence of healthcare-associated infections are arguably less likely to be influenced by a change in the support, leadership, or patient safety climate.

Future reports related to the REACH study will present results regarding changes in cleaning practice, as measured by ultraviolet light auditing and adenosine triphosphate measurements. These findings may add to our understanding of whether the cleaning bundle intervention, with its 5 components, was associated with quantifiable changes in practice, consistent with other studies.[14-16]

Our study had limitations, specifically the cross-sectional design of the questionnaire. A paired pre/post comparison of responses was not possible because the number of respondents who completed both surveys is unknown. The study team encouraged the use of a unique respondent identification code to enable paired analysis. In practice, while the research team observed some respondents using the same unique number pre and post, many chose not to use a unique number, perhaps due to concerns about protecting their confidentiality and different respondents completing each questionnaire. Overall, only a small number of matched responses could be identified (n = 35). Despite this, no significant differences in demographic data were observed between pre- and post-test data, suggesting that observed pre/post changes were due to the intervention, not to differences in participant characteristics.

The questionnaire tool used validated questions; however, a large proportion of respondents had a first language other than English, and the research team, while conducting the questionnaire, observed some difficulty in English comprehension in some environmental services staff members. The use of verbal surveys may be worth considering in future studies or by hospitals wanting to assess the level of knowledge of environmental services staff members. Questions related to attitudes, roles of cleaning, and perceived organizational support were presented toward the end of the questionnaire, which, as previously stated, comprised other questions used for other purposes. The length and dual purpose of the survey may have had an effect on the responses to these questions. In some hospitals, environmental services staff members were very skeptical about being asked about their attitudes and perceived organizational support. Despite assurances about confidentiality, some participants expressed concern about their responses being identified by the hospital, especially to questions about perceived organizational support. Conducting a questionnaire on knowledge and practice, separate from attitudes and perceived organizational support, is recommended for future studies.

This article presents new knowledge about the level of understanding of infection control principles and related cleaning practices in environmental services staff members. In this underexplored group of hospital workers, the results indicate that environmental services staff members have a high level of understanding in knowledge and perceived organizational support and regarding practice-based questions, and that they understand the importance of their role. However, there is a perceived lack of organizational support, feedback, and investment in cleaning resources. The attitudes of environmental services staff members should not be ignored, and understanding the determinants of cleaning performance is critical in tailoring interventions to improve hospital cleaning and reduce the risk of infection transmission.

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SUPPLEMENTARY DATA

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